MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIRETORIA DE OPERAÇÕES

PROJETO ESTRATÉGICO DE ARMAMENTO INSTITUCIONAIS

Relatório Técnico nº: **RTPRF 02/2019**	Emissão: **13.08.2019**	Revisão:
Assunto: **PADRONIZAÇÃO DO SISTEMA DE ARMAS GLOCK PARA A PRF**		

1. INTRODUÇÃO

Os estudos da Polícia Rodoviária Federal conduzidos pela equipe do projeto ARM - Armamentos Institucionais, foram iniciados ainda no segundo semestre de 2015, tendo com um dos principais objetivos, estabelecer critérios rígidos e bem definidos para a escolha e aprovação de qualquer arma ou munição para o quadro de dotação da PRF, com o objetivo que a instituição, seus servidores e a sociedade brasileira não fossem vítimas de armas de baixa qualidade, segurança e confiança e que o alto investimento realizado fosse corretamente aplicado. Buscando isso, diversos estudos, pesquisas e testes foram realizados ao longo dos anos, que culminou, no final de 2017 com o processo de aquisição do Sistema de Armas Glock.

2. OBJETIVO

O presente relatório tem por finalidade apresentar os estudos, análises, testes e indicadores que levaram a equipe do projeto a definir e, com base neles, sugerir a padronização do Sistema de armas Glock para a PRF.

Conforme será demonstrado, esses armamentos atendem as necessidades do serviço de um policial rodoviário federal, principalmente no que diz respeito a segurança, confiabilidade, efetividade, performance, capacidade, precisão, modularidade, modernidade, ergonomia, durabilidade e empregabilidade.

3. DESENVOLVIMENTO

3.1. CONTEXTUALIZAÇÃO

Inicialmente cabe-nos esclarecer o contexto nacional e institucional em que surgiu a demanda por novos armamentos dentro da PRF, que culminou com a aquisição dos Sistema de armas Glock.

No ano de 1996 o Departamento de Polícia Rodoviária Federal foi a primeira força de segurança pública nacional a adquirir pistolas no calibre .40 S&W, calibre este que mais tarde se tornaria um dos calibre mais utilizados pelas forças policiais em todo o mundo.

Com o desgaste natural do armamento adquirido a PRF buscou modernizar seu parque de armamentos, sendo adquiridos 3000 mil unidades do modelo PT-840 entre os anos de 2009 e 2012. Porém, já no ano de 2010 após a compra e distribuição das primeiras armas, várias pistolas passaram a apresentar diversos problemas, que deixavam as armas inoperantes para o uso, expondo a risco não só os PRF´s mas a sociedade também.

Devido a gravidade do tema, no ano de 2015 a PRF instituiu o Projeto ARM - Armamentos Institucionais para, entre outras coisas de: Realizar pesquisas, levantamentos e estudos sobre segurança, confiabilidade, efetividade, performance, capacidade, precisão, modularidade, ergonomia, durabilidade e empregabilidade dos armamentos empregados pela PRF; Apresentar proposta de normatização do protocolo de registro e controle das panes, quebras, falhas, defeitos e quaisquer outros problemas relacionados às armas de fogo e munições em qualquer que seja a situação no âmbito da PRF; e propor melhorias, otimizações, mudanças, substituições, padronizações e possíveis aquisições com base nos estudos.

Durante os estudos do projeto, para a surpresa da PRF, a empresa Taurus colocou no ar o site http://www.qualidadetaurus.com.br/, onde publicou novos manuais de armas, informando, entre outras coisas, e diferentemente do que diziam seus manuais anteriormente publicados que "QUALQUER ARMA PODE DISPARAR EM CASO DE QUEDA". Ora além disso claramente não representar a verdade, haja vista a existência de protocolos de testes internacionais que atestam e aprovam vários modelos de armas de outros fabricantes em testes rigorosos de queda e resistência, como pode foi visto como uma tentativa ardilosa da fabricante não ser implicada judicialmente nos inúmeros casos de disparos de arma de fogo após a queda registrado no Brasil.

Na fase de estudos, somente relacionados aos estudos das armas de porte, foram confeccionados cerca de 10 relatórios técnicos, contendo desde pesquisas junto ao efetivo da PRF e em outras instituições policiais; análises de estudos de outras instituições; realizações de testes de campo entre outros. Uma das principais consequências desses estudos, foi o estabelecimento da necessidade de substituição de 100% das armas antes empregadas pela PRF, devido ao desgaste de suas peças e/ou por falha de projeto que, em ambos os casos deixaram as armas inseguras para a atividade de Policial Rodoviário Federal.

Ademais, os estudos permitiram à PRF definir as características técnicas necessárias e desejáveis para suas novas armas de porte, garantindo qualidade, segurança e confiança no emprego dos armamentos. Desta forma, ao final do ano de 2017 a PRF iniciou seu processo de compra de 12.565 unidades de pistolas Glock, o que permitiu a substituição integral de todas as suas antigas armas de porte.

3.2. ESTUDOS E PESQUISAS

Estabelecidas as atribuições e objetivos do projeto ARM, bem como a definição das prioridades, os técnicos passaram a se debruçar no estudo sobre as armas de porte. Diante disso, foram definidos todos os pontos que precisavam ser realizadas amplas pesquisas e estudos.

Somente após finalizados os estudos e pesquisas sobre cada ponto, a equipe responsável apresentava uma conclusão e elaborava um Relatório Técnico (RTPRF). Como forma de maximizar a convocação dos integrantes da equipe, muitos desses trabalhos ocorrerem em paralelo um com outro, com atualizações constantes para todos os integrantes. A ferramenta SEI, com a ajuda dos programas de compartilhamento on-line de arquivos foram essenciais para o andamento do projeto.

Iniciaremos um resumo de cada tema central desses estudos, fazendo referência a cada um dos relatórios correlatos produzidos.

3.2.1. **Análise minuciosa das armas da PRF**

Relatórios sobre o tema:

- RTPRF 04.2016 - Situação das armas da PRF - SEI nº 4081870;
- RTPRF 05.2016 - Panes nas armas da PRF - SEI nº 4081879 e;
- RTPRF 05.2017 - Análise descritiva dos problemas apresentados nas pistolas PT-840 - SEI nº 7748235

As pesquisas e estudos sobre o parque de armamentos atualmente utilizado pela PRF necessariamente foi a primeira a ser realizada, haja vista que somente após essa análise, que os especialista teriam uma noção da dimensão dos problemas e poderiam estabelecer uma um direção para os estudos.

Devido aos anos de experiência na área de instrução com os armamentos, ainda no ano de 2015 a equipe de técnicos do projeto já possuía um amplo conhecimento dos principais problemas envolvendo 03 (três) modelos em uso das armas de porte da PRF, PT 100, PT-840 e PT-640, todos pertencentes ao fabricante nacional Taurus, somente não sabíamos da dimensão (frequência) deles. Para melhor compreensão, no RTPRF 04.2016, foi apresentado detalhadamente um relato das características, histórico e condições atuais de cada um desses modelos.

O modelo da Pistola Taurus PT 100 podemos destacar que trata-se de uma aquisição realizada no ano de 1996 onde a Polícia Rodoviária Federal foi a primeira força de segurança pública nacional a adquirir pistolas no calibre .40 S&W. Esse armamento inicialmente atendia bem aos propósitos da Polícia Rodoviária Federal, mas com o passar dos anos, devido ao desgaste decorrente do uso natural e do tipo de material empregado em sua fabricação, somado especialmente aos diversos ambientes climáticos brasileiro, que possui altas temperaturas e umidade e ainda, com o grande avanço tecnológico da indústria armamentista, que evoluiu as técnicas e os materiais empregados na fabricação dos novos armamentos, diminuindo peso e dimensões, trazendo uma maior capacidade de munição, acoplagem de acessórios, resistência às intempéries, acréscimo dos itens de segurança e diversos outros avanços, esse armamento e tecnologia empregados se tornaram obsoletos frente aos ofertados pelo mercado atualmente. Muitas dessas armas já haviam sido baixadas ou estavam em processo de baixa por motivo de quebra ou seu conserto ser antieconômico, o que tornou a substituição de todas as armas deste modelo algo inevitável.

Além disso, um fator preponderante para o descarte desse modelo de arma para a atividade da PRF foi a publicação da emprega Taurus, em seu site http://www.qualidadetaurus.com.br/, dos novos manuais de armas, informando, entre outras coisas, e diferentemente do que diziam seus manuais anteriormente publicados que "QUALQUER ARMA PODE DISPARAR EM CASO DE QUEDA".

Outro modelo utilizado pela PRF a época era o das pistolas Taurus PT 640 em virtude do desenvolvimento e expansão das atividades de Inteligência e Assuntos Internos da PRF, surge a demanda de uma arma que permita o porte velado, para uso discreto, pois as dimensões da PT 100 se mostravam inadequadas para que o policial passasse despercebido no cenário, em trajes civis, durante a coleta de informações.

Diante dessa demanda no ano de 2003, foi definida o modelo da PT 640, um projeto da forjas Taurus, com dimensões reduzidas, que trabalhava com mesmo calibre e uma capacidade razoável de munições, além de se enquadrar adequadamente às necessidades apresentadas até então pelos policiais que atuavam nessas áreas.

Essas eram as únicas pistolas que a PRF adquiriu que não eram para uso ostensivo, sendo pistolas destinadas à policiais lotados na corregedoria e inteligência, que em virtude da peculiaridade de suas atividades, necessitam de armas de pequeno porte, que pudessem ser utilizadas de maneira dissimulada em trajes descaracterizados.

Por ser uma arma adquirida para uma atribuição específica, existente em pouquíssima quantidade e não estar incluída nos treinamentos anuais da PRF, as informações de panes, quebras e falhas desse modelo são muito pequenas, e não serviram de referencial para um levantamento confiável. Porém, apesar do pouco uso, assim como no modelo da PT-100 destacamos a baixa proteção contra intempéries em seu acabamento externo, fazendo com que a aparição de pontos de ferrugens nesse armamento seja uma constante.

Com o objetivo de adquirir um armamento mais moderno, que fosse capaz de solucionar reclamações do efetivo e que ainda possuísse um incremento de tecnologia em sua construção, com uso de materiais mais leves, possibilidade de uso de acessórios, maior capacidade de tiro, acabamento que dificultasse a aparição de ferrugem, buscou-se no mercado nacional uma substituta para a PT-100, momento em que a PRF realizou a aquisição da Pistola Taurus PT 840.

A aquisição do primeiro lote de pistolas do Modelo PT-840 ocorreu no ano de 2009. Sendo que logo após a aquisição das primeiras unidades da pistola PT-840, os primeiros problemas começaram a surgir e, com o passar do tempo, o que se iniciou como sendo uma aquisição que viria a modernizar o quadro de armas de porte da PRF passou a ser uma grande preocupação para os policiais, instrutores de tiro e administração.

No corpo dos relatórios técnicos RTPRF 04.2016, RTPRF 05.2016 e RTPRF 05.2017. Constam diversas informações de problemas estruturais no modelo PT-840 que tornaram este armamento um risco ao Policial e a sociedade.

Destacamos ainda um outro problema que a PRF possuía, mas que era gerado pelo fato dos 3 modelos de armas serem diferentes um dos outros. Essa fato fazia com que o policial precisasse passar por um processo de capacitação em cada um desses armamentos, em especial aqueles das áreas de inteligência e corregedoria, que empregavam a PT-640 e um dos modelos ostensivos. Isso fazia com que a PRF precisasse realizar dois eventos de capacitações distintos, um para cada arma, gerando um custo de material e de pessoal com essas capacitações.

Diante desse quadro, tornou-se imperativo a busca por um sistema de armas para substituir todo o quadro de dotação de armas de porte da PRF e que fosse padronizado com apenas uma plataforma para todos os seus modelos (para uso ostensivo, uso velado e simulacros de treinamento) e mesmo sistema de funcionamento. Sendo assim o uso de armas com mesma plataforma ajuda a otimizar os investimentos com as instruções, facilitando a capacitação/habilitação do policial no manuseio (montagem, desmontagem, teclas de operação, sistema de funcionamento, etc) de ambos os modelos de pistolas (Standard e subcompacta). Além disso, como as armas utilizam a mesma plataforma devem permitir a intercambiabilidade das peças para quando for exigido em situações críticas operacionais, tornando ainda a manutenção de segundo escalão, a cargo de servidores especializados, mais facilitada e com custos reduzidos, haja vista que as ferramentas e peças de reposição utilizadas serão as mesmas.

Como um processo desse vulto, seria extremamente dispendioso, exigindo não apenas um processo de aquisição, mas também um grande evento de capacitação para a inserção de uma novo armamento, tornou-se necessário a realização de um estudo aprofundado acerca das características técnicas que esse novo armamento deverá possuir, com pesquisas extensas, tanto ao público alvo (PRF´s) quanto aos diversos fabricantes de armas destinadas ao público policiais, a fim de que seja priorizado uma arma que seja capaz de atender aos anseios da PRF e da sociedade brasileira.

3.2.2. **Pesquisa junto aos PRF`s e instrutores de armamento e tiro**

Relatórios sobre o tema:

- RTPRF 03.2016 - Pesquisa de satisfação na PRF - SEI nº4081867

Com o objetivo de levantar informações sobre a satisfação do efetivo da PRF e dos instrutores de armamento e tiro acerca das armas de porte em uso na PRF, foi realizado uma ampla pesquisa acerca da qualidade, confiança, ergonomia (peso, dimensões, etc), segurança, conforto, capacidade de tiro e outros itens dos armamentos de porte da PRF, avaliando a aceitabilidade do seu efetivo com o armamento de porte, analisando separadamente algumas especificações técnicas, o que permitiria identificar quais os aspectos a serem melhorados ou implementados no futuro. Para tanto foram confeccionados dois formulários.

O primeiro formulário foi dedicado para a equipe de instrutores de armamento e tiro onde, devido ao conhecimento específico sobre o tema, as perguntas foram mais técnicas e direcionadas, buscando analisar os requisitos de adequação da arma para o serviço da PRF, o tamanho, peso da arma e do gatilho, proteção contra intempéries, capacidade de uso de acessórios, capacidade de munição, ergonomia da empunhadura, aparelho de pontaria, quantidade de peças, facilidade no manuseio, acabamento externo, o grau de confiabilidade das armas por modelo e do fabricante em geral, bem como a ocorrência de panes. Além disso buscou-se obter uma opinião desses instrutores quanto ao calibre mais adequado para o serviço policial, envolvendo os três principais calibre usados pelas forças policiais no mundo.

O segundo formulário foi direcionado a todo o efetivo da PRF, buscando analisar a confiança no armamento, a ocorrência de panes e o grau de satisfação quanto ao tamanho da arma, peso da arma e gatilho, proteção quanto às intempéries, possibilidade de uso de acessórios, capacidade de munição, empunhadura, aparelho de pontaria, quantidade de peças, facilidade de manuseio e acabamento externo.

Todas estas pesquisas buscaram resultados que pudessem ser quantificados, e respeitasse formulações e critérios estatísticos, visando aportar os fundamentos legais e técnicos para tomada de decisão dos gestores. As respostas obtidas nortearam as decisões da equipe de projetos com base nos anseios dos agentes policiais, permitindo a busca por equipamentos com tecnologias compatíveis com as atividades desempenhadas pela PRF.

Conforme dito anteriormente, os questionários de satisfação foram aplicados para levantar o grau de satisfação dos modelos e tipos de armas empregados pela PRF nos seguintes quesitos:

a) Grau de confiabilidade na arma;

b) Ocorrências de panes;

c) Tamanho;

d) Peso;

e) Peso do gatilho;

f) Proteção anti-ferrugem;

g) Possibilidade de uso de acessórios;

h) Capacidade de munição;

i) Empunhadura (tamanho/ergonomia);

j) Aparelho de pontaria;

k) Quantidade de peças;

l) Facilidade de manuseio;

m) Acabamento externo.

Já os instrutores de tiro, além dos itens listados acima, considerando a experiência e as informações técnicas que poderiam ser fornecidas por esse público, foram indagados sobre:

a) O porque da confiança na arma ou ausência dela;

b) Frequência das ocorrências de pane durante as instruções;

c) Grau de satisfação com a arma, considerando a adequação da arma ao serviço da PRF;

d) Confiabilidade com as armas do fabricante Taurus e o porquê;

e) Experiência com armas em pane seja em serviço ou treinamento;

f) Qualidade das armas de porte nacionais;

g) Qual o melhor calibre para a atividade policial, dentre os três mais utilizados e o porquê.

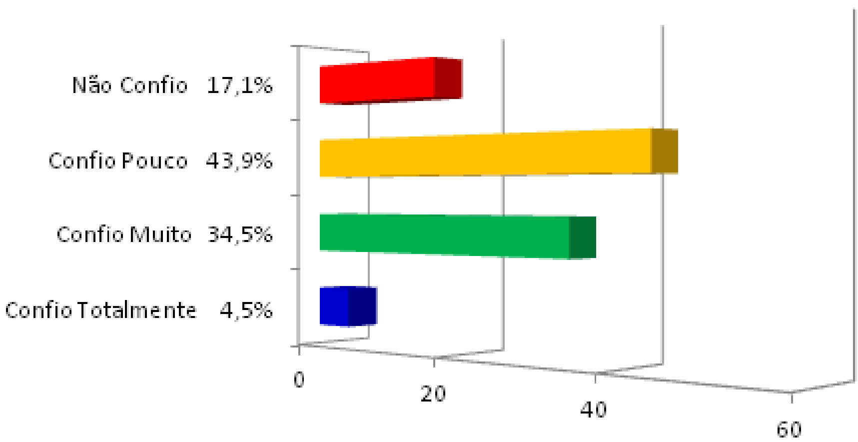
Importante ressaltar que existiam três modelos de armas disponibilizadas ao efetivo, e que cada policial avaliou apenas o modelo de arma que ele utilizava e conhecia profundamente. O primeiro gráfico apresenta a confiabilidade geral do efetivo no armamento, incluindo os três modelos das armas, logo em seguida realizamos a separação da pesquisa nos dois principais modelos empregados pela PRF, o da PT100 e da PT 840, que juntas representam mais de 99% de todas as armas dos porte da PRF.

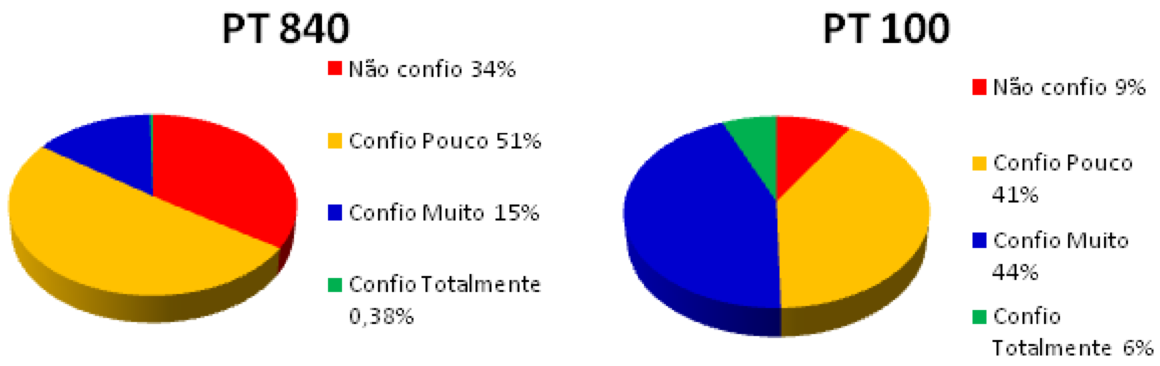
Dos policiais pesquisados, 2773 utilizam a PT100 e 1333 a PT840 e 65 a PT640.

RESULTADOS DA PESQUISA JUNTO AO EFETIVO

A. Confiabilidade

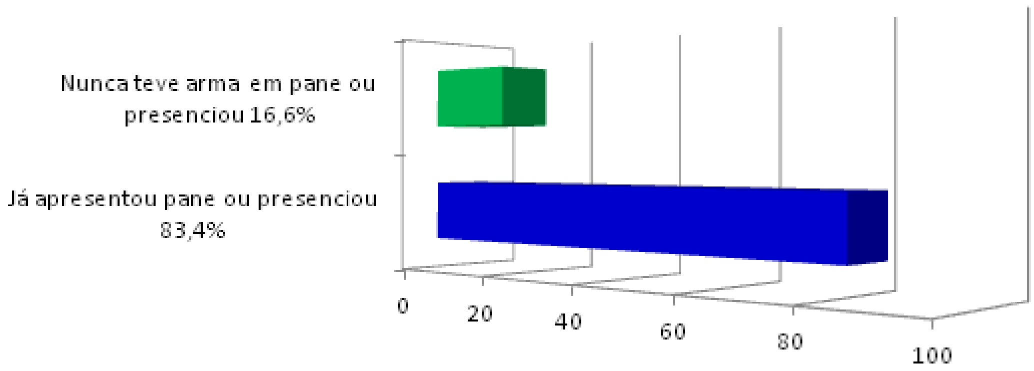
O gráfico abaixo apresenta o grau de confiança do efetivo nas armas de porte da PRF, já o segundo gráfico apresenta esse grau de confiança nos dois principais modelos de armas de porte.





B. Ocorrência de panes

Dentro do objetivo de estabelecer o grau de confiança nas armas, foi questionado aos policiais se sua arma já havia apresentado pane ou se já haviam presenciado uma pane ocorrer em uma arma de um colega.

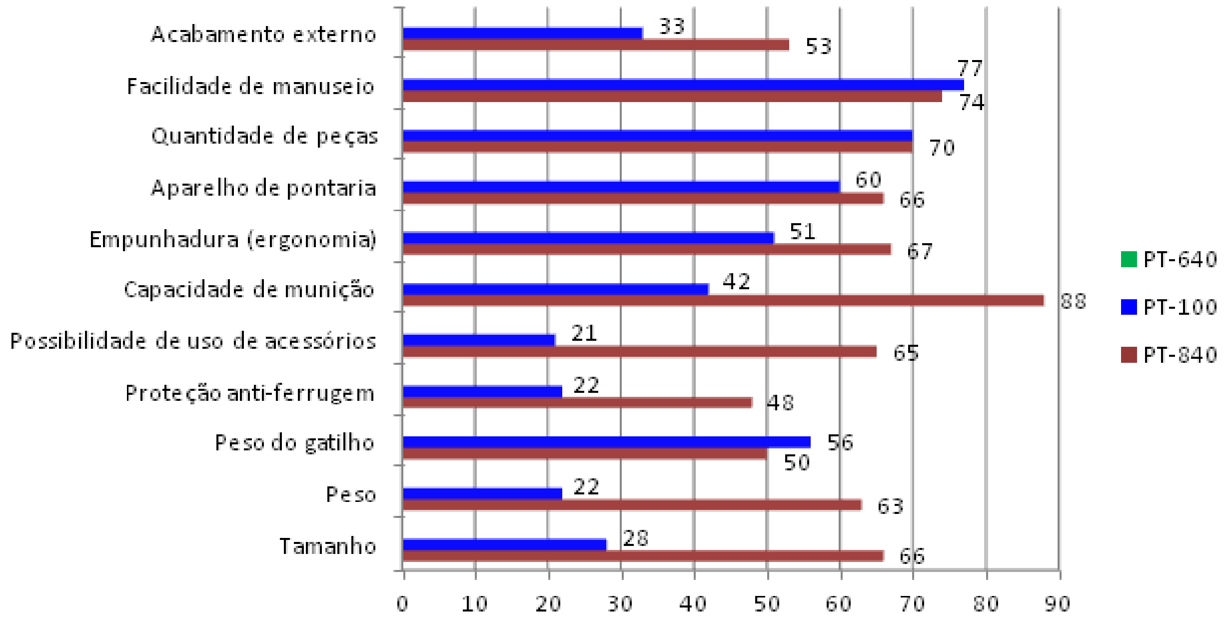


Conforme extraímos dos resultados coletados, a confiança em ambos os modelos de arma de porte utilizados pela PRF era baixíssima, chegando, nos melhores casos à apenas 50% e nos piores a 15,38%. A explicação dessa falta de confiança do efetivo justificou-se através de um outro gráfico, onde analisamos os índices de pane e percebemos que 83,4% do efetivo já teve sua arma em pane ou já presenciou a arma de um colega em pane. As ocorrências constantes de panes, falhas ou mau funcionamentos. muitas vezes sem nenhuma explicação, trazem uma sensação de desconfiança na segurança desse armamento.

C. Satisfação com o armamento

Foram realizadas uma série de 11 perguntas, cada uma analisando um aspecto específico do armamento, com o intuito de obter o grau de satisfação do operador sobre aquele aspecto. Essa pesquisa serviu para analisar as características técnicas de cada modelo utilizado na PRF, onde percebemos àquelas que mais agradam aos operadores, contribuindo na definição das características técnicas para os armamentos de porte da PRF.

A pesquisa foi realizada sobre quatro parâmetros, sendo eles: Extremamente satisfeito, Satisfeito, insatisfeito e extremamente insatisfeito. O gráfico abaixo mostra todos os 11 quesitos analisados, onde os dados nele apresentados foram obtidos com a somatória das avaliações de "extremamente satisfeito" e "satisfeito.



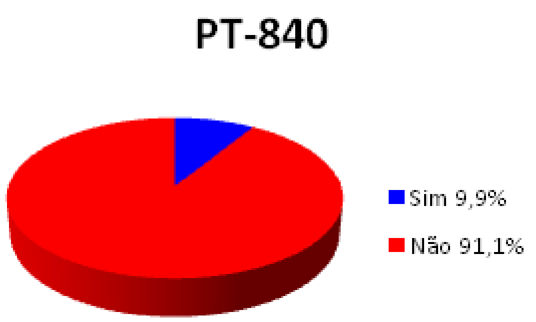
Nesta etapa não foi analisada mais a confiança no armamento ou seu funcionamento, mas sim as características pontuais descritas. Verificando a tabela acima, percebemos claramente os pontos que mais agradavam e desagradavam o efetivo. Conseguimos extrair desses dados que, referente ao aparelho de pontaria, facilidade de manuseio e quantidade de peças a maior parte do efetivo se considera satisfeita com o disponível atualmente e que em relação ao tamanho, peso, capacidade de utilização de acessórios e capacidade de munição o modelo da PT 840 ganha mais que pelo dobro da diferença do modelo da PT-100.

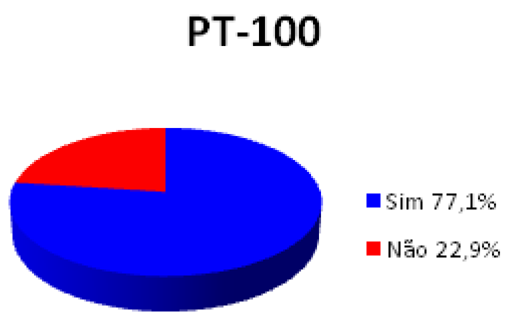
E por último, vemos que em relação ao peso do gatilho, a proteção anti-ferrugem e o acabamento externo ainda estão aquém das expectativas do efetivo, estes resultados levaram a equipe do projeto a aprofundar os estudos relativos a todas estas características e principalmente as relatadas neste parágrafo para melhor especificar essas características dentro das necessidades da PRF.

PESQUISA COM OS INSTRUTORES

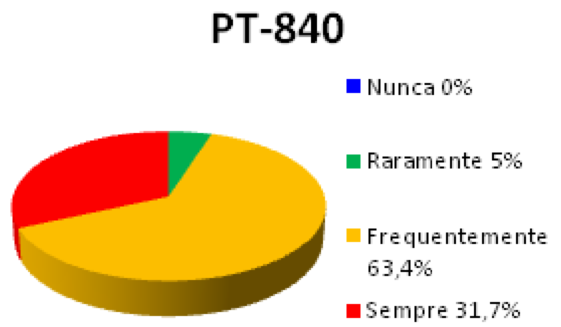
A. Confiança no armamento

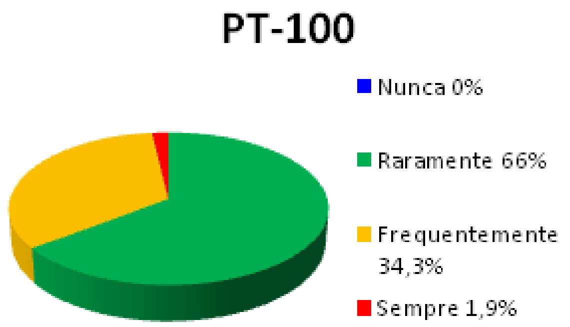
Os gráficos apresentados abaixo apresentavam a confiança dos instrutores nos dois principais modelos de arma de porte da PRF à época, a PT-100 e a PT-840, e a frequência com que essas armas apresentavam panes durante as instruções.





B. Ocorrência de panes em instruções



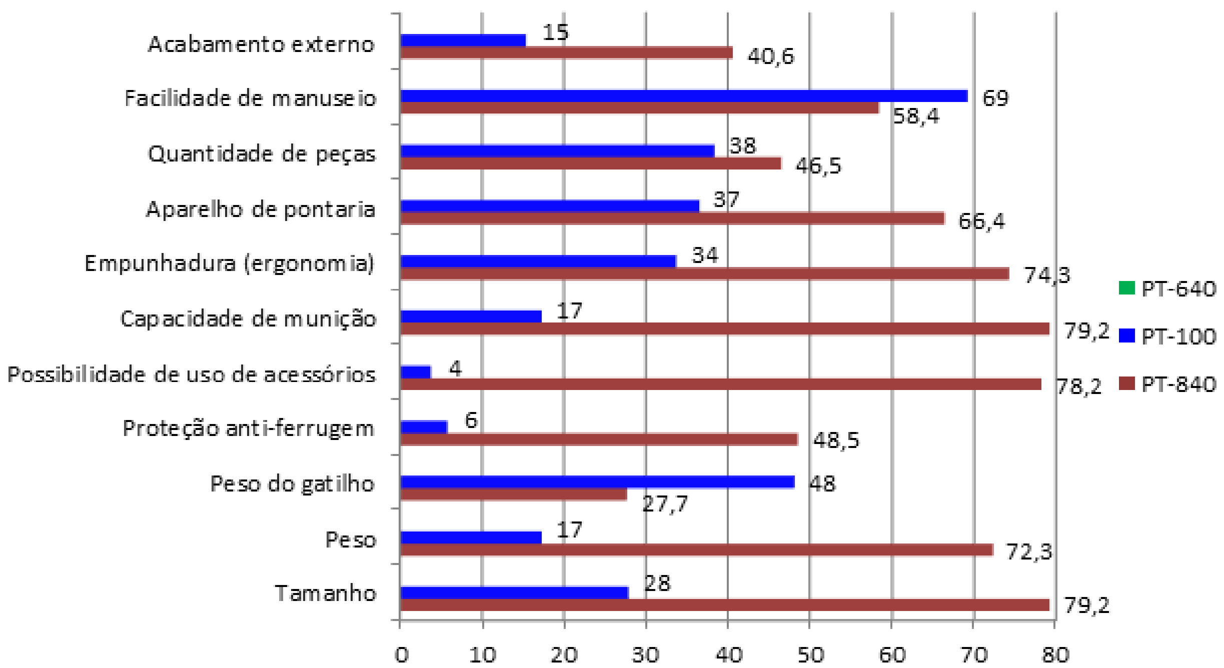


A análise do grau de confiança do armamento trouxe um dado alarmante e preocupante para a PRF, mostrando que quase a totalidade dos instrutores de tiro pesquisados (91,1%) não confiavam no modelo da PT-840, modelo este apresentado pelo fabricante como substituto da PT-100, quando analisamos o modelo da PT-100, percebemos que a confiança nele era boa entre os instrutores, trazendo como problema o fato de que o modelo advém de um projeto muito antigo e já obsoleto, não atendendo as demais demandas da PRF para com um armamento de porte.

C. Satisfação com o armamento

Assim como a pesquisa junto ao efetivo, foi realizada uma série de 11 perguntas, cada uma analisando um aspecto específico tanto da PT-100 quanto da PT-840, com o intuito de obter o grau de satisfação do instrutor sobre aquele aspecto. Essa pesquisa serviu para analisar as características técnicas de cada modelo utilizado na PRF, colaborando com a definição das características técnicas mínimas aceitáveis para as pistolas de dotação da PRF.

A pesquisa foi realizada sobre quatro parâmetros, sendo eles: Extremamente satisfeito, Satisfeito, insatisfeito e extremamente insatisfeito. O gráfico abaixo mostra todos os 11 quesitos analisados, onde os dados nele apresentados foram obtidos com a somatória das avaliações de "extremamente satisfeito" e "satisfeito.



Ao realizarmos a análise do resultado das pesquisas com os dois públicos distintos, operadores e instrutores de armamento e tiro, observarmos a clara coerência nas informações colhidas no que diz respeito as características técnicas, com a diferença que, os conhecimentos técnicos dos instrutores possuem uma valoração bem superior na análise desses quesitos.

Sendo assim, verificamos que em relação ao tamanho, peso, capacidade de utilização de acessórios, capacidade de munição, empunhadura e aparelho de pontaria, as especificações do modelo PT

840 atendem de maneira satisfatória uma parte substancial do efetivo (mais de 60% dos operadores e instrutores), entretanto este modelo peca pela falta de confiabilidade e segurança.

Assevera-se com todo o exposto, que os trabalhos são norteados pelos preceitos gerenciais da Administração Pública, visando a aplicabilidade e maximização da eficiência no uso dos recursos públicos. A participação não apenas do operador policial, mas dos especialistas da área em questão em várias fases do projeto, por intermédio de participação em testes avaliativos e pesquisas de percepção de segurança, reafirmam o norte seguido pela equipe do Projeto em busca do melhor equipamento para as situações vivenciadas pelos PRF.

Com a análise da pesquisa de satisfação do efetivo e dos instrutores foi apresentada uma realidade que assustou aos próprios integrantes do projeto que, apesar de já conhecer previamente os problemas de confiabilidade das armas, devido as panes apresentadas dentro e fora da PRF, não se imaginava que os números seriam tão alarmantes e que o grau de desconfiança em determinado modelo de arma adotada chegava aos 91,1% para os instrutores pesquisados e 85% para os operadores. Porcentagem elevadíssima, mas claramente explicada pelo índice de panes que a arma apresentou demonstrado no relatório específico já citado. Isso só fortaleceu a necessidade de tratar de forma séria e com a celeridade devida a busca por um armamento de qualidade, que seja confiável, tanto para o operador, quanto para a sociedade.

Além de analisar a confiabilidade dos armamentos, as pesquisas serviram para nortear a equipe pela busca de características para o novo armamento, haja vista que analisou a opinião dos operadores e instrutores acerca de várias características da arma de porte.

3.2.3. **Estudo sobre o calibre**

Relatórios sobre o tema:

- RTPRF 06.2016 Teste dos calibres - SEI nº4081911

Diante desse quadro de necessidade de substituição de todo o quadro de armamentos, aliado a recente (ano de 2014) recomendação do FBI do uso do calibre 9mm para a atividade policial, a PRF vislumbrou como o momento mais propício para realizar os estudos que pudessem retificar ou modificar qual o calibre ideal para a atividade da PRF, e aí sim orientassem um possível processo de substituição do calibre e do armamento. Porque tal mudança só poderia acontecer caso fosse realizado a completa substituição das armas, caso contrário isso seria impossível, haja vista que a operacionalização de duas armas de calibres distintos seria incoerente, contrário ao que pregam as melhores doutrinas e dispendioso.1

Ao longo dos anos, com o desenvolvimento dos calibres e surgimento de novas munições, além do aperfeiçoamento das pesquisas envolvendo a balística terminal, as informações sobre a superioridade do calibre .40 foi perdendo sua força, principalmente após o próprio FBI divulgar um novo estudo onde recomendava o retorno ao calibre 9mm para as atividades policial/defesa.

Apesar dessa tendência de retorno ao uso do calibre 9mm, aqui no Brasil isso foi praticamente imperceptível, haja vista que esse calibre 9mm era de uso restrito das forças armadas e da Polícia Federal até o primeiro semestre de 2016. Sendo que a maioria das instituições policiais ainda possuem restrições em suas portarias de dotação quanto a aquisição desse calibre. Isso tornou difícil tanto o uso, quanto o próprio desenvolvimento do calibre 9mm aqui no Brasil.

Levantamentos recente realizados pela equipe de projeto aliados a própria rotina de treinamentos da PRF evidenciam que o forte recuo provocado pelo disparo do calibre .40 S&W tem dificultado bom agrupamento dos disparos e o controle da arma por policiais de pequena estatura e pouca força muscular e/ou pouco familiarizados com armas de fogo. Some-se a isto o fato de que de acordo com o Protocolo de Testes Balísticos do FBI, os calibres de uso policial (munição expansiva de alta performance) 9x19mm, .40 S&W e .45 ACP não têm apresentado diferença significativa de desempenho, quando utilizando armas de mesma plataforma.

Para realizar esses estudos a equipe de técnicos definiu três pesquisas como sendo necessárias:

1 - A replicação dos testes do FBI com as munições nacionais, a fim de saber se o calibre 9mm seria mesmo o vencedor, mesmo com as munições produzidas no Brasil, haja vista que estas são

diferentes das produzidas no exterior;

2- Realização de testes comparativos de calibres em um grupo de teste de Policiais Rodoviários Federais a fim de analisar a diferença dos grupamentos e percepção dos policiais e

3- Um levantamento em outras instituições policiais a fim de averiguar qual o calibre mais empregado por elas. Os resultados iremos apresentar de forma reduzida abaixo.

REPLICAÇÃO DOS TESTES DE BALÍSTICA DO FBI

Na busca de realizar um estudo comparativo entre calibres 9mm e .40 utilizamos o protocolos desenvolvido pelo FBI e publicado em maio de 2014.

Considerando que os testes realizados pelo FBI utilizaram munição de fabricação americana, os mesmos não traduziam a realidade das munições nacionais, a PRF entrou em contato com a embaixada americana e solicitou formalmente os métodos empregados para os testes, de modo a permitir que os mesmos fossem replicados pela PRF aqui no Brasil.

Os propósitos dos testes de penetração do FBI são para determinar as seguintes informações relativas a cada cartucho em particular:

- A capacidade de penetração de cada projétil;
- A expansão de cada projétil;
- A velocidade média de cada cartucho com armas similares.
- A precisão média de cada cartucho com armas similares: Este teste é realizado com pistola apoiada em estativa ou saco de areia e/ou com provete. Além de não dispormos de provete, esse teste busca avaliar a precisão dos armamentos avaliados. Como esse não faz parte do objetivo da PRF, e sim de realizar um teste comparativo entre o calibre .40 S&W e 9x19mm, optamos pela não realização do mesmo.

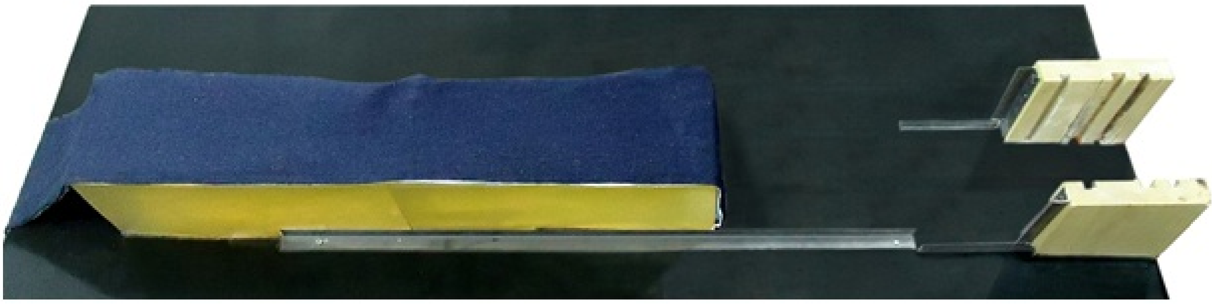
Todos os testes de foram realizados com disparos feitos a uma distância de 3 metros medidos da boca do cano da arma até a face do bloco de gelatina suína misturada a uma concentração de 10%, por ter uma consistência similar ao tecido humano.

Foram realizados os seguintes testes conforme o protocolo supracitado.

1º Teste – Gelatina Pura

Disparos em bloco de gelatina sem qualquer anteparo.

2º Teste – Vestimenta Pesada



Disparos em bloco de gelatina coberto por uma combinação de tecidos, simulando uma vestimenta para frio.

Testes 3 a 6

Nos testes 3, 4, 5 e 6, os blocos de gelatina devem ser cobertos por uma combinação de duas camadas de algodão

3º Teste – Chapas de Aço

Disparos em bloco de gelatina com anteparo de duas placas de aço utilizada na fabricação de automóveis.

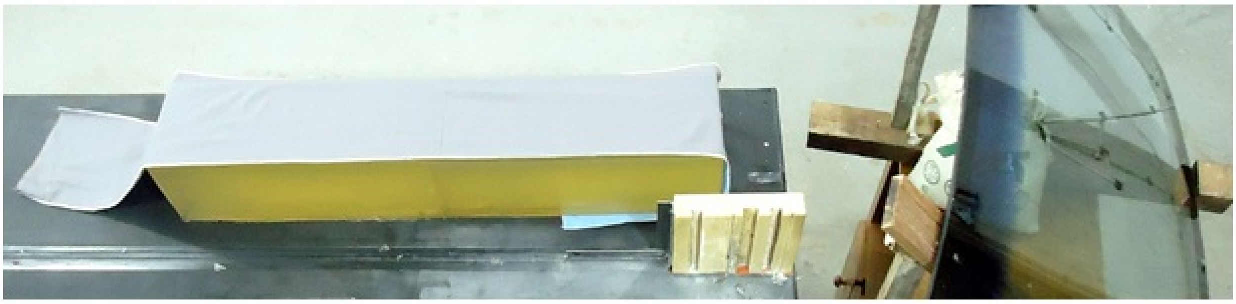
4º Teste – Gesso

Disparos em bloco de gelatina com anteparo de duas placas de gesso, simulando uma parede de gesso.

5º Teste – Madeira Compensada

Disparos em bloco de gelatina com anteparo de uma placa de madeira, simulando uma porta de madeira.

6º Teste – Para-brisas Automotivo



Disparos em bloco de gelatina com anteparo de um para-brisa, simulando um disparo contra o motorista.

Cada teste fornece um grupo de informações que são preenchidas de acordo com uma tabela fornecida pelo FBI. Quanto maior a pontuação, mais eficiente é o cartucho em diversos cenários e, conseqüentemente, mais indicado para defesa.

Os resultados dos testes foram coletados, fotografados e filmados, e seus resultados preenchidos em fichas próprias. Com o intuito de replicar o protocolo do FBI com munições nacionais foram realizados os testes com as munições mais empregadas na atividade policial no Brasil, quais sejam: .40S&W GOLD HEX EXPO 155g (utilizada pela PRF atualmente), .40 CXPO TACTICAL 130gr e suas similares no calibre 9x19mm, que é a 9x19mm +P+ 115gr e a 9x19mm CXPO +P+ 92,3gr.

Deste comparativo obtivemos os seguintes resultados:

TIPO DE MUNIÇÃO	PONTUAÇÃO OBTIDA
.40 EXPO GOLD 155gr	260
9x19mm EXPO gold +P+ 115gr	220
9x19mm CXPO +P+ 92,3gr	305
.40 CXPO TACTICAL 130gr	250

Com base nestas informações obtidas nos testes realizados pela equipe do Projeto ARM e, buscando ampliar ao máximo o estudo realizado, foi verificado que durante os testes realizados pelo próprio FBI com munições produzidas no mercado americano, as munições que atingiram as melhores pontuações no protocolo do FBI foram, no calibre 9x19mm a munição de 147gr e no calibre .40S&W a munição de 180gr. Diante disto, entramos em contato com o único fabricante nacional de munições, a Companhia Brasileira de Cartuchos - CBC, para saber se a mesma dispunha destas munições em seu catálogo de produtos disponíveis para teste por esta equipe. Momento no qual fomos informados de que a CBC dispunha em processo de desenvolvimento das seguintes munições: No calibre 9x19mm EXPO Bonded +P 124gr e EXPO Bonded +P 147gr e no calibre .40S&W a Bonded 180gr. Podendo nos fornecer imediatamente as munições no calibre 9x19mm e sem previsão, à época, para fornecimento, para teste, da munição 180gr no calibre .40S&W.

Sendo assim, foi solicitado ao fabricante as munições 9x19mm EXPO Bonded +P 124gr, e a 9x19mm EXPO Bonded +P 147gr, para a CBC com intuito de realização dos testes.

Destes resultados podemos realizar um comparativo com os 06 tipos de munições testados:

TIPO DE MUNIÇÃO	CALIBRE	PONTUAÇÃO OBTIDA
9x19mm CXPO +P+ 92,3gr	9X19mm	305
9x19mm EXPO Bonded +P 147gr	9X19mm	300
9x19mm EXPO Bonded +P 124gr	9X19mm	275
.40 EXPO GOLD 155gr	.40S&W	260
.40 CXPO TACTICAL 130gr	.40S&W	250
9x19mm EXPO gold +P+ 115gr	9X19mm	220

Nos testes realizados na segunda etapa, em que pese a pontuação obtida pela CXPO +P+ 92,3gr, ter sido superior as demais, a mesma apresentou demasiada instabilidade e comportamento anômalo de sua trajetória após a transfixações dos anteparos, o que não foi considerável como um comportamento aceitável para uma munição de uso policial, merecendo testes complementares para sua eventual recomendação.

Ressaltamos que apesar da munições 9mm terem atingido um desempenho bem superior que as munições .40S&W, quando comparamos as munições nacionais com as americanas, percebemos que estas últimas ainda apresentam um desempenho significativamente superior.

TESTES COMPARATIVOS DE ADAPTABILIDADE ENTRE OS CALIBRE .40 E 9MM

Os testes visaram analisar o comportamento do operador X arma, com parâmetro de aplicação de 02 (duas) pistolas, sendo ambas da marca Taurus, modelos PT 840 e PT 809, e munições .40 S&W e 9X19mm respectivamente.

Salienta-se, que conforme especificações técnicas constantes no site da Taurus (www.taurus.com.br) as armas de porte – pistolas, acima identificadas, tem suas medidas externas idênticas, com pequena tolerância, e ainda com relação ao peso, constata-se no referido site que a diferença é de aproximadamente 20 (vinte) gramas, ou seja, de difícil percepção.

Objetiva-se em especial analisar o armamento que ofereça uma maior assertividade dos disparos e que possuam uma maior compatibilidade com os operadores policiais.

Ademais, aponta-se o pleno atendimento ao princípio constitucional da supremacia do interesse público, visto que a análise comparativa compactua com os interesses da sociedade em fornecer aos seus agentes de segurança pública equipamentos eficientes e que lhes proporcione confiança e satisfação.

Os testes visaramm avaliar:

Agrupamento: Foi analisado a proximidade com o centro do alvo, bem como, a junção dos pontos de impactos, analisados perante as raias existentes no alvo;

Comportamento: Para a efetividade e eficiência do disparo, faz-se necessário o domínio do equipamento pelo operador, respeitado a execução tempo e assertividade, ação do recuo (sensibilidade), desfazimento de empunhadura, administração de recuo e controle da arma, análise do controle na recuperação da visada e assimilação de recuo.

Recuperação de visada: Na realização de disparos em caso de conflito, é necessário ao operador policial a recuperação da visada em cada disparos, realinhando com o alvo/agressor, diminuindo assim possíveis efeitos colaterais, e gerando velocidade nos disparo aumenta capacidade neutralização, motivo pelo qual, é necessário a avaliação da recuperação da visada.

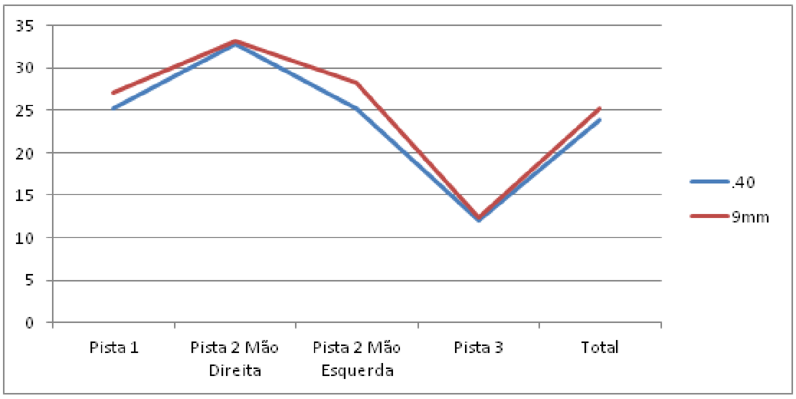
Foram aplicados testes diferenciados, com o uso de 3 (três) pistas, com exercícios variados, realizado com ambos equipamentos, salientando-se que 50 % dos operadores iniciaram com a PT 840 e 50% iniciaram com a PT 809, sendo que em nenhum momento os operadores sabiam qual arma estavam utilizando. Os testes seguiram critérios claros definidos pelo nosso estatístico, a fim de que os resultados alcançados extraíssem o máximo de similaridade com a realidade.

Nos meses de janeiro e fevereiro de 2016 foram realizados os testes de adaptabilidade nos estados do Rio Grande do Sul, Santa Catarina, Paraná, São Paulo e Rio de Janeiro. Todos os resultados estão devidamente registrados em planilhas individuais por atirador e os alvos utilizados por cada policial se encontram identificados e serão arquivados por até um ano após os testes.

Tendo em vista o caráter diagnóstico dos testes, vale ressaltar que os mesmos foram desenvolvidos sem nenhum suporte didático ao policial. Ao iniciar cada pista o policial era informado apenas do procedimento e da dinâmica, não recebendo orientações ou correções com relação a técnica empregada. Buscou-se com isso aproximar os disparos aqui realizados a uma realidade de serviço operacional, trazendo mais veracidade aos resultados em relação ao nível dos disparos e qualidade do nosso PRF.

Considerando que os testes foram realizados com armamentos ergonomicamente idênticos e que a única variável apresentada foi a mudança de calibre entre uma arma e outra. Podemos extrair comparativos entre o desempenho dos policiais rodoviários federais que permite analisar argumentos técnicos como uma melhor recuperação de visada e uma maior facilidade de grupamento de disparos no calibre.

Conforme se verifica no gráfico abaixo, em todos os exercícios propostos o nível de acerto com o calibre 9x19mm, apesar de pequenos, se mostraram superiores aos do calibre .40S&W.



Os resultados obtidos estão descritos e porcentagem de acerto em relação a pontuação total possível para cada exercício. A realização dos testes se deu de forma que cada policial iniciava seus disparos com o armamento de calibre distinto, o que nos permite realizar uma análise que demonstre um comparativo em relação a qual calibre possibilitou uma melhor seqüência de disparos. Sendo possível verificar que os policiais rodoviários federais que iniciaram os disparos com o calibre 9x19mm tiveram um resultado global superior aos policiais que iniciaram com o calibre .40S&W. Numa proporção de acertos de 24,43% a 24,18%, respectivamente.

PESQUISA JUNTO A OUTRAS INSTITUIÇÕES POLICIAIS

Foram realizadas pesquisas junto a outras instituições policiais no Brasil e no mundo. Para isso a PRF entrou em contato com várias embaixadas no Brasil e com todas várias instituições policiais aqui no Brasil para realizar questionamento acerca de suas armas e características.

A pesquisa revelou o uso majoritário do calibre 9mm pelas instituições policiais fora do Brasil e uma tendência de migração para o calibre 9mm aqui no Brasil. Em relação ao Brasil, percebe-se que a migração foi apenas das equipes especializadas, que é natural, haja vista que os grupos especializados sempre estão na vanguarda da tecnologia e equipamentos que os demais membros da corporação, além de que a migração de todo o efetivo implica em alterações de portarias de dotação e em um alto investimento por parte da instituição.

Conclusão dos estudos de calibre

Tratar da escolha de um calibre para dotação por parte de um departamento de polícia sempre suscitará em um debate muito acintoso, que por vezes tendência a ficar muito no campo da subjetividade. Isso foi exatamente o que a equipe do projeto buscou afastar, a "subjetividade". Buscando sempre a resposta no campo técnico/científico e com testes que seguem protocolos e percentagens definidas.

Muitos policiais e "conhecedores" de armamentos externam suas opiniões apenas na ideia de que quanto maior o calibre, maior a capacidade de "estrago" no alvo e conseqüentemente seria este a melhor opção. Aqui no Brasil, se criou quase um folclore em torno do calibre .40, desvalorizando o calibre 9mm por possuir um diâmetro menor que o .40.

Toda discussão sobre o calibre ideal deve partir da ideia de que, o calibre, quando considerado sozinho, traz junto consigo um conjunto exclusivo de fatores a considerar, como: Capacidade no carregador; Disponibilidade de munição; Recuo; Peso; Custo da munição; Desgaste do armamento; Assertividade/recuperação da visada.

Nunca se deve considerar apenas um calibre como a solução ideal. O projétil é o que atinge um alvo e em última análise, as especificações do projétil é que devem ser o foco do debate.

Sendo assim, após os testes realizados, a equipe do projeto se sente tranquila em recomendar a adoção do calibre 9mm em substituição ao .40 S&W para as suas armas de porte.

3.2.4. **Compilação de Panes em armamentos nacionais, na mídia e em outras instituições**

Relatórios sobre o tema:

- RTPRF 07.2016 - Panes em armamentos de uso policial divulgadas na mídia - SEI nº 4081917 e;
- RTPRF 08.2016 - Panes em pistolas de instituições policiais diversas - SEI nº 4081921

Nesses 02 relatórios a equipe do projeto ARM buscou compilar em um local único toda uma série de problemas que os armamentos produzidos pela indústria nacional vinham apresentando a época, a fim de embasar a decisão de se buscar especificações técnicas robustas para futuras aquisições de armamentos.

3.2.5. Requisitos técnicos das Pistolas da PRF

Relatórios sobre o tema:

- RTPRF 01.2016 - Relatório das áreas especializadas da PRF - SEI nº 4104909e;
- RTPRF 02.2016 - Indicação da arma de porte da PRF - SEI nº 4081820

Logo após constatada pela equipe do Projeto ARM que seria necessário a substituição de todas as armas de porte da PRF, a equipe do projeto passou então a buscar a especificação de quais seriam os requisitos técnicos necessários que o armamento de porte deveria possuir para atender as demandas dos mais diversos ambientes operativo da PRF.

Para que isso fosse possível, a equipe do Projeto ARM estabeleceu três linhas de pesquisas:

A. Consultar todas as áreas especializadas de atuação da PRF, para identificar quais as características e requisitos técnicos às áreas entendiam como sendo necessárias e desejáveis para o adequado emprego da arma de porte em cada área, e o porquê de cada uma delas.
B. Consultar diversas instituições de segurança pública no Brasil e no Mundo acerca de quais as características que eles definiram como necessárias para suas armas de porte e o porquê de cada uma delas, a fim de avaliar a viabilidade e adequação com a atividade da PRF;
C. Reunir os especialistas em armamento e tiro da PRF para apresentar as necessidades das áreas especializadas, as informações colhidas de outras instituições de segurança, os resultados das pesquisas com os Policiais e Instrutores da PRF e todos os demais pontos levantados pelo projeto ARM para, a partir desse ponto, unir esses requisitos e com isso definir os requisitos técnicos do novo sistema de armas para a PRF;

CONSULTA DAS ÁREAS ESPECIALIZADAS DA PRF

Para entender quais as necessidades de todas as áreas da PRF, o Projeto ARM reuniu um grupo de 6 instrutores de tiro na ANPRF - Academia Nacional da Polícia Rodoviária Federal, sendo que cada um destes instrutores atuam em um diferente área especializada da PRF, sendo elas: Cinotecnia, Operações Aéreas, Operações Especiais, Motopoliciamento, Inteligência e Corregedoria. Além dessas áreas especializadas, todos em conjunto avaliaram as necessidades das áreas Administrativa e Operacional (Escala ordinária) da atividade-fim que são áreas do serviço ordinário da PRF e que portanto todo PRF já vivenciou e conhece essas atividades

Após reunidas as áreas, foram debatidos vários aspectos, do emprego da arma, sempre focando na técnica de utilização da arma por cada área (onde portar, formas de saque, ambientes operativos como helicóptero, mata densa, motocicleta, etc) e ainda a necessidade de mecanismos ou acessórios específicos vinculados a arma. Sendo assim, cada instrutor consultou os colegas que atuam na mesma área especializada e posteriormente apresentou as considerações de sua área e suas necessidades, as quais resumimos abaixo:

A. **Operações Aéreas**

Considerando as particularidades da operação aérea no âmbito da Polícia Rodoviária Federal, pilotos e operadores, cada um com diferenças significativas em sua rotina, onde o Operador, trabalhando em atividade de pronto emprego, atua equipado com um número razoável de materiais, cadeirinha de rapel, cabo ou fita de segurança, arma longa como principal e arma de porte como secundária, colete balístico, rádio (HT), etc. Que o espaço de trabalho é restrito tanto para o piloto quanto para o OEE – Operador de Equipamentos Especiais, sendo que este último requer grande movimentação para visualização de áreas sensíveis de pousos em locais restritos, bem como embarque e desembarque de passageiros e alocação de bagagens e equipamentos diversos, somando-se ainda realização de rapel e outras manobras com lançamento de cabos.

Considerando as peculiaridades descritas, o armamento de porte deveria possuir:

1. Conter o mínimo de peças salientes, sem cão aparente, para evitar enrosco em cabos, fitas e outros equipamentos;
2. Possuir disponibilidade de acessório para ampliar sua eficiência, em especial, sistema de mira óptica, visto que, ao guarnecer a aeronave, o Operador atua sem o apoio de outros policiais, pois os dois pilotos estão restritos às suas funções;
3. Deve ter uma maior capacidade de munições pelo motivo citado no item 2 acima; um único PRF fazendo a segurança da aeronave e dos dois pilotos;
4. Opere mesmo em condições adversas de exposição à maresia, poeira e areia suspensas pelo movimento das pás do helicóptero, bem como à umidade;
5. Deve oferecer mecanismos de segurança compatíveis com as especificidades da atividade aérea policial, em especial, manobrar com portas abertas e pousos em locais com populares no entorno. Diante disto, torna-se de suma importância, a trava do gatilho, para impedir o acionamento do gatilho por inércia na queda.

B. **Motociclismo**

A atividade de motociclismo engloba os serviços de motopoliciamento, escolta e escolta com batedores. Em todas elas, o armamento fica exposto de forma ainda mais acentuada às intempéries, tais como chuva (frequentemente ácida em função da poluição atmosférica), maresia e umidade, bem como outros fatores danosos: fumaça, poeira e detritos lançados de outros veículos. Dessa forma, deve-se adotar um armamento que ofereça maior resistência a esse tipo de influência externa. Um armamento cujo acabamento não sofra corrosão e ferrugem proporciona ao operador maior confiabilidade sob regime regular de uso e maior facilidade de manutenção periódica. Deve-se ainda evitar cão externo pois o mesmo contribui para o acúmulo de detritos e sujeira provenientes da poluição do ar e do movimento da motocicleta. O armamento deve possuir dimensões e peso reduzidos, pois em determinados momentos da atividade de motopatrulhamento, o segurança da equipe (passageiro da primeira motocicleta da formação) passa grande parte do tempo com a arma empunhada e repousada sobre a coxa, condição em que o peso da arma pode gerar fadiga excessiva na empunhadura e obrigar o operador a coldrear seu armamento. Essa situação diminuiria sua capacidade reativa frente a uma situação que se apresente devido à grande amplitude do cenário de operações. Ainda nessa condição, é preciso prever a possibilidade de atracação de cabo fiel na arma atrelado ao cinto de guarnição pois, em função das condições adversas da rodovia e do balanço natural da motocicleta, além de outros fatores, pode ocorrer a perda do controle sobre o armamento e com o fiel o operador pode reassumir sua empunhadura, evitando o alcance dessa arma por pessoas alheias à atividade policial.

Em função dos equipamentos de segurança individual e intrínsecos à atividade, além da adoção de coletes táticos nos quais se colocam outros equipamentos e aparelhos, necessitamos de um armamento com o menor número possível de teclas externas, o que reduziria o risco de enroscamento no colete ou seus acessórios quando o operador executar uma mudança de quadrante de responsabilidade.

A motocicleta em deslocamento gera instabilidade da visada por parte do operador. É imperativo que a arma disponha de aparelho de pontaria de trítio para melhorar a visada no período noturno e da possibilidade de adoção de aparelho suplementar de pontaria, tipo "red dot", o que traria uma vantagem tática para o operador e garantiria uma maior precisão na visada do alvo.

Considerando todos os argumentos acima, extraímos as seguintes características para o armamento de uso pelos Motociclistas:

1. Extrema resistência às intempéries e outros fatores abrasivos;
2. Segurança contra queda;
3. Baixo peso;
4. Existência de fixador para o Fiel;
5. Proteção contra disparos acidentais em caso de queda;
6. Mínimo de peças externas para evitar enrosco;
7. Permitir emprego de aparelhos ópticos

C. **Inteligência**

A estrutura da Inteligência da PRF, doutrinariamente cumpre papel de assessoramento e produção de conhecimentos a nível estratégico, tático e operacional no Departamento de Polícia Rodoviária Federal. Para tal, diversas operações de inteligência e contra inteligência lançam agentes à campo com o mister da busca de dados e informações negadas em ambientes operacionais sensíveis e até mesmo adversos à presença de forças do estado, invariavelmente cumpre missões em áreas dominadas pelo tráfico de drogas, comunidades hostis à presença de agentes estatais, cumpre missões de contra inteligência tais como: acompanhamento de operações de segurança pública, escolta e proteção de dignitários nacionais e até mesmo de outros países, proteção de áreas e instalações de eventos de interesse da União e da PRF e, atendendo solicitações de outros organismos estatais e de inteligência, onde a discrição é fundamental.

Considerando a necessidade de um armamento confiável, de fácil e rápido manejo e manuseio, leve e que seja resistente e de dimensões apropriadas, esta área demandada pugna por uma arma que reúna as seguintes condições:

> A necessidade de porte de arma junto ao corpo diuturnamente em ambientes das mais variadas condições, incluindo a região litorânea e por conseguinte, altas taxas de salinidade no ar; os altos índices de umidade ao longo de todo o território brasileiro fazem com que o armamento possua uma excelente resistência a sudorese, preferencialmente fabricado utilizando polímeros em sua armação sejam os mais indicados também para as atividades do pessoal de inteligência. Além da resistência apresentada pelo polímero frente às intempéries, a leveza do material também colabora com a redução de peso, fazendo das armas que o utilizam, muito mais leves, o que se traduz em conforto ao agente operacional.
>
> Uma arma que não possui travas externas, proporciona maior segurança ao seu operador visto que se apresenta isenta de engatar, enroscar, em cintos e vestimentas. A inexistência de cão externo se traduz em maior conforto ao seu operador, uma vez que não apresenta cantos vivos que possam machucar ou incomodar dado a especificidade do porte velado a que se destina. A própria inexistência de cão externo torna a arma menos suscetível a variações durante o acionamento uma vez que não há golpe do cão sobre o percussor e que seu próprio gatilho por não haver desconexão de armadilha mantém um curso mais regular e suave resultando em disparos bem mais precisos.
>
> Carregadores que possibilitem o intercâmbio entre outros modelos de tamanhos diferentes de armas deste mesmo fabricante é requisito fundamental para proporcionar mobilidade tática em situações de emergência.
>
> O aparelho de pontaria deverá ser do tipo fixo, evitando a necessidade de ajustes periódicos que influenciem na precisão do tiro, de construção metálica e de TRÍTIO que facilite a operação da arma em condições de baixa visibilidade.
>
> O acabamento das partes metálicas deverá ter tratamento anticorrosivo eficaz contra a oxidação proveniente do suor, da umidade gerada pelo corpo e pelas intempéries da natureza como um todo, em especial, chuva e maresia.
>
> É desejável que o próprio fabricante do armamento tenha em seu portfólio de produtos sistemas de treinamento “em seco” ou do tipo “*Simunition**” que possam ser adaptados ao armamento para treinamentos de custo reduzido.

Considerando as argumentações da área de inteligência, identificados as principais características solicitadas pela área:

1. Resistência a intempéries e sudorese intensa;
2. Necessidade que os carregadores dos modelos ostensivos sejam compatíveis com o modelo de uso velado;
3. Ausências de cantos vivos;
4. Mínimos de teclas externas;
5. Existência de modelos idênticos em peso, dimensões e teclas para treinamento (simulacros);
6. Arma compacta de baixo peso para uso velado;

D. **Corregedoria**

Considerando que os servidores lotados na área de corregedoria no âmbito da Polícia Rodoviária Federal atuam tanto no ambiente administrativo quanto no ambiente operacional tornando muitas vezes necessário o uso do uniforme e equipamentos operacionais, dependendo da atividade desenvolvida;

Considerando que os servidores lotados na corregedoria quando em atuação no ambiente operacional utilizando uniforme e equipamentos operacionais necessitam portar arma específica àquela atividade ostensiva e quando em atuação em um ambiente que demanda a não utilização do uniforme necessitam portar arma específica àquela atividade dissimulada, o que faz com que estes policiais empregam rotineiramente as duas armas de porte, a de uso ostensivo e a de uso dissimulado, o que exige que as armas possuam compatibilidade de funcionamento, peças e teclas, a fim de evitar erros no acionamentos dessas teclas, bem como reduzir os recursos com treinamento.

Considerando que a atividade correicional demanda de ações que exigem do seu servidor discrição e dissimulação nos ambientes onde atua;

Identificamos as características que o armamento utilizado por servidores da área de corregedoria devem possuir de forma a maximizar sua dissimulação e facilitar sua utilização:

1. Tamanho reduzido para porte dissimulado junto ao corpo;
2. Resistência à corrosão provocada pela sudorese dada a utilização junto ao corpo;
3. Oferecer mecanismos de segurança compatíveis com as especificidades da atividade policial;
4. Reduzido número de peças ou teclas ressaltadas e cantos vivos, sem cão aparente, de forma a minimizar o enrosco ou aprisionamento em roupa ou cinto utilizados pelo servidor;
5. As duas versões, de uso ostensivo e dissimulado possuam a mesma plataforma e que seus carregadores sejam compatíveis entre si;

E. **Operações com cães**

O GOC – Grupo de Operações com Cães, durante sua atividade, executa suas atividades em vários cenários como: ônibus, carros, caminhões, edificações e em áreas abertas e em áreas de matas dos mais diversos tamanhos, além de quando em treinamento muitas vezes dependendo do local, precisa estar pronto para qualquer eventualidade. Diante deste cenário, digo que o armamento do operador de cães está exposto a chuva, poeira e outros detritos em virtude do trabalho ou treinamento, necessitando para isso um equipamento resistente a corrosão ferrugem e de fácil manutenção. Já a empunhadura deverá ter a possibilidade de regulagem para adequação a anatomia das mãos, esta situação influenciará diretamente na qualidade dos disparos, pois o tamanho correto proporciona melhor empunhadura.

Outra característica da área é o adentramento em locais apertados que podem conter bagagens ou outros obstáculos, exemplo disso são: ônibus, interior de veículos, boléias de caminhões, carroceria de caminhões e carretas, por este motivo, necessita-se de um equipamento que não possua muitas teclas, que possam por ventura enganchar na hora das atividades de policiamento.

Outra peculiaridade da atividade é que muitas vezes estamos utilizando o cão, sempre em guia e na mão auxiliar, com isso pode, eventualmente, ser feito o uso do armamento com apenas uma das mãos. Um aparelho de pontaria que no mínimo tivesse trítio ou outro mais moderno como red dot e que este armamento tivesse a possibilidade de acoplar acessórios, principalmente lanterna, pois ao entrar em algum local hostil e escuro fazendo uso do cão, só se tem uma das mãos para fazer uso do armamento.

Considerando as argumentações da áreas, extraímos as características solicitadas pela área:

1. Ausência de cão externo;
2. Regulagem no tamanho da empunhadura da arma;
3. Mínimo de teclas externas;
4. Proteção contra disparos acidentais em caso de queda;
5. Local para fixação do fiel;
6. Possibilidade de uso de miras ópticas;
7. Possibilidade de uso de lanternas;

F. **Operações Especiais**

Por definição as ações desenvolvidas em Operações Táticas e Especiais requerem equipamento diferenciado, resistente às intempéries e de fácil manuseio, manutenção e emprego.

Haja vista do emprego das equipes nas searas supracitadas, elenca-se um rol não-exaustivo das ações: equipes aerotransportadas em aeronaves de asa fixa e rotativas, operações em blindados, operações de controle de distúrbios, patrulhamento em áreas urbanas e rurais de alto risco, cumprimento de mandados de prisão, escolta e segurança de dignitários e proteção às vítimas e testemunhas, dito isto, percebe-se que muitas das características citadas pelas outras áreas são inerentes às de um operador de um grupo de Operações especiais, devido a similaridade dos ambiente operativos (escolta de autoridades, emprego em aeronaves e embarcações, etc), daí a inclusão da maioria das necessidades por eles já elencadas.

Observando-se que o equipamento prioritário em tela se trata de arma de porte, utilizada como segunda arma de emprego, consideram-se necessárias as características supramencionadas, no tocante à durabilidade e simplicidade. Ainda ressalta-se a necessidade de acoplamento de dispositivos optrônicos para otimizar o engajamento.

Considerando as argumentações da áreas, extraímos as características solicitadas pela área:

1. Resistência a intempéries e sudorese;
2. Manuseio simples;
3. Poucas teclas;
4. Proteção contra disparos acidentais em caso de queda;
5. Possibilidade de emprego de miras optrônicas;
6. Existência de duas versões, de uso ostensivo e de uso dissimulado que possuam a mesma plataforma com carregadores compatíveis;

Pelo que se observa da exposição de argumentos, verifica-se que cada área especializada expõe uma gama de características desejáveis do armamento, mas que muitas delas estão presentes em todas as áreas, o que facilitou a busca por um sistema de armas que atenda a todas as áreas. Já em relação às áreas administrativas e policiamento ordinário da atividade fim, muitas dessas características das áreas especializadas acabam também por atender todas as demandas dessas áreas.

CONSULTA A OUTRAS INSTITUIÇÕES POLICIAIS NO BRASIL E NO MUNDO

Com o objetivo de levantar informações acerca de quais armas são empregadas pelos órgãos de segurança pública no mundo e quais eram os motivos, foi realizada uma extensa pesquisa junto às inúmeras instituições policiais do Brasil e do Mundo – estas últimas por intermédio das embaixadas dos países no Brasil. Além disso, foram aproveitados os dados de consulta semelhante realizada pelo Departamento de Polícia

Federal – DPF, que foram resumidos e expostos na planilha que encontra-se no relatório técnico anexo ao presente.

Ao analisarmos os resultados, destacamos alguns pontos observados:

- O uso praticamente unânime do calibre 9mm. Na verdade apenas algumas instituições polícias no Brasil empregam o calibre .40. A preferência pela escolha do calibre 9mm por essas tradicionais e renomadas instituições policiais, reforçam positivamente a escolha feita pelos especialistas da PRF;
- Boa parte das instituições elencaram o manuseio simples e o mínimo de teclas externas como características para um arma de emprego policial.
- Todos as instituições que informaram a justificativa para escolha do armamento colocaram de forma clara a necessidade de aprovação das armas em algum tipo de testes ou protocolos rigorosos de tiro e funcionamento, exigindo principalmente resistência a quedas e perfeito funcionamento mesmo em condições extremas de uso (temperatura, umidade, sujeira);
- Também ficou em destaque foi a resistência a corrosão e condições climáticas extremas.

Ao analisar as características definidas por muitas dessas tradicionais e renomadas instituições, percebemos que as características definidas por nossos especialistas seguiram a mesma linha de raciocínio, o que é coerente, haja vista que muitas dessas instituições possuem similaridade de atuação com alguns dos ambientes operativos da PRF. E ainda, que a fabricante Austríaca Glock é, de longe, a mais empregada no serviço policial.

ELABORAÇÃO DE CARACTERÍSTICAS TÉCNICAS

A fim de garantir que a busca em todo o mercado de armas, nacional e internacional, atendessem as necessidades da PRF, foi elaborada uma relação com características que, acima de tudo, transmitissem confiabilidade e segurança ao operador policial. Todo o detalhamento dessas especificações, além de outras, constam nos relatórios técnicos e foram utilizadas para a definição do sistema de armamento.

Com a realização dos estudos, foi possível definir não apenas as características técnicas necessárias para as armas de porte da PRF, mas também aquelas desejáveis, ou seja, que embora não diretamente vinculada à segurança, qualidade ou confiabilidade, trazem vários benefícios extremamente vantajosos para a atividade da PRF, garantindo assim, além destes, sua perfeita adequação às diversas atividades e atribuições da PRF.

Importante destacar que o novo sistema de armas não inclui somente um, dois ou três modelos de armas de porte, mas inclui também a existência de simulacros e armas de simulação de combate. Essa integração é essencial para a completa interação do sistema de arma, permitindo que sejam empregados simulacros de mesma plataforma, dimensões e funcionamento. E, considerando que o treinamento é algo constante dentro da atividade policial, o uso de simulacros com mesmas dimensões, mecanismos e formas de funcionamento, mas que são inertes e incapazes de efetuar disparos com munição real são extremamente úteis, pois garantem a segurança dos treinamento e impossibilita os acidentes e confusões que podem ser gerados com o uso de armas reais durante treinamento simulados.

O risco de um disparo acidental ao empregar armamento real para simulações é constante, existindo diversos casos envolvendo vítimas, muitas vezes fatais no Brasil e no Mundo. A própria PRF já foi vítima de disparos acidentais efetuado durante treinamentos simulados, um deles, infelizmente, levando a óbito um aluno, devido ao uso de armas reais em treinamento simulados.

Passaremos a apresntar todas as características técnicas o corpo de especialistas definiu como requisitos necessários para o novo sistema de armas da PRF de forma a atender as peculiaridades das atividades da PRF.

i. Tipo de ação: dupla com semi-engatilhamento

Sistema de percussor lançado de ação dupla com semi-engatilhamento do percussor por apresentar todas as vantagens do sistema de ação dupla e sem suas desvantagens, permitindo que se tenha um sistema que apresente um peso e um curso de gatilho que permita ao policial desistir do acionamento caso seja necessário, e simplifique o treinamento em virtude deste sistema apresentar peso e curso de gatilho constante e relativamente leve.

ii. Sistema de percussão

Sistema de percussor lançado (striker-fired) com semi-engatilhamento e com travas automáticas passivas por apresentar as seguintes vantagens: menos peças envolvidas no funcionamento, facilitando a manutenção da arma, maior ergonomia por não apresentar recortes e frestas para acomodação de martelo, diminuindo a incidência de acúmulo de sujeira e outros motivos conforme descrito no RTPRF 02/2016:

iii. Tipo e comprimento do cano

O comprimento do cano interfere diretamente na precisão e recuo do armamento, além de interferir na ergonomia do porte, pois influencia no tamanho final da arma. Sendo assim, para a arma de uso ostensivo, que precisa priorizar ao máximo à precisão do disparo, sem prejudicar à ergonomia da empunhadura, o comprimento do cano da versão ostensiva deve ser entre 110mm e 115mm, já para a versão subcompacta, onde seu uso efetivo é destinado apenas para casos extremos de legítima defesa, devendo ser priorizado o conforto e a capacidade de permanecer dissimulada junto ao corpo, sem prejudicar em demasia sua empunhadura, o comprimento do cano deve ser entre 85mm e 90mm.

Além disso, foi definido que o cano seja confeccionado em aço forjado por martelamento a frio, com raiamento de perfil poligonal, com acabamento interno e externo em tenifer ou acabamento que ofereça proteção similar ou superior.

iv. Mínimo de teclas externas

Considerando os níveis de stress e adrenalina a que se submete o policial durante um confronto armado, sua arma deve ser a mais simples possível, de forma a possuir o mínimo de obstáculos para a realização de um disparo com segurança, desta forma, para que haja o disparo deve haver apenas o simples pressionar do gatilho. Com isso, a existência de teclas e registros externos deve ser minimizado ao máximo, bem como botões, protuberâncias, saliências e quinas, o que resulta num uso simples e confortável do armamento, reduzindo o risco de acionamentos acidentais durante o confronto, o que pode provocar o travamento ou pane do armamento, deixando tanto o policial quanto a sociedade mais vulneráveis. Uma arma com esta configuração proporciona ainda maior conforto, segurança e estabilidade seja para o uso ostensivo ou uso dissimulado, pois tem a possibilidade mínima de enroscar em vestimentas, vegetação e capas táticas, além de simplificar o processo de ensino aprendizagem, coadunando com a ideia de que arma de uso policial deve ser o mais simples possível.

v. Tratamento das partes metálicas

Considerando a grande capilaridade da PRF, bem como a exposição do armamento as mais diversas condições climáticas (regiões com alta umidade e temperatura, regiões litorâneas com alto índice de salinidade, regiões frias e secas etc), torna-se imperativo que o tratamento das partes metálicas possua a melhor resistência não apenas as intempéries supramencionadas, mas também ao desgaste natural decorrente do uso na atividade policial (quedas, arranhões, exposições a chuva, poeira, fuligem, etc). Sendo assim, é necessário que a arma possua o acabamento externo da superfície do ferrolho e do cano em tenifer ou acabamento que ofereça proteção equivalente ou superior com acabamento preto fosco.

vi. Chassi em polímero com insertos em aço

A pistola deve possuir chassi fabricado em polímero de alta resistência, sem reforço de fibra de vidro e com insertos de aço que funcionam como trilhos do ferrolho. Os chassis das armas G17 (tamanho padrão) devem ser de polímero de cor coyote e as das G26 (tamanho subcompacto) em polímero preto. As armas destinadas ao ensino da PRF nos modelos G17 e G26 deverão ser com chassi na cor preta.

O chassi de polímero de alta resistência é o mais indicado, por proporcionar a arma um menor peso e ter alta resistência à corrosão, seja por suor, maresia, umidade ou poeira. O polímero também é muito pouco afetado pelas variações de temperatura e tem excelente resistência mecânica (atrito, choque, quedas, tração e pressão), mantendo-se as características físicas inalteradas. É um ser material leve que proporciona conforto em termo de portabilidade e dissimulação em várias situações de trabalho.

vii. Carregadores bifilares em aço com revestimento em polímero e intercambiáveis

A proteção contra as intempéries climáticas extremas e condições de trabalho com risco de quedas, abrasividades e arranhões não se restringe apenas a arma, mas também ao carregador, que muitas vezes é renegado pelo policial. Os carregadores das pistolas devem bifilares e confeccionados em aço recoberto com polímero para conferir uma maior proteção aos mesmos, e ainda, os carregadores devem ser compatíveis entre armas do mesmo modelo e entre as do modelo ostensivo para dissimulado, proporcionando maior mobilidade e apoio tático em situações de emergência das unidades que trabalham à "paisana". Os carregadores das armas subcompactas (G26), devem ser compatíveis com a utilização de prolongadores anatômicos na base do carregador que permite o apoio do dedo mínimo da mão forte na empunhadura, aumentando capacidade de munição e melhorando a empunhadura da arma.

viii. Retém do carregador ambidestro ou reversível

As pistolas armas G17 e G26 devem ter retém do carregador ambidestro ou reversível visando a fácil utilização das armas por policiais destros e sinistros.

ix. Intercambiabilidade de peças

A fim de facilitar a aquisição de peças de reposição e a manutenção das pistolas a equipe do Projeto decidiu que as armas G17 e G26 devem ser de mesma plataforma de funcionamento e apresentar um índice de intercambiabilidade de peças de no mínimo 60%.

x. Empunhadura ajustável

As pistolas G17 e G26 devem possuir ao menos a porção anterior da empunhadura (backstrap) em pelo menos 3 tamanhos distintos (P, M e G) para atender as demandas referentes às diferentes compleições físicas dos policiais da PRF, devendo a troca dessas peças ser de forma simples e rápida.

xi. Sistemas de segurança

A exposição a quedas está presente nos mais variados ambientes, seja durante uma perseguição a pé, no embarque/desembarque da viatura (duas ou quatro rodas) ou aeronave, durante a transposição de obstáculos (Muretas de contenção, muros, barrancos, etc) entre outros casos. Desta forma, as armas devem prover essa segurança e confiança sem dificultar ou aumentar a complexidade do uso de uma arma de fogo.

Considerando doutrina de uso da arma na PRF, bem como a dinâmica dos confrontos policiais, onde o nível de estresse/adrenalina reduz consideravelmente a coordenação motora fina, nessas situações, deve-se exigir do policial o mínimo de movimento para que o mesmo possa empregar o seu armamento com segurança. Sendo assim, o armamento deve permitir o disparo com o simples pressionamento do gatilho, sem a necessidade do acionamento de outras teclas, seja para o início dos disparos, seja para o retorno ao coldre.

As pistolas devem ter ao menos 3 travas distintas em seu sistema de segurança, que funcionam de forma passiva e automática, sendo estes: trava de percussor, trava inercial do gatilho e trava de queda e as pistolas devem ser capazes de resistir a quedas em piso rígido (concreto, aço etc.) de alturas de 1,5m em qualquer posição, e, após as quedas, mesmo que alguma peça não estrutural da arma venha quebrar, as armas devem ser capazes de efetuar disparos com segurança.

xii. Sistema de funcionamento

As pistolas G17 e G26 devem operar pelo princípio de funcionamento de ação direta dos gases com trancamento com curto recuo do cano, através do sistema conhecido por Colt-Browning modificado, por ser um sistema simples, confiável e amplamente utilizado pela grande maioria dos fabricantes de pistolas.

xiii. **Trilho para acessórios**

Considerando a vantagem tática fornecida pelo uso de equipamentos e acessórios (lanternas, miras laser e miras infravermelhas), a arma deve possuir um trilho compatível com os acessórios que utilizem o padrão picatinny na parte frontal da armação, mas que tenha os cantos arredondados e mais suaves ao manuseio, a fim de evitar abrasões ou lesões ao operador.

Existência de armas com tamanhos distintos (standard e subcompacta) com mesma plataforma.

Dentro de qualquer instituição policial, o investimento de tempo e recursos no treinamento é substancial. Além de necessário, é obrigatório o treinamento para a habilitação e renovação anual da habilitação em todo tipo de arma de fogo, conforme preceitua as diretrizes da Portaria Interministerial nº 4.226/2010.

Dessa forma o uso de armas de plataformas diferentes ensejam necessidades de treinamentos também diferentes, muitas vezes dobrando os custos com instrução. Sendo assim, considerando o emprego de armamentos em tamanhos distintos, para as mais diversas aplicações na PRF, torna-se necessário que esses modelos de armas, embora com tamanho distintos, possuam mesma plataforma, ou seja, mesmo tipo funcionamento, teclas de operação e manejo, de forma a reduzir os custos com reposição de peças, manutenção e treinamento/capacitação.

xiv. **Possibilidade de uso de aparelho óptico.**

Considerando o avanço tecnológico no setor de armamentos, que passou a trazer o uso de miras ópticas para as pistolas e revólveres, as chamadas Miras Mini Reflex - MRS. Com isso, o enquadramento dos alvos precisam de apenas um ponto de foco em vez de uma massa e uma alça de mira, trazendo muito mais velocidade dos disparos.

Desta forma, o modelo ostensivo precisa dispor de uma variação com a possibilidade de utilização de miras MRS. Essas armas devem possibilitar o uso das principais miras mini reflex - MRS disponíveis no mercado internacional, bastando para isso a substituição de peças originais no modelo de serviço ostensivo além de possuir a disponibilidade de coldre ostensivo com no mínimo 1 grau de retenção e que possua o sistema modular QLS.

xv. **Existência de versões para treinamento**

Com a finalidade de realizar treinamentos minimizando riscos tanto aos instrutores quanto aos instruendos, a PRF necessita de armas específicas para essa finalidade. O uso de simulacros com mesmas dimensões, mecanismos e formas de funcionamento, que são inertes e incapazes de efetuar disparos com munição real são extremamente úteis, pois garantem a segurança dos treinamento e minimiza os acidentes e confusões que podem ser gerados com o uso de armas reais durante treinamento simulados.

O sistema de armas deve possuir modelos semelhantes ao modelo operacional padrão, idênticos em funcionamento, mas na cor vermelha, mas que sejam capazes de se realizar treinamento em seco, que realizem de forma automática o reset do gatilho, que mesmo se colocando munição real a arma seja incapaz de realizar disparos, mas que tenham o cano aberto para que seja possível a colocação de sistemas de treinamento a laser. Devem também possuir modelos semelhantes e funcionais na cor azul que permitam a utilização de munição de treinamento (projéteis marcadores com tinta). Por fim, devem possuir ainda um modelo semelhante, com cortes para visualização do funcionamento do mecanismo, também impossibilitada de realizar disparos com munição real. Esses modelos de treinamento devem manter dimensões, peso e funcionalidades (peso e curso do gatilho, carregador, teclas externas ...) similares ao modelo operacional padrão.

xvi. **Peso e curso do gatilho**

A fim de propiciar o treinamento do policial em um menor espaço de tempo, gerando economia de tempo e investimento além de minimizar um dos motivos que mais ensejam erros nos direcionamentos dos disparos durante os confrontos armados (pesos e cursos diferentes do gatilho quando em ação simples ou dupla), as pistolas devem possuir um peso e um curso constante do gatilho. Esse peso não pode ser demasiado grande e nem o curso muito longo, o que geraria uma dificuldade excessiva aos policiais do sexo feminino e/ou com menores compleições físicas, nem demasiado leve e com curso muito curto como em ação simples, o que poderia gerar a ocorrência de disparos acidentais provocados pelos próprios policiais devido a alta carga de stress adrenalina durante os confrontos armados, devendo então possuir o peso com variação entre 2,5 a 3,5 Kg.

xvii. Raiamento poligonal

O tipo de raiamento do cano irá definir, entre outras coisas a durabilidade do mesmo e a precisão dos disparos. Confeccionado em aço forjado por martelamento a frio, polido internamente com raiamento de perfil poligonal, possibilitará uma maior durabilidade, menos arrasto, maior velocidade do projétil e maior facilidade de limpeza. Esse tipo de raiamento proporciona uma melhor vedação dos gases em torno do projétil, isso repercute em velocidades ligeiramente maiores e mais consistentes. Há também ganho na menor deformação de projétil, resultando em arrasto reduzido, o que ajuda a aumentar a velocidade do projétil. Isso redunda na redução do acúmulo de cobre ou chumbo dentro do cano, o que resulta em características de manutenção mais fáceis. Todas essas características acabam por representar uma menor sensibilidade à falha e por conseguinte, o prolongamento de sua vida útil do cano.

xviii. Possibilidade de fixação do fiel

Por solicitação unânime de todas as unidades especializadas da PRF, devido a atuação em cenários e missões específicas (operações aéreas, Operações com cães, Motopoliciamento, adentramento em regiões de mata, etc), que muitas vezes fogem do cotidiano da maioria dos policiais, o uso do "fiel" para impedir a perda do armamento e caso de queda torna-se imprescindível.

Sendo assim, a arma deve possuir zarelho ou orifício para fixação de fiel na base da empunhadura.

xix. Existência de sistema de identificação por rádio frequência

Buscando garantir um controle real sobre os armamentos institucionais e a garantia da possibilidade de rastrear e identificar armamentos eventualmente extraviados ou roubados, os armamentos devem ser dotados de RFid - "Radio-Frequency IDentification", ou seja, identificação por rádio frequência, em Conformidade com a norma EPCglobal ISO 18000-63, numa frequência entre 860 MHz - 960 MHz Type C. Que utilizem marcadores passivos, que respondem a um sinal enviado por uma unidade transmissora/leitora, colocados em local discreto, de forma a dificultar/impossibilitar sua retirada por terceiros, e de modo que não alterem o funcionamento e/ou sua aparência/anatomia externa, devendo os mesmos serem injetados no polímero.

xx. Assistência técnica no brasil

A fabricante deve possuir unidade próprio ou empresa representante no Brasil, capaz de garantir a reposição de peças por período mínimo de 10 anos, com capacidade de honrar a garantia de fábrica e possibilidade de prestar assistência técnica em todo território nacional quando solicitado.

xxi. Aparelho de pontaria

Tendo em vista que a PRF se envolve em muitas ações noturnas e de baixa luminosidade, as pistolas devem possuir aparelho de pontaria metálico de 3 pontos com insertos auto-luminescentes em Trítio, afixados de maneira a garantir sua devida inamovibilidade durante o uso policial.

xxii. Da confiabilidade - maturidade do projeto - histórico de batalha

Os dicionários geralmente definem o termo “confiabilidade" como algo que é seguro, fidedigno, consistente e genuíno. Quando falamos na confiabilidade de uma arma de fogo, esperamos que esses adjetivos se apliquem. Sendo assim, o termo confiabilidade assume um caráter mais definitivo: a confiabilidade é definida como a probabilidade de um determinado dispositivo desempenhar a função pretendida por um período de tempo especificado sob condições estabelecidas. O "desempenho em condições estabelecidas" refere-se às condições operacionais e ambientais, ou stresses, que o equipamento pode experimentar durante a sua vida útil.

As pistolas devem possuir a comprovação de utilização, sem ocorrências de graves problemas, há pelo menos 03 anos, por 5 (cinco) órgãos policiais e/ou militares, em 3 países distintos e em dois continentes diferentes. Conforme restou provado durante os estudos e pesquisas, inclusive na consulta realizada a vários órgãos de segurança pública, a aprovação em protocolos de teste e resistência, por mais completos que sejam, são impossíveis de conter a gama de variedade de situações as quais a rotina operativa de um policial está submetida. Sendo assim, essa exigência de maturidade e tempo de exposição se torna imprescindível para reduzir a probabilidade do projeto em apresentar falhas, zelando pela vida da sociedade e dos próprios policiais.

O próprio TCU - Tribunal de Contas da União, durante uma auditoria alertou a PRF sobre o fato de adquirirmos essas armas de forma pioneira, se expondo a riscos advindo com o desconhecido.

Assim, a comprovação de emprego do armamento por outras instituições policiais no Brasil e no mundo tem por finalidade evitar que a Administração Pública seja utilizada como cobaia para testes de um equipamento que pode expor a risco a vida desses servidores e da sociedade, trazendo dissabores e prejuízos futuros, que podem estender-se para além das questões financeiras e comprometer a vida, a saúde e integridade física dos policiais e de terceiros.

xxiii. Da confiabilidade - aprovação em protocolos internacionais

Seguindo a mesma linha de raciocínio sobre a confiabilidade aplicada ao histórico de batalha, é premente que a confiabilidade possa ser determinada, computada, testada e comprovada. Portanto, faz-se necessário o emprego de protocolos consolidados para que seja possível testar, sob diferentes condições operacionais, os complexos sistemas das armas de fogo.

Diante dos diversos problemas enfrentados pela PRF e por diversas outras instituições policiais nacionais e de fora e, seguindo ainda a orientação do próprio órgão de controle de produtos controlados do Exército Brasileiro, em que sugeriu que as instituições de polícia deveriam adotar protocolos de testes adequados a suas atividades, os técnico da PRF estabeleceram como parâmetro base dois protocolos de testes internacionalmente conhecidos, sendo publicada a portaria 104 de 30 de armço de 2017 do Diretor Geral da PRF, estabelecendo a exigência das certificações nos seguintes testes:

- OTAN - AC/225 (LG/3-SG/1) D14 e
- NIJ Standard - 0112.03 (*Autoloading Pistols for Police Oficers*)

A fim de evitar possíveis erros de interpretação, deixamos claro que, conforme consta no próprio Sumário Executivo do Protocolo NIJ Standard - 0112.03 (*Autoloading Pistols for Police Oficers*), os requerimentos de performance e os métodos ali estabelecidos são designados para pistolas utilizadas por Oficiais de segurança pública como sua **"arma de serviço."**

> "Recognizing that the vast majority of law enforcement agencies today use autoloading pistols as their issued **duty weapon**, the National Institute of Justice (NIJ), through its National Law Enforcement and Corrections Technology Center (NLECTC) system, recently performed a series of tests for autoloading pistols."
>
> "Reconhecendo que a vasta maioria das Agências de Aplicação da Lei atualmente utilizam pistolas semiautomáticas como **Armas de Serviço** padronizadas, o Instituto Nacional de Justiça (NIJ), através de sistemática do seu Centro Tecnológico Nacional de Aplicação da Lei e Correção (NLECTC), recentemente realizou uma série de testes para pistolas semiatomáticas."(tradução nossa)

O conceito de "duty weapon" ou "Arma de serviço", empregado pelo próprio Protocolo são os modelos que descrevemos como arma destinada ao serviço ostensivo, que citamos acima.

Desta forma, o Protocolo da NIJ Standard - 0112.03 (*Autoloading Pistols for Police Oficers*) se aplica tão somente ao modelo G17, haja vista ser a G26 um arma de uso dissimulado, não ostensivo.

Destacamos ainda que esses testes, também não se aplicam às versões de treinamento, haja vista que as mesmas não são empregadas com munições letais reais, muito menos em situações operacionais, não necessitando portanto de teses de simulam essas situações.

Podem ser aceitos testes de outros protocolos diferentes, desde que realizem os mesmos testes aqui descritos nas mesmas condições ou em condições mais rigorosas.

3.2.6. Da Relação Custo benefício

Considerando que a primeira aquisição internacional de armamentos de porte realizada por instituição de segurança pública foi realizada pelo DPF - Departamaento de Polícia Federal no ano de 2005, que adquiriu pistolas do mesmo fabricante que forneceu as pistolas adquiridas pela PRF só que de 3ª geração (equanto as pistolas da PRF já são de 4ª geração), foi realizada a um valor unitário de U$ 450,00 (quatrocentos e cinquenta dólares).

Considerando que diversas aquisições (2016, 2017 e 2018) de pistolas importadas realizadas no território nacional foram do mesmo fabricante que forneceu as pistolas adquiridas pela PRF, da mesma 4ª geração, a um valor unitário de U$ 495,00 (quatrocentos e noventa e cinco dólares), conforme consta nos autos do processo de compra (SEI nº 9090532).

Considerando que a PRF, em busca de garantir um controle real sobre os armamentos institucionais e a garantia da possibilidade de rastrear e identificar armamentos eventualmente extraviados ou roubados, algo que é inclusive, incentivado e solicitado pelo Ministério Público no Brasil (https://goo.gl/nRcZzj), os armamentos da PRF são dotados de RFid - "*Radio-Frequency IDentification*", ou seja, identificação por radiofrequência, em Conformidade com a norma EPCglobal ISO 18000-63, numa frequência entre 860 MHz - 960 MHz Type C;

Considerando o estudo do Projeto IA2 de Identidade visual da PRF, que definiu a necessidade de separação em cores das vestimentas da PRF, fez com que as partes em polímero deverão ser na cor Coyote, não podendo ser pintado e sim o próprio polímero que deverá ser colorido, exigências estas que fogem do padrão de identificação das armas e que naturalmente agregam valor ao produto.

Importante também citar que a única aquisição de armamento de porte internacional que não teve como vitoriosa a empresa austríaca Glock foi um registro de preços realizado pelo governo do estado do Ceará para 14.000 unidades. Que, por ser Registro de Preços gerou uma expectativa de venda à época de um total de 85.000 unidades, entretanto sem a exigência de identificação por rádio frequência e de polímero em cor diversa da preta. Neste processo a arma foi adquirida a um valor final de U$ 446,51 (quatrocentos e quarenta e seis dólares e cinquenta e um cents). Ou seja, apenas U$ 3,49 (três dólares e quarenta e nove centavos) abaixo do valor de aquisição das 12.565 unidades da PRF, que agregam ainda o equipamento que possibilita a identificação por rádio frequência e as partes em polímero na cor Coyote.

Considerando que o valor unitário final na nossa aquisição foi o de U$ 450,00 (quatrocentos e cinquenta dólares), mesmo com todas as inovações descritas acima, foi possível negociar um valor idêntico ao praticado 12 anos antes em uma aquisição de pistolas de uma geração anterior.

Portanto, diante de todas as considerações aqui elencadas, a PRF seguramente conseguiu a melhor aquisição de armamento de porte da história recente do Brasil no quesito custo/benefício.

4. DA PADRONIZAÇÃO

Considerando todos os estudos realizados pela Polícia Rodoviária Federal e demais instituições pesquisadas ao longo dos anos de 2015 a 2018, bem como o excelente resultado alcançado ao longo das centenas de instruções de habilitações com o novo sistema de armas Glock, que realizou a substituição integral de todas as pistolas anteriomente empregadas pela PRF, pelas novas pistolas Glock, onde não foi registrado nenhum incidente, pane ou problema com o treinamento de quase 10.000 mil PRF´s. Restou claro que as especificações técnicas definidas pela equipe de técnicos da PRF atendem perfeitamente às necessidades da PRF, garantindo não apenas a qualidade, segurança e confiança dos armamentos, mas atendendo também aquelas características desejáveis, ou seja, que embora não diretamente vinculada à segurança, qualidade ou confiabilidade, trazem vários benefícios extremamente vantajosos para a atividade da PRF, garantindo assim, sua perfeita adequação às diversas atividades e atribuições da PRF, atendendo desde o efetivo ordinário, as áreas especializadas e o ensino.

Com a finalização desse longo processo de estudos, que culminou com a substituição integral das armas de porte da PRF pelo Sistema de armas da fabricante Glock, que inclui não apenas os três modelos operacionais, mas ainda ss 03 versões exclusivas para treinamento, totalizando 06 modelos de pistolas compatíveis entre si, e que, devido a essa padronização, permitem uma redução significativa de custos com instrução e treinamento, além de evitar a possibilidade de erros de execução devido a confusão com os procedimentos de operação de um modelo com outro, torna-se necessário que esse sistema de armas seja padronizado para o emprego da Polícia Rodoviária Federal.

Considerando ainda que dentro de qualquer instituição policial, o investimento de tempo e recursos no treinamento é substancial, sendo além de necessário, obrigatório o treinamento para a habilitação e renovação anual da habilitação em todo tipo de arma de fogo, conforme preceitua as diretrizes da portaria interministerial nº 4226/2010, destacadas abaixo. Dessa forma o uso de armas com mesma plataforma, funcionamento e teclas de operação faz com que os recursos com as instruções caiam significativamente, especialmente quando comparados a instruções com armas de plataformas diferentes, que ensejam necessidades de treinamentos também diferentes, muitas vezes dobrando os investimentos com instrução.

> "16. Deverão ser elaborados procedimentos de habilitação para o uso de cada tipo de arma de fogo e instrumento de menor potencial ofensivo que incluam avaliação técnica, psicológica, física e treinamento específico, com previsão de revisão periódica mínima.
>
> 17. Nenhum agente de segurança pública deverá portar armas de fogo ou instrumento de menor potencial ofensivo para o qual não esteja devidamente habilitado e sempre que um novo tipo de arma ou instrumento de menor potencial ofensivo for introduzido na instituição deverá ser estabelecido um módulo de treinamento específico com vistas à habilitação do agente.
>
> 18. A renovação da habilitação para uso de armas de fogo em serviço deve ser feita com periodicidade mínima de 1 (um) ano."

Esse aumento com custos de instrução e treinamento devido ao emprego de armas com plataformas diferentes é algo que a PRF conhece muito bem, pois viveu esse problema até o final do ano de 2018, quando empregava 03 modelos de armas diferentes, onde cada modelo necessitava de um processo de habilitação diferente, podendo portanto compará-lo quando da mudança para o atual sistema de armas da Glock.

Na PRF os policiais que fazem jus ao uso de armas subcompactas são os lotados nos serviços de inteligência, corregedoria, operações especiais e cargos com função comissionada, sendo que essas armas se destinam a outra dinâmica de atuação e são usadas seletivamente a depender da atuação, ou seja, esses policiais precisam ter a sua disposição armas de tamanho "Standard" e "subcompacta". Além disso, devido aos desgaste natural provocado pelas atividades desses setores, a rotatividade dos policiais nessas áreas é considerável. Sendo assim o uso de armas com mesma plataforma ajuda a otimizar os investimentos com as instruções, facilitando a capacitação/habilitação do policial no manuseio (montagem, desmontagem, teclas de operação, sistema de funcionamento, etc) de ambos os modelos de pistolas (Standard e subcompacta). Caso contrário, toda vez que um servidor fosse lotado em um setor onde o uso de outra arma fosse necessário a PRF teria um novo gasto com instrução.

Além disso, considerano que junto com as armas, a PRF adquiriu um conjuto de "spare parts" (peças de reposição), que garantirá a manutenção de todo esse armamento adquido pelos próximos 20 anos, no mínimo. E como as armas utilizam a mesma plataforma, torna a manutenção de segundo escalão, a cargo de servidores especializados, mais facilitada e com custos reduzidos, haja vista que as ferramentas e peças de reposição utilizadas serão as mesmas.

Desta forma, após o longo processo de estudos que culminou com a substituição de todos os 03 modelos de armas distintos e não compatíveis antes empregados pela PRF, por um único Sistema de armas, confiável, seguro e de qualidade, com funcionamento, teclas de operação, montagem e desmontagem e demais itens compatíveis entre sí, permitindo uma uniformidade de procedimentos, instrução e operação, independente da área na qual o policial atue, especializada ou não, resta a PRF padronizar esse sistema de armas, a fim de que as futuras aquisições respeitem as especificações aqui estabelecidas e fortemente fundamentadas, evitando que armas incompatíveis com o atual sistems de armas sejam adquiridas e inseridas dentro da PRF. De tal forma que, uma nova modificação ensejaria, obrigatoriamente, um novo e longo estudo, que comprovasse, a superioridade, não apenas na qualidade, segurança, confiabilidade e demais características, mas ainda na vantajosidade econômica da substituição, assim como foi comprovada ao longo deste processo.

5. **CONCLUSÃO**

Por fim, considerando:

O que prescreve o artigo 15 da Lei 8666, de 21 de junho de 1993, em seu inciso I, que estabelece que "As compras, sempre que possível, deverão: I - atender ao princípio da padronização, que imponha compatibilidade de especificações técnicas e de desempenho, observadas, quando for o caso, as condições de manutenção, assistência técnica e garantia oferecidas; ";

Os relatórios constantes nos processos 08650.025836/2016-40, 08650.019721/2017-05 e 08650.006431/2018-74, confeccionados pela Equipe de técnicos do Projeto Estratégico ARM - Armamentos Institucionais, criado através das Portarias da Direção da PRF Nº 329, de 16 de outubro de 2015 e Nº 144 de 19 de maio de 2017 com a função de, entre outras atribuições: "propor melhorias, otimizações, mudanças, substituições, padronizações e possíveis aquisições com base nos estudos realizados."

A migração do calibre .40 S&W para o calibre 9x19mm para as armas de porte da PRF, após estudos constantes no RTPRF 06.2016 (SEI nº 4081911);

A aquisição e distribuição, para todas as unidades da Polícia Rodoviária Federal em todo o Brasil, de 12.565 unidades de pistolas do Sistema de armas Glock, no calibre 9x19mm, incluindo 11.300 unidades do modelo G17 para uso ostensivo e 615 do modelo G26 para uso dissimulado, que tornou as pistolas da fabricante Glock, nos modelos G17 e G26, como sendo o único sistema de armas de porte atualmente empregada pela PRF. Fazendo com independete da área em que atuem, todos os PRF´s possuem armas de mesma plataforma, com peças e carregadores intercambiáveis entre os modelos;

O recolhimento do uso operacional dos 3 modelos de armas de porte, no calibre 40S&W, pertencentes a fabricante Taurus, anteriormente empregados pela PRF;

Com a distribuição das novas pistolas Glock e recolhimento das pistolas da fabricante Taurus, as pistolas semi-automáticas da marca Glock, modelos G17 e G26 representam 100% (cem por cento) do acervo de pistolas em uso da Polícia Rodoviária Federal;

O resultado extremamente satifatório obtido durante os eventos de capacitações com os quase 10,000 PRF´s que receberam o armamento, onde nenhuma pane, incidente ou problema foi relatado;

A Aquisição e distribuição de simulacros para treinamento de todo o efetivo em todos os estados, que são idêncicos as armas reais, o que tornou mais seguro e eficiência os treinamentos de nossos policiais;

O nível de treinamento realizado com os armeiros da PRF, bem como o estoque de peças sobressalentes existentes para pistolas da marca Glock (adquiridas em conjunto com as armas) e a intercambialidade de peças entre os modelos das referidas pistolas;

A realização, por outros órgãos de segurança pública nacionais, que já realizaram estudos, laudos, perícias, pareceres técnicos, atestados e relatórios sobre padronização de armamento;

RECOMENDAMOS:

Padronizar, no âmbito da Polícia Rodoviária Federal - PRF, como Sistema de Armas de porte da PRF, as pistolas calibre 9 x 19 mm, da fabricante GLOCK Ges.m.b.H;

Definir os modelos G17, G17 MOS e G26 e suas versões de treinamento (G17 R, G17 T, G17 Cutaway), como os únicos modelos de arma de porte que devem ser adquiridos para uso ostensivo e dissimulado nas próximas aquisições a serem realizadas pela PRF.

Definir como certificações mínimas necessárias para aquisição das referidas armas de porte de uso ostensivo e/ou dissimulado, o atendimento aos seguintes testes pertencentes ao Protocolo OTAN - AC/225 (LG/3-SG/1) D14 (SEI nº 20664052):

- Intercambiabilidade de peças - Método 2.18.3;
- Inspeção preliminar, características das armas e dos disparos - Método 2.1;
- Disparo em Seco (Resistência) - Método 2.5.2.2;
- Verificação da precisão (Precisão e dispersão) - Método 2.4.2;
- Teste de temperatura extrema e condições agravadas - Método 2.9.1.2 (Teste de

frio); Método 2.9.2.2 (Teste de alta temperatura); Método 2.13.1.2 (Sem lubrificação);

- Teste de temperatura e umidade - Método 2.9.3.2
- Teste de imersão em água salina - Método 2.13.4
- Teste de névoa salina - Método 2.13.3
- Teste de arrasto em areia - Método 2.13.6
- Teste dinâmico de poeira e areia - Método 2.13.5.2.2
- Teste de lama - Método 2.13.7
- Teste de pulverização acelerada com água Método 2.13.2
- Teste de congelamento Método 2.9.4
- Teste de resistência Método 2.5.3
- Teste de queda Método 2.15.3
- Teste de obstrução por projétil Método 2.10.3.2.1, no que for aplicável.

Definir como certificação complementar necessária para aquisição das referidas armas de porte de uso ostensivo, o atendimento ao Protocolo:

- NIJ Standard - 0112.03 (Autoloading Pistols For Police Officers) SEI nº (20664058):

Os referidos testes de ambos os protocolos citados não se aplicam às versões de treinamento, haja vista que as mesmas não são empregadas com munições letais reais, muito menos em situações operacionais, não necessitando portanto de teses de simulem essas situações.

Poderão ser aceitos testes realizados por protocolos diferentes destes elencados, desde que realizem os testes aqui descritos nas mesmas condições ou em condições mais rigorosas.

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Documento assinado eletronicamente por **FRANCISCO RODRIGUES DE OLIVEIRA NETO**, **Policial Rodoviário(a) Federal**, em 13/08/2019, às 11:10, horário oficial de Brasília, com fundamento no art. 10, § 2º, da Medida Provisória nº 2.200-2, de 24 de agosto de 2001, no art. 6º do Decreto nº 8.539, de 8 de outubro de 2015, e no art. 42 da Instrução Normativa nº 116/DG/PRF, de 16 de fevereiro de 2018.

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NATO ARMY ARMAMENTS GROUP

LAND GROUP 3 ON CLOSE COMBAT INFANTRY

SUB-GROUP 1 ON STANDARD SMALL ARMS AMMUNITION

Evaluation procedures for future NATO Small
Arms Weapon Systems
Note by the Secretary

Following the approval by SG/1, the document on Evaluation Procedures for future NATO small arms and weapon systems is now published as a reference document.

(Signed) H. Briche

Original: English
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NATO UNCLASSIFIED

5 November 2001

NOTICE
AC/225(LG/3-SG/1)D/14 ADD
+ DISTR LG/3

NATO ARMY ARMAMENTS GROUP

LAND GROUP 3 ON CLOSE COMBAT INFANTRY

Evaluation Procedures for Future NATO Small Arms Weapon Systems

Note by the Secretary - Addendum

1. Following a printing error please find herewith an addendum to the document AC/225(LG/3-SG/1)D/14 comprising the table of contents and page 2-127.

2. Any inconvenience is much regretted.

(Signed)H. BRICHE

Original: English
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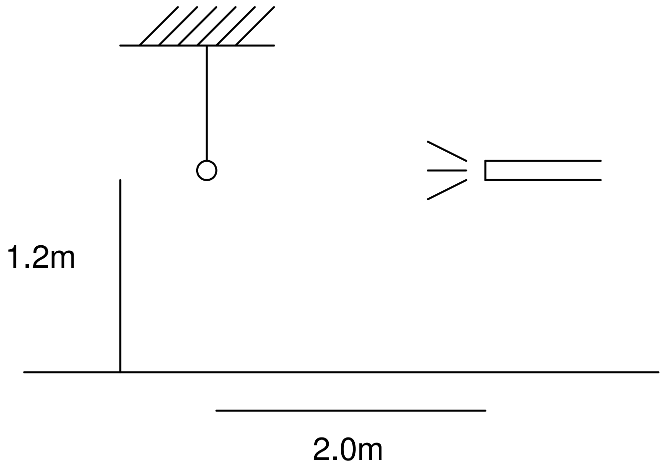

D/14 Evaluation procedures for future NATO Small Arms Weapon Systems

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SECTION 1

INTRODUCTION AND TEST PLANNING

1.1 BACKGROUND

1.1.1 The original D/14 NATO Small Arms Test Manual was jointly written in the 1960s by Belgium, France, Germany, Netherlands, United Kingdom and United States. The Manual was completely revised in the early 1970s by an international group of experts in preparation for the 1977-1979 NATO Small Arms Test Programme. The Manual was redrafted in 1980 under the auspices of the international NATO Small Arms Test Control Commission (NSMATCC), to ensure that lessons learned from these tests were incorporated. A revision of this Manual, to align French and English versions, was undertaken in 1991/1992 by a Working Group of AC/225(Panel III/SPl).

1.1.2 The current revision in 1999/2000, by AC/225 (LG/3-SG/1)D/14 Working Group, takes into account latest advances in technology as well as the STANAG 4512 (CRISAT) target.

1.2 PURPOSE

1.2.1 The purpose of this Manual is to define a series of assessment tests for small arms weapons and ammunitions. These tests are to assess the performance characteristics against agreed NATO requirements. This Manual is only a guide for drafting detailed test plans to meet the particular circumstances of the testing to be done. The tests in this manual make no attempt to stipulate acceptance or rejection criteria (except possibly as regards safety). Their purpose is to provide NATO countries, and NATO as a body, with all relevant test and analysis data to assist in appraisals of weapons and ammunition designs against the agreed requirements. As applicable, control weapons and ammunition will be used to provide comparative data. In the few instances where desirable performance figures are quoted in this manual, these are to be taken as a guide only.

1.2.1.1 The tests in this Manual can be used not only for NATO tests, but also for purely national testing against particular national criteria. They would then give a basis of comparison with previous NATO testing and with other national testing based on this manual.

1.2.2 Tests to be used in a particular programme must be based on consideration of:

- Exact objective of the testing
- Weapon/ammunition type and availability for test
- Development stage
- Test facilities, personnel and locations
- Test control arrangements
- Test reporting requirements
- Results analysis plan
- Time/cost considerations

1.3 SCOPE

1.3.1 Weapons and Ammunitions This Manual covers testing of the following main categories of ammunition and weapons: (Weapon Family is defined in document AC/225(LG/3)D/7.

1.3.1.1 Weapons Family

1.3.1.1.1 General There is no international definition of the term "Small Arm". The term has traditionally been used to denote small calibre personal weapons. However, in recent years this definition has become blurred and a variety of weapons are now being included in this classification. Categories of Small Arms taken in account in this manual are:

- Personal Defence Weapons (PDW)
- Individual Combat Weapons (ICW)
- Support Weapons (SW)
- Special Weapons
- Non-Lethal Weapons (NLW)

1.3.1.2 Munitions Three types of munitions are taken in account

- Kinetic munition
- Bursting munition, fuzed or unfuzed
- Munition with fuse

1.3.2 **Categories of Tests** The tests fall into the two main categories defined below:

1.3.2.1 Technical Tests These are conducted by personnel trained in the engineering or scientific fields, using an engineering approach, with the object of determining the technical performance and safety features of the weapon and/or ammunition. The tests are characterised by controlled conditions and the elimination, as far as possible, of human influence or error, by the use of environmental chambers, controlled laboratory, shop and field trials and statistical methodology. The technical tests, as well as establishing the relative suitability against agreed NATO requirements, also provide data for use in further development and allow determination of the technical safety and suitability of the weapon/ammunition for firing by soldiers in military tests.

1.3.2.2 Military Tests These are conducted under field conditions with the object of determining whether the weapon meets the agreed requirements and is suitable for service use. The tests are characterised by both qualitative observations and judgement of selected military personnel having a background of field experience, and conducted using soldiers representative of those who will use the weapon in the fields.

1.3.2.3 Test Sections In this Manual the tests are divided into sections under the following main headings:

Section 1 : Introduction and Test Planning

Section 2 : Common Tests for Weapon Systems

Section 3 : Common Tests for Munitions

Section 4 : Specific Tests for Kinetic Munitions

Section 5 : Specific Tests for Bursting Munition

Section 6 : Specific Tests for Fuses

Section 7 : Tests for Sighting Systems

Section 8 : Human Factors/Engineering

Section 9 : Military Tests: Weapon Systems

1.3.2.4 Climatic Testing An explanation of the basis used in this Manual for climatic testing is given at Annex A.

1.3.2.5 Support Weapon Mounting Some considerations on the test firing of support weapons from particular mounts (vehicle, anti-aircraft) are given in Annex B.

1.3.2.6 Special Test Mounts In technical tests, where manned firing is either not practical or not allowed for safety reasons, special test mounts will have to be used. Although ideally, for purposes of comparison, a common mount with fittings for each different weapon should be used, technical difficulties in achieving this may make it impractical.

1.4 TEST PLANNING ELEMENTS

1.4.1 Objective of Test Programme Before any test planning is started, the exact objective of the test programme must be established and agreed by all participants. Where agreed NATO requirements are concerned, it is essential that these give sufficient definitive detail (as a guide this should be to the same detail as is required of national requirement/specification documents).

1.4.2 Overall Planning of Tests Once the basic requirement documents are agreed upon, planning can be made on the test programme. It may be advisable for the NATO body concerned to task one or two nations jointly with the preparation of an overall plan for the tests, who can then co-ordinate with test centres, manufacturers and national and NATO support organizations to establish a draft overall plan. The various elements of such a plan are outlined in the paragraphs that follow.

1.4.3 Choice of Tests and Extent Tests should be selected from this Manual appropriate to the basic requirements being considered and suitable to the stages of development of the systems to be tested. Following this test selection, decisions will have to be made on weapon/ammunition requirements/availability (both quantities and dates).

1.4.4 Test Centre Facilities Once tests have been selected, test centres providing the required facilities must be selected and national approval obtained. Factors involved in the choice of test centres include:

- Test selection and weapon/ammunition availability (quantities and dates)
- General locations (widely dispersed test centres can cause test control and equipment transport problems)
- Firing ranges (including safety restrictions) and other test facilities (vibration tables, etc.)
- Measuring, recording and analyses facilities
- Climatic conditions (both ambient and simulated climatic chambers)
- Test personnel requirements, availability and training
- Accommodation availability (both personnel and weapons/ammunition - including workshop/cleaning areas)
- Dates of readiness to start tests and availability for full period involved
- International test control arrangements
- Type and extent of reports required
- Method of results assessment
- Costs involved, financing and financial control

1.4.5 **Results Analysis** At a very early stage in the overall planning, the question of overall Results Analyses/Evaluation must be considered in order to ensure:

- A fully adequate method of Results Analyses/Evaluation
- Availability of suitable specialised personnel from the different NATO countries
- Availability of computer and computer personnel support
- Test results format and extent required for assessment/analyses purposes
- International control of Results Analyses/Evaluation procedure
- Costs involved and financing

1.4.6 **Specialist Assessment** The requirements for Specialist Assessment/Groups of Experts/Design Authority must also be considered early in the overall planning stage to ensure the test detail reflects up-to-date technology and allows valid assessment of results which can then be fed into the overall Results Analysis/Evaluation. Subjects requiring Specialist Assessment could include:

- Hit probability
- Maintenance
- Reliability
- Terminal ballistics
- Suitability for use
- Acoustic effects
- Nuclear and chemical effects
- Training systems

1.4.7 **International Test Control** The question of international test control must also be resolved early in the overall planning stage, including:

- Test control personnel (qualifications, experience, linguistic capability, availability dates)
- Support personnel (secretaries, translators, interpreters, finance accounting support)
- Accommodation and supporting administration
- Office equipment (including photocopying, document storage)
- Management body supervising the international test control organization
- Final test report requirements
- Costs involved and financing

1.4.8 **Test Agreement** Once the full overall outline planning has been made it must be agreed both by the appropriate NATO body AC/225 (LG/3-SG/1) and by the NATO countries involved. A formal document, such as a Memorandum of Understanding (MoU), may be advisable. When formal agreement has been given to a NATO test programme, then the detailed test planning can be carried out.

1.5 DETAILED TEST PLANNING

1.5.1 Action Once Programme is Agreed Once formal agreement has been given for a NATO test programme, then detailed test planning has to be undertaken both by the international test control organisation and at the test centres involved.

1.5.2 Action by Test Control Organisation Action by the international test control organisation will include:

- Decisions on own internal organization;
- Decisions on own method of work;
- Setting up Secretariat;
- Establishing own responsibilities towards test centres;
- Laying down details of weapons and ammunition for testing, including full delivery details;
- Arranging for specialist advice;
- Establishing Results Analyses Plan;
- Establishing translation system (French-English);
- Making arrangements to ensure safety during testing;
- Establishing procedure detail for each test (test centre to draft for control organization approval);
- Ensuring systems, even though different, are all treated equally;
- Arranging provision of weapon handbooks and descriptions;
- Arranging briefings and liaison visits by manufacturers to test centres;
- Establishing procedure for test queries;
- Establishing format and extent of test results sheets and reports (including analysis reports) required, both from test centres and for distribution to NATO countries;
- Establishing test limitations regarding time and budget;
- Establishing full financial, budgetary and audit arrangements;
- Establishing own decision-making proces and relationship to supervisory management body;
- Visiting test centres to check planning, equipment, organization, and resolving problems expeditiously.

1.5.3 **Action by Test Centres** Based on the lines of action established by the international test control organization, each test centre involved will have to take action, including:

a. Decision on Senior Staff:
- NATO test co-ordinator at the test centre
- NATO test conducting officers

b. Decisions on Availability at the Test Centre of:
- Trained test personnel
- Secretarial staff and office equipment
- Translators
- Support personnel
- Firing range facilities
- Other test facilities, including climatic chambers
- Support facilities (stores, workshops, vehicles)
- Measurement and data collection system
- Special test apparatus, either from outside the test centre or adoption of existing apparatus there
- Material for testing (steel plate, sand, solvents etc.)
- Financial accounting system

c. Drafting of:
- Outline test plan including allocation of weapons and test teams to series of tests (see also paragraph 1.5.4 below)
- Test detail for each test, carrying out trial testing if necessary to establish feasibility and test apparatus/techniques to be used
- Overall test programme at the test centre, including special arrangements for certain testing required before other testing can take place
- Test centre budget estimates

d. Liaison with manufacturers, particularly on weapon characteristics, fittings to test apparatus, action on malfunctions, handbooks, also resolving queries arising during initial planning or testing.

e. Safety considerations.

f. Presenting test plans and programme and test detail for each test to the international test control organization for approval.

g. Presenting budget estimates for approval.

h. Establishing own internal test query procedures.

j. Establishing test result sheets and test reports format, size and copies required and arranging own internal organization to provide these in the appropriate NATO language.

k. Establishing contact with experts in specialist field (or group of experts) to assist both in preparing test detail and with later analysis of results

l. Establishing data provision and personnel and facilities for specialist analysis

1.5.4 **Outline Test Plan** The outline test plan will be influenced in particular by:

- Number and types of systems for testing;
- Number of weapons, quantity of ammunition per system;
- Number of test teams/test soldiers
- Firing ranges and facilities available;
- Number of weapons for each test (normally three, but less for certain tests - particularly those of a destructive nature);
- Need to carry out certain testing first either for safety reasons or because "new" weapons are required;
- Need to carry out certain testing last as a destructive nature or "worn" weapons required;
- Availability of special barrels and ammunition;
- Report workload from tests;
- Possible need to prolong or repeat some testing;
- State of development - and thus reliability - of weapons or ammunition;
- Special arrangements for systems of novel design;
- Climatic conditions;
- Working hours permitted;
- Financial and budgetary restrictions;
- Safety considerations.

1.5.5 **Military Test Considerations** Additional considerations will apply to military tests particularly if the international test control organization is responsible directly for what has to be taken into account in arranging NATO tests, even before the first round has been fired.

1.5.6 **Scope of Considerations** The considerations given in the paragraphs above are not comprehensive, but are purely designed to give an impression of what has to be taken into account in arranging NATO tests, even before the first round has been fired.

1.5.7 **1977 -79 NATO Test Experience**

1.5.7.1 Much valuable experience of NATO Small Arms testing and evaluation was gained during the 1977-79 NATO Small Arms Test and Evaluation Programme. Reference documents, listed in Annexes C and D, should be studied carefully before planning any future NATO Small Arms test and evaluation programme.

1.5.7.2 Layouts and trade names of equipment given in this manual mostly come from these 1977-79 NATO tests. Test centres will have to draft their test detail so as to make best use of facilities and equipment available to them.

1.5.8 **Delivery of Equipment for Testing** It is essential that all the equipment required for testing (test and control weapons and ammunition, special test barrels and fittings, detailed drawings and manuals etc.) be delivered to the test centre concerned as laid down during test planning - these delivery dates being well in advance of the actual start of testing to allow full familiarisation, fitting to test mounts, trials of test apparatus etc. The importance of delivery to test centres on time must be stressed: possibly some type of penalty for late or incorrect delivery might be considered during test planning.

1.5.9 **Design Data Package** Each manufacturer should be required to produce a complete data package on his weapon and ammunition before the commencement of testing. If this is not possible then one weapon and some ammunition may have to be retained, unused in the testing, as a model/pattern.

1.6 SAFETY

1.6.1 Safety is paramount throughout all test preparation and execution. The test conducting officer must have full responsibility to stop testing whenever safety considerations demand this.

1.6.2 The manufacturer must provide a manual/user handbook containing clear instructions on safety in handling. These instructions must be followed exactly throughout all technical and military testing. Special consideration must also be given to particular tests (obstruction in barrel, cook-off, etc.) which may necessitate unmanned firing. All weapons must have been subjected successfully to proof firing before use on technical or military tests. If there is electrical ignition affecting any explosive component (primer, detonator, propellant, explosive charge) then additional testing must be done to cover electrical and radiation hazards. There are set RADHAZ test assessments which will need to be carried out.

1.6.3 Safety must be evaluated throughout all testing and not only in the specific safety test (2.10). Test personnel must keep an eye on safety during each test and note carefully each incident, which could give rise to a safety problem.

1.7 PARTICULAR TEST FACTORS

1.7.1 **Use of Controls** Control weapons and ammunition are to be used during all testing to act as a datum point with known in-service systems and also as a cross-check that the overall results from the NATO tests agree with known similar test results with these control systems.

1.7.2 **Common Test Procedure** When several weapons and their ammunition are being tested at different sites, it will be necessary to ensure that similar procedures are followed in all respects.

1.7.3 **Homogeneity** Care must be taken that there is homogeneity between all weapons and ammunition of a particular system presented for test. Particularly, where separate weapon deliveries are made for technical and military tests or development-type ammunition is produced in a number of small lots, special verification of homogeneity will be required.

1.7.4 **Order of Carrying Out Tests** The order in which the particular tests will be carried out will depend on a number of factors such as:

- Preliminary/safety testing
- Testing with new weapons
- Testing with "worn" weapons
- Destructive testing
- Availability of test teams, facilities and climatic conditions

The main grouping of Weapons Technical Tests might be:

- Technical review of weapon documentation
- Initial design safety and suitability assessment
- Preliminary inspection/firing
- Special properties (noise, flash, smoke, gases, temperature, kinematic analysis, recoil impulse, reflectivity, NBC)
- Functioning life of components/systems under normal temperature conditions
- Functioning under adverse conditions (rain, dust, mud, salt water, temperature and humidity, icing)
- Mechanical stresses / rough handling
- Ammunition properties (when launched from weapon) accuracy, penetration, wound ballistics, light brush, ricochet, wind deflection, trajectory)
- Sighting systems
- Ancillaries

- Grenade launch
- Functional user safety
- Special measuring and reporting systems

1.7.5 **Full Firing Records** A full, accurate record must be kept of all firing conducted (weapon logbook), together with details of all malfunctions and stoppages. Extracts must then go into each relevant test report.

1.7.6 **Units of Measurement** The normal units of measurement shall be of the Metric Systeme International d'Units (S.I). Where non-metric units are shown in brackets in this Manual, these are given as an indication only. They are not necessarily an absolutely accurate equivalent of the metric unit quoted.

1.7.7 **Manufacturing Considerations** Where there is a specific need to establish the ease and cost of production, including availability of material, this should be done. Further details are given in Annex E.

1.8 GENERAL FOREWORD ON PROCEDURES

1.8.1 **General** Information on particular weapon system tests is given in this Section. For any particular programme, the tests appropriate to the requirements and to the stage of development should be selected and the necessary specific test detail should then be drafted for approval.

1.8.1.1 This document is intended to be a guide to those tests to be carried out in the assessment of a weapon system. It does not preclude the conduct of other tests, where appropriate.

1.8.1.2 A "Control" in-service weapon should, wherever feasible, be fired in each test to provide a basis for comparison.

1.8.1.3 During test planning, the various requirements of testing with "new" weapons and of "destructive" testing must be considered, together with the availability of ranges, test facilities, test crews, environmental conditions and timings.

1.8.1.4 The test instructions should include details of the test results reporting required, including the format suitable for assessment / analysis.

1.8.1.5 The results of the tests are to be studied statistically by comparing the various samples in order to deduce valid parameters from them and to establish whether basic requirements have been met. A weapon history/log book is to be maintained throughout the testing for each test and control weapon.

1.8.1.6 For area target weapons, where appropriate, and where fully operational area target ammunition is not essential to the test, then inert training ammunition may be used.

1.8.2 **Definitions**. Certain terms used throughout this document are defined in the Table 1.1.

Table 1.1 DEFINITIONS

TERMS	TO COVER
PERSONAL DEFENCE WEAPON	PDW include those weapons which are primarily designed for personal defence such as revolvers, pistols and Sub Machine Guns (SMG).

INDIVIDUAL COMBAT WEAPON	ICW include rifles of all types (including sniper and anti materiel), shotguns, Light Machine Guns (LMG) including Light Support Weapons (LSW) and Squad Automatic Weapons (SAW).
SUPPORT WEAPON	SW include Crew Served Weapons (CSW), medium machine guns (MMG), Heavy Machine Guns (HMG), Vehicle Mounted Machine Guns (VMMG), Area Target Weapons (ATW). ATW include HE grenade launchers, both individual and crew-served), Automatic Grenade Launchers (AGL).
SPECIAL WEAPONS	The special weapons category includes weapons other than PDW, ICW and SW which, because of their unusual nature or usage, require specific consideration.
NON-LETHAL WEAPONS	Non-Lethal Weapons (NLW) are explicitly designed and primarily employed so as to incapacitate personnel or materiel, while minimizing fatalities, permanent injury to personnel, and undesired damage to property and the environment.
POINT TARGET AMMUNITION	High velocity conventional projectiles for the smaller calibres, with possibly more sophisticated rounds for the medium and heavy support weapon calibre
AREA TARGET AMMUNITION	Any form of ammunition used for area target fire including both "area target ammunition" as such and also point target ammunition used in area target grenade projection (see "cartridge" below).
AREA TARGET AMMUNITION OR ROUNDS OR GRENADES	All three terms are used to cover any form of area target ammunition used for area target projection (see "cartridges" below). Although "rounds" mainly refer to tube-launched ammunition (e.g. US M406, US M433) and "grenades" to muzzle-launched systems, any use of either term is to be taken to apply equally to the other, as appropriate.
PROJECTILE	That part of the "round" or "grenade" which is projected to the target, but excluding adaptors, fins, etc., which, although projected from the weapon, are not projected to the target, as such. For special area target ammunition, such as "rebound" rounds/grenades, "projectile" will normally refer to the final projectile reaching the target, but must, of necessity, be interpreted so as best fulfil the object of the particular test under consideration.
CARTRIDGE	Any pre-assembled (fixed) ordnance item consisting of a cartridge case, primer, propellant and projectile.
AREA TARGET WEAPON OR GRENADE LAUNCHING SYSTEM	Any form of weapon used for the projection of area target projectiles, including both "grenade launchers" and grenade dischargers". The term includes the area target weapon sighting system, even where this may also be used for another purpose (part of a point target weapon sighting system).

GRENADE LAUNCHER	Any form of tube specifically designed to fire area target ammunition/rounds. It may be permanently fitted to the rifle (e.g. US M203), detachable, or independent (e.g. US M279). It may also be automatic, semi-automatic or single-shot.
INDIVIDUAL GRENADE LAUNCHER	A grenade launcher that contains a tube that is specifically designed to fire area target ammunition/rounds and which is fully operated by one person. An individual grenade launcher can be either of two types (a) independent weapon system (e.g. US M79), or (b) an attachment to a rifle that contains a separate tube for launching grenades (e.g. US M203).
RIFLE GRENADE LAUNCHER	Any individual weapon providing the necessary barrel interface, muzzle adapter or spigot that permits the launching of fixed grenade munitions using the propellant gases from standard service ammunition or grenade cartridges.
CREW SERVED GRENADE LAUNCHER	A grenade launcher that requires more than one person to operate. Typically has automatic fire and requires either a ground mount or vehicle mounting (e.g. US Mk 19)
GROUND OR VEHICLE MOUNT	All of the supporting structure interposed between the gun and the ground or vehicle, except the actual cradle/adaptor used to secure the weapon to the mount.
SIGHTS	A sight is more than a mechanical, optical or electro-optical device for aiming a firearm or for laying a gun or launcher in position (as defined in Section 7). For example, sights can be classified as either glass or iron. Glass sights comprise all sights which include an optical element such as a collimator, telescope, periscope, etc. Iron sights are classified as a mechanically adjusted sight.

1.8.3 Preparation of Weapons for Testing

1.8.3.1 The preparation of weapons for testing must be specified in the detailed test instructions (method of cleaning, lubricant to be used, method of lubrication, re-lubrication during testing). Details should be noted in the test reports. Lubricants used must be those recommended by the manufacturer.

1.8.4 Malfunctions

1.8.4.1 In the detailed test instructions a procedure must be specified for the recording and subsequent assessment and analysis of all defects in the functioning of the weapon, ammunition and ancillary items, both those which cause a stoppage and those which do not.

1.8.4.2 Malfunctions involve ammunition, weapons or ancillary items and fall into two categories : malfunctions which cause a stoppage (for example, failure to feed, failure to extract or to eject) and those which do not (for example, faulty sealing of the weapon, loss of the flash hider, loosening / shifting of the sight).

1.8.4.3 On each occasion, attempts should be made to establish the cause of the malfunction (weapon, magazine, belt, ammunition, weapon rest or test personnel). When a series of malfunctions occur due to faulty weapon system design, these are to be attributed to the weapon. Malfunctions due to actions performed by personnel, such as faulty assembly of parts or mistakes in the insertion of ammunition, are to be attributed to personnel, unless they arise from a fault in the weapon system's design.

1.8.4.4 The procedure used during the 1977-79 NATO tests is outlined in Annex C. Annex K, entitled "Reliability, Availability, Maintainability (RAM) Data" is the recommended procedure for future tests.

1.9 FACILITIES AND INSTRUMENTATION

The facilities and instrumentation required to conduct tests are specified in the appropriate sections of this manual.

1.10 ORGANISATION OF TEST

1.10.1.1 Weapon Familiarisation The operating methods for the test weapon system must first be studied and thorough familiarisation acquired with the characteristics of the test weapon system. The specified tests will need to be adapted for certain equipment, otherwise it may not be possible to carry out some of the tests.

1.10.1.2 Technical Manuals Technical Manuals from either the contractor or military should be studied to familiarize the tester with characteristics and functions, instructions for safety and servicing (Preventive Maintenance, Trouble Shooting, and Detailed Maintenance), repair parts list, and operating procedures.

1.10.1.3 Previous Testing Reports on similar, previously-conducted tests and any documentation (from the manufacturer or the military authority) will be studied before a test is carried out. If there is adequate evidence on safety and suitability for service from NATO (or individual NATO countries) test reports, then this may be accepted and the relevant tests omitted.

1.10.1.4 Hardstands and Mounts For weapons which are not held in the hand, the appropriate rest which is compatible with the weapons must be used. This rest can be designed and built before the test, if it is not supplied by the manufacturer. Ground mounts (bipods, tripods, etc.) supplied with the test weapon, but which have not been previously tested, will be included in all the specified tests (climatic, adverse conditions, etc.)

1.10.1.5 Number of Test Samples An adequate number of test weapons is required to represent the population from which the sample has been drawn. The sample size of each sub-test must be sufficient (at least three weapons) to provide reasonable confidence that comparison of test results to requirements will be meaningful. Although a sample of three weapons may be suitable for a sub-test, at least nine new weapons should be provided for a complete development test. The results of the tests are to be studied statistically by comparing the various samples in order to deduce valid parameters from them and to establish whether basic requirements have been met. A weapon log will be maintained throughout.

1.10.1.6 Use of Inert Rounds Where appropriate, and where fully operational area target ammunition is not essential to the test, then inert or training rounds may be used.

SECTION 2

COMMON TESTS FOR WEAPON SYSTEMS

2.1 PRELIMINARY INSPECTION, FIRING AND WEAPON CHARACTERISTICS

This test is divided into three parts : preliminary inspection, weapon characteristics determination and preliminary firing.

2.1.1 Preliminary Inspection The preliminary inspection shall consist of the following:

2.1.1.1 Documentation Read and determine the adequacy of manufacturer's manuals, instruction handbooks and / or other documentation presented.

2.1.1.2 Packing Determine adequacy of packaging and preservatives on metal parts. Record any rust or damaged parts that was a result of packaging. Verify contents with shipping list.

2.1.1.3 Inspection Disassemble weapon and carefully examine all parts for damage. Photograph the weapon in various states of disassembly and the weapon with and without accessories, in conjunction with the reference system described below.

2.1.1.4 Checks Check numbering on weapon and components. Record numbers and names (established, if necessary) of all assembly groups and parts. [The handbooks, data sheets or any other documentation provided by the manufacturer may be consulted as a basis] If parts are not numbered, record established part names and numbers along with photographs and sketches, if necessary. For each weapon system descriptive sheets are to be made out, showing:

a. Each main assembly group divided into assemblies
b. Each assembly with its components
c. A simple reference system, possibly using

- Weapon reference number (A1, B7 etc.)
- Numbering of main assembly groups (Roman numerals)
- Numbering of assembly groups (Arabic numerals)
- Numbering of components (Arabic numerals)

(An example of such a reference system is given at the end of this section)

2.1.1.5 Records Record any defective parts noted at the time of disassembly, repair or replace, as required.

2.1.2 Weapon Characteristics Determination

2.1.2.1 Obtain and record force / displacement curves and free lengths for all springs, within the design operating range (if specified in the test plan).

2.1.2.2 Measure and record weapon length, height and width;

a. Without accessories; with normal butt and folded butt (as appropriate)
b. With / without magazine
c. With accessories

2.1.2.3 Measure and record the following physical characteristics where applicable :
a. Firing pin protrusion
b. Firing pin energy (if specified in the test plan). The measurement plan must be clearly defined and recorded
c. Trigger pull or effort. In the case of multi-stage triggers, the force and stroke to operate each stage are to be recorded
d. Cocking effort (charging force), as appropriate
e. Headspace
f. Barrel bore measurements (where appropriate)
g. Chamber and bullet lead configuration (where appropriate)
h. Unsupported cartridge case length [to rear of barrel breech face] (where appropriate)
i. Test launcher length, width and height (where appropriate)
j. Receiver length (where appropriate)
k. Length, width of attachment system (where appropriate)
l. Measurements applicable to the electrical firing system (if necessary)
m. Recoil measurements [energy and force of recoil in relation to time measured by both ballistic pendulum and piezo-electric load cells] (as appropriate)

2.1.2.4 Record the following weapon weights and individual sub-assembly weights, as appropriate:

a. Without accessories or magazine
b. With loaded magazine
c. With magazine, accessories and 100 cartridges

Record the weights of any accessories.

2.1.2.5 Record magazine or ammunition box capacity and weight, with and without ammunition.

2.1.2.6 Record the type of barrel and measure and record barrel characteristics, as follows;

a. Length
b. Rifling

c. Number and width of grooves
- Direction of twist
- Pitch of twist and / or rate of twist at the muzzle
- Length of rifling
- Diameters across the grooves and lands throughout the bore

d. Method of attachment to barrel of the following, if fitted :
- Flash suppressor
- Rifle grenade
- Bayonet
- Other

2.1.2.7 Measure and record the following weapon data (for individual weapons only) ;

a. Distance from the bore line to a horizontal line projected through the middle of the butt support
b. Weapon moment (G_W x Sa) where:
G_W = weapon mass x acceleration due to gravity [$9.81 m.s^{-2}$]
Sa = distance from centre of gravity to butt extremity
c. "Effort" factor : weapon moment multiplied by distance between butt extremity and the line through the forward hand support

2.1.2.8 Note time and tools necessary for:

- Complete disassembly of the weapon
- Assembly of the weapon after complete disassembly
- Dismounting the operating parts and magazine (field strip)
- Assembly of the operating parts and magazine
- Filling / charging magazine (if appropriate)

2.1.2.9 Determine and describe the method of operation from the feeding cycle to cocking / firing / extraction / ejection, including any method for the control of recoil forces. State any known method of operation such as recoil, blowback, gas operated, etc. (if appropriate). Record the type(s) of safety employed.

2.1.2.10 If the method of operation is gas, with an adjustable gas bleeder system, state the method of manual adjustment and any pre-adjustments necessary.

2.1.2.11 Record any adjustments that can be made to change the rate of fire for the weapon (if appropriate). Record provisions for the regulation of fire (semi-automatic, automatic, etc.) and whether a burst-limiting device is fitted.

2.1.2.12 Record the type of locking employed. State if the weapon fires from an open or closed bolt (if appropriate). Provide an explanation if the weapon does not fit into either category.

2.1.2.13 If the weapon makes use of a feed system, state the type and driving force required. Types of feed may range from single shot to linkless feed.

2.1.2.14 For individual weapons only, where a grenade launching capability is available, record the following details;

- Type of system
- Special attachments
- Special sights

2.1.2.15 In the case of rifle-launched grenades, perform the attachment of rifle grenades to the rifle. Practice the mounting and dismounting of rifle grenades. Make sure that the rifle grenade assembly is firmly held in place and secured.

2.1.2.16 If the grenade launcher makes use of a separate tube that attaches to a rifle, practice the attachment and disassembly procedure make sure that the grenade launcher is attached properly.

2.1.2.17 If iron sights are fitted to the weapon, these should be inspected to ensure that they are fully functional for maximum and minimum elevations. For rifle-launched grenades, ensure that the sights are compatible with the rifle-launched grenade, when attached. For grenade launchers that are attached to rifles (e.g. US M203), ensure that the rifle sights are fully functional when the grenade tube is attached. Make sure that the grenade tube sights are functional throughout maximum and minimum elevations. Record the information in Section 7 for both grenade launcher and rifle.

2.1.3 Preliminary Firing - General Foreword on Procedures

Prior to undertaking the preliminary firings the firer must ensure that he / she has sufficient knowledge of the system in order to conduct the testing in a safe manner. See Section 1.8 for further details.

2.1.4 Preliminary Weapon Testing

The following sequence of tests should be undertaken :

2.1.4.1 Establish safe loading and firing procedures.

2.1.4.2 Fire dry normal cartridges, dry high pressure cartridges and oiled normal cartridges. The high pressure test (proof) rounds, chemically cleaned and then dried, will be fired at a pressure 30% higher than the normal test cartridge at 21^{o} C. Where possible, these high pressure rounds will be made up using standard cartridge components. On completion of these firings, cartridge headspace, bore, chamber, etc. are to be measured for comparison with previous measurements and the weapon components shall be inspected to ensure that no component of the weapon has been deformed or damaged. Any abnormal condition found on proof firing will necessitate reproof. For non-NATO standard ammunition, to arrive at the correct proof cartridge overpressure, a pressure barrel with the same configuration as the barrel of the test weapon must be used. A detailed description of the method of firing will be given for all these tests.

2.1.4.3 Conduct firing for the evidence of projectile metal parts separation.

2.1.4.4 Conduct preliminary firing to check zeroing of the weapon.

2.1.4.5 Determine muzzle velocity from a suitable method of observed velocity (AC/225 (LG/3-SG/1) D/9 or D/8, for example).

2.1.4.6 Determine and record peak chamber pressure and port pressure, as appropriate (see also Section 3.6) in addition, muzzle energy should be calculated.

2.1.4.7 Measure and record cyclic rate. For gas-operated weapons the gas settings are to be taken into account and recorded.

2.1.4.8 Determine the efficiency of extraction in the event of a misfire. If necessary, specially prepared ammunition should be used.

2.1.4.9 Determine the robustness of the round under repeated loading and unloading without firing. The ammunition used for this test should then be fired under precautions:

Note: All procedures are mandatory: however, previously established data may be used to satisfy the requirement.

2.1.4.10 For certain area target weapons different preliminary firing conditions should be used. Grenade launchers should be tested in a similar manner to the test procedures for point target weapons specified above. The firing of proof rounds in rifle grenade launchers should not be undertaken, unless the proof round is designed to test the rifle grenade. Firing a rifle proof round to launch a rifle grenade should not be considered. An increased weight rifle grenade or a heated round should be considered as an alternative to firing a rifle proof round.

MAIN ASSEMBLY GROUP

Serial No.	French	English
I	Ensemble fût, canon, boitier de culasse	Upper Receiver Group
II	Ensemble crosse-mécanisme d’armement	Lower Receiver Group
III	Culasse mobile	Bolt System
IV	Chargeur	Magazine Assembly
V	Bretelle	Sling

Upper Receiver Group

Serial No.	French	English
I.1	Ensemble fût, canon, boitier de culasse	Upper Receiver Assembly
I.2	Garde-main, droite et gauche	Right and Left Handguard
I.3	Levier d’armement	Cocking Handle

EXAMPLE OF COMPARATIVE DATA SHEET

Serial	Weapon Characteristics	Unit	Weapons (Ref.No.)
1.	Weight		
a.	less accessories and magazine	kg	
	with filled magazine		
b.	with magazine, accessories and 100 rounds	kg	
c.		kg	
2.	Effort		
a.	trigger effort	N	
b.	cocking effort	N	
3.	Length		
a.	without accessories and with normal butt	mm	
	without accessories and with folded butt		
b.	with accessories	mm	
c.		mm	
4.	Width		
a.	without accessories and with normal butt	mm	
	without accessories and with folded butt		
b.	with accessories	mm	
c.		mm	
5.	Height		
a.	without magazine	mm	
b.	with magazine	mm	
c.	with optical sight	mm	

Serial	Weapon Characteristics	Unit	Weapons (Ref.No.)
6.	<u>Barrel Data</u>		
a.	Type of barrel		
b.	Length overall	mm	
c.	Length of barrel	mm	
d.	Length of rifling	mm	
e.	Type of grooves		
f.	Number of grooves		
g.	Type of pitch		
h.	Length of pitch	mm	
j.	Diameter from grove to groove	mm	
	Diameter from field to field		
k.	Width of grooves	mm	
l.		mm	
7.	<u>Magazine or belt</u>		
a.	Type		
b.	Capacity		
c.	Weight empty	kg	
d.	Weight when full	kg	
8.	<u>Weapon Data</u>		
a.	Distance Ax(1)	mm	
b.	Weapon moment (2)		
	Distances from butt extremity to useable	Nm	
c.	handguard extremities		
	Effort factor (3)	m	
d.			
e.		Nm^2	

Serial	Weapon Characteristics	Unit	Weapons (Ref.No.)
9.	Sights		
a.	Iron Sights		
(1)		mm	
(2)		mm	
(3)		mm	
(4)			
(5)			
		mm	
b.	Optical Sights	mm	
(1)			
(2)		mm	
(3)			
(4)		mm	
(5)			
(6)			
(7)			
(8)			
(9)			
(10)			
(11)			
(12)			
(13)			
(14)			
(15)			
(16)			
10.	System of Operation of the weapon		
11	Locking System		
12	Firing from open or closed bolt position		
13	Type of fire		
14	Burst limiter		
15	Gas regulator		
16	Types of safety		
17			
a.			
b.			
c.			
d.			
e.			

18 a. b. c.	Grenade launch capability type of system special attachments special sights		
19	Other accessories		

Notes:

1. Distance Ax = Distance from bore line to a horizontal line projected through the middle of the but support.
2. Weapon moment = Gw x Sa
   Gw = Weapon mass x g (acceleration due to gravity)
   Sa = Distance from centre of gravity to butt extremity
3. Effort factor = Weapon moment x distance between butt extremity and the line through the forward hand support
4. Bx = Height of sight line above bore line
5. Cx = Distance from rear sight to a line projected from the top rear of the stock, this line being perpendicular to the bore axis.

2.2 KINEMATIC ANALYSIS

2.2.1 This test is not compulsory, but should be carried out, as required. It applies to weapons with an automatic or semi-automatic fire capability.

2.2.2 Kinematic analysis is one of the basic techniques used in weapon design. It is, however, only required in particular circumstances, such as in design or development testing and in those instances where the cause of a malfunction cannot be established without use of this technique. High speed motion pictures of the weapon and its major components provide a qualitative description of weapon operations. Time-displacement measurements showing absolute and relative positions of various components are fundamental data obtained. Simultaneous with displacement-time measurements it is desirable and sometimes necessary to measure certain forces, strains and pressures in the weapon. Mechanical and electrical instruments are used as appropriate.

2.2.3 Small modifications to the test weapons are normally required to mount the test instrumentation and to facilitate viewing of the motion of the components.

2.3 SAFETY RECOMMENDATIONS

2.3.1 Overview

2.3.1.1 The overall goal of a system safety programme is to design systems that do not present hazards. However, the nature of most complex systems makes it impossible or impractical to design them to be completely hazard-free. In this case the aim must be to eliminate them or reduce the associated risks to an acceptable level. As hazard analyses are performed, hazards will be identified that will require resolution. System safety precedence defines the order to be followed for satisfying the system safety requirements and reducing risks. The alternatives for eliminating the specific hazard or controlling its associated risk will have to be evaluated so that an acceptable method for risk reduction can be agreed upon.

2.3.1.2 Information necessary to prepare a safety release recommendation is usually generated from the cumulative results of various sub-tests. A safety recommendation reflects engineering judgement, based upon a careful study of all safety features, manual and interlock types, such as those intended to prevent firing before the breech is locked, firing without the grenade tube (US M203 type) locked in place, or firing without the rifle grenade securely attached. Reports should be made of hazardous operation of manually-operated assemblies, such as feed covers, trigger, manual directing handles (barrel heat shields) or grips, etc. Observations of high pressure gas or particles emanating from the breech area in a direction that could be hazardous to the gunner or crew should be made. Other observations that should be recorded include case ejection direction that could be hazardous to the gunner or crew, insecure mounting (especially of the rifle grenade and tube attachments), failure of the sear resulting in a runaway gun condition or any other failure which results in a hazardous condition. There is also a need to consider noise, toxicity and blast over pressure.

2.3.1.3 Hazard identification, categorisation and corrective actions will need to proceed through design, development and testing of all development phases. Assessment of risk will be necessary in determining what corrective actions should be taken. Whatever level of hazard risk reduction is taken must be thoroughly justified in all cases.

2.3.2 Hazard Severity

2.3.2.1 Hazard severity categories are defined to provide a qualitative measurement of the worst credible mishap resulting from personnel error, environmental conditions, design inadequacies, procedural deficiencies, system or sub-system component failure or malfunction. The category descriptions are as follows in Table 2.1:

Table 2.1 HAZARD SEVERITY CATEGORIES

DESCRIPTION	CATEGORY	MISHAP DEFINITION
CATASTROPHIC	I	Death or system loss.
CRITICAL	II	Severe injury, severe occupational illness or major system damage.
MARGINAL	III	Minor injury, minor occupational illness or minor system damage.
NEGLIGIBLE	IV	Less than minor injury, occupational illness or system damage.

These hazard severity categories provide guidance to a wide variety of programmes. However, adaptation of a particular programme is generally required to provide a mutual understanding between the test sponsor and the contractors as to the meaning of the terms used in the category definitions. The adaptation must define what constitutes a system loss, major or minor system damage and severe or minor injury and occupational illness.

2.3.3 Hazard Probability

2.3.3.1 The probability that a hazard will be created during the planned life expectancy of the system can be described in potential occurrences per unit of time, events, population, items or activity. Assigning a quantitative hazard probability to a potential design or procedural hazard is generally not possible early in the design process. A qualitative hazard probability may be derived from research, analysis and evaluation of historical safety data from similar systems. Supporting rationale for assigning a hazard probability shall be documented in hazard analysis reports. An example of a qualitative hazard probability ranking is listed below in Table 2.2:

Table 2.2 HAZARD PROBABILITY

DESCRIPTION *	LEVEL	SPECIFIC INDIVIDUAL ITEM	FLEET OR INVENTORY **
FREQUENT	A	Likely to occur frequently	Continuously experienced
PROBABLE	B	Will occur several times in the life	Will occur frequently
OCCASIONAL	C	Likely to occur sometime in the life	Will occur several times
REMOTE	D	Unlikely, but possible to occur in life of an item	Unlikely, but can reasonably be expected to occur
IMPROBABLE	E	So unlikely it can be assumed that the occurrence may not be experienced	Unlikely to occur, but possible

* Definitions of descriptive words may have to be modified, based on quantity involved.
** The size of the fleet or inventory should be defined.

2.3.3.2 Action shall be taken to eliminate identified hazards or reduce the associated risk. CATASTROPHIC and CRITICAL hazards shall be eliminated, or their associated risk reduced to a level acceptable to the test sponsor. If this is impossible or impractical, alternatives shall be recommended to the test sponsor.

2.3.4 Risk Assessment

2.3.4.1 To determine what actions to take to correct identified hazards a system of determining the level of risk involved must be developed. A good risk assessment model will enable decision makers to properly understand the amount of risk involved relative to what it will cost in time and money to reduce the risk to an acceptable level.

2.3.4.2 To eliminate as many hazards as possible it is necessary to prioritise hazards for corrective action. A categorisation of hazards may be conducted according to risk level criteria. Categorisation may be based on severity, since not all hazards are of equal magnitude or criticality to personnel safety and mission success. In some cases the anticipated consequences of hazardous events may be minimal, whilst in others it may be catastrophic. Hazard categorisation may also involve the determination of the likelihood of the hazardous event actually occurring. This may be reported in non-numeric (quantitative) terms, such as once in ten thousand flights, or 1×10^{-4}/flight. Priority order may be accomplished either subjectively, by qualitative analyses resulting in a comparative hazard risk assessment, or through quantification or the probability of occurrence resulting in a numeric priority factor for that hazardous condition. Tables 2.3 and 2.4 show two sample matrices for hazard risk assessment, which can be applied to provide qualitative priority factors to assigning corrective action. In the first matrix an identified hazard assigned a hazard risk of 1A, 1B, 1C, 2A, 2B or 3A might require immediate corrective action. A hazard risk index of 1D, 2C, 2D, 3B or 3C would be tracked for possible corrective action. A hazard risk index of 1E, 2E, 3D or 3E might have a lower priority for corrective action and may not warrant any tracking actions. In the second matrix, risk indices of 1 to 20 (1 being the highest risk) are assigned somewhat arbitrarily. This matrix design assigns a different index to each frequency-category pair, thus avoiding the situation caused by creating indices as products of numbers assigned to frequency and category, which causes common results such as 2 x 6 = 3 x 4 = 4 x 3. This situation hides information pertinent to prioritisation. These are only examples of a risk assessment method and do not fit all programmes.

TABLE 2.3 FIRST EXAMPLE - HAZARD RISK ASSESSMENT MATRIX

	HAZARD	CATEGORI ES		
FREQUENCY OF OCCURRENCE	I CATASTROPHIC	II CRITICAL	III MARGINAL	IV NEGLIGIBLE
(A) FREQUENT	1A	2A	3A	4A
(B) PROBABLE	1B	2B	3B	4B
(C) OCCASIONAL	1C	2C	3C	4C
(D) REMOTE	1D	2D	3D	4D
(E) IMPROBABLE	1E	2E	3E	4E

HAZARD RISK INDEX SUGGESTED CRITERIA

1A,1B, 1C, 2A, 2B, 3A Unacceptable
1D, 2C, 2D, 3B, 3C Undesirable (Test sponsor decision required)
1E, 2E, 3D, 3E, 4A, 4B Acceptable with review by Test Sponsor
4C, 4D, 4E Acceptable without review

TABLE 2.4 SECOND EXAMPLE - HAZARD RISK ASSESSMENT MATRIX

HAZARD CATEGORIES				
FREQUENCY OF OCCURRENCE	I CATASTROPHIC	II CRITICAL	III MARGINAL	IV NEGLIGIBLE
(A) FREQUENT	1	3	7	13
(B) PROBABLE	2	5	9	16
(C) OCCASIONAL	4	6	11	18
(D) REMOTE	8	10	14	19
(E) IMPROBABLE	12	15	17	20

HAZARD RISK INDEX SUGGESTED CRITERIA

1 - 5 Unacceptable
6 - 9 Undesirable (Test sponsor decision required)
10 - 17 Acceptable with review by Test Sponsor
18 - 20 Acceptable without review

2.3.5 Mechanical and Implied Safety

2.3.5.1 Testing shall comply with Section 2.10.

2.3.6 Feed System Safety

2.3.6.1 If the weapon employs a magazine or belt feed, conduct a safety check to determine the hazard, if any, of double feeding. Examine the types of ammunition (projectile configuration) supplied for design safety. Evaluate the variations in feeding angles induced by different projectile configurations. A check should be made to determine whether there is a risk of the nose of a round in the feed system hitting the primer of a chambered round. If so, conduct at least 10 trials with each type of cartridge striking a chambered primed case (in lieu of a live round) by initiating a normal feeding cycle.

Note: In the case of 40mm high velocity grenade rounds (e.g. US M430A1 etc.) do not use primed cases with propellant in the high pressure chamber.

2.3.7 Rifle Grenade Safety

2.3.7.1 For muzzle-launched grenades determine the safety effects of:

- Firing a mis-positioned grenade
- Firing with a grenade using the wrong launching cartridge
- Firing a burst : determine if the rifle can function (fully/semi-automatic) if the first round is used to launch a grenade

2.4 ACCURACY AND DISPERSION

2.4.1 Object: General

a. To evaluate the inherent accuracy and dispersion and velocity characteristics of the weapons when fired semi-automatically (with controlled bursts) and automatically at ranges of 100m (or sometimes less) out to the maximum operational range.

b. To evaluate the inherent accuracy of the aiming system graduation.

c. To evaluate, in the case of rifle attached grenade launchers, mutually harmful effects on dispersion or alignment and security of attachments.

Military tests will include the evaluation of the accuracy and dispersion of the weapons when employed in combat conditions.

2.4.2 Method: Point Target Weapons

2.4.2.1 Firings are to be carried out on white targets at least 2 metres square, with an aiming mark at their centre (represented by a black upper semi-circle, the radius of which equals 1/1000th the firing distance [range]).

2.4.2.2 Automatic targets may be used, if they are approved by NATO. These work on an optical or acoustic basis, to give the x and y coordinates automatically, including for short and extended burst firing and can be used on line, with a central data collecting and processing station. Such targets offer a time and cost saving for all accuracy firing and are indispensable for extended burst firing.

2.4.2.3 Three skilled and trained marksmen will fire point target weapons from the shoulder using the weapon's own rest (bipod or tripod, if the weapon is so equipped), in the prescribed positions for use. When the weapon is not fitted with a rest, a bench rest (see 2.4.2.7) will be used. For the purpose of comparison with other weapons of the same type, single shot firing may be carried out from a suitable machine rest [accuracy fixture] if the weapon is fitted with specific fixing points. It is not advisable to fire weapons which are normally fired hand held from an accuracy mount. At ranges of 300m and beyond, the cross range wind velocity must not exceed 1.5 m per second. Ideally, where possible, firings should be carried out in a tunnel protected from wind. Similar test conditions, where applicable, shall be used for area target weapons.

2.4.2.4 Firing from standing, kneeling and sitting positions may be conducted in all phases, when deemed necessary.

2.4.2.5 Detailed test planning must cover the following aspects :

- Lighting of targets and firing position :
- Selection of firers :
- Zeroing :
- Temperature :
- Sequence of firing on some random selection system :
- Firers not learning where they are hitting (and then trying to correct their aim) :
- Rejection criteria if few hits are achieved at a certain distance.

2.4.2.6 Firings are to be carried out in the semi-automatic, controlled burst and fully automatic modes of firing, as appropriate to the weapon under test. Details of the firings to be carried out are shown in Table 2.5.

2.4.2.7 A bench rest is a table, with a seat, providing support for an extended arm and elbows : use of this facility minimises round to round variation when used by a skilled shooter.

2.4.2.8 Machine rests are usually designed for specific weapons and come in two main forms :

- Targetting jack ; weapon is pneumatically clamped at the butt. The forestock is suitably modified, if necessary, and rests on a rotatable spool. A dual coil springing arrangement absorbs the recoil of the weapon after each shot, controlling weapon movement along the bore axis only.

- Accuracy cradle ; weapon butt is supported at the rear, top, bottom and sides. The forestock is supported and a downward force is applied at the sling swivel. The cradle rests in a “V” block and is repositioned manually after each shot

2.4.2.9 The prone position is a lying position with no support other than, where specified, a sling or a bipod.

Table 2.5 ACCURACY AND DISPERSION FIRINGS - POINT TARGET WEAPONS

	Semi-Automatic Mode	Controlled Burst Mode	Fully Automatic Mode
Position	See Notes [1], [2]	See Note [2], [4]	See Note [2]
Firing Ranges	See Note [3]	See Note [3]	See Note [3]
Firing Regimes	3 x 10 round groups	3 x 30 round firings (in 3 round controlled bursts) See Note [5]	3 x 10 round continuous bursts
Data Collection	See Note [6]	See Notes [6], [7]	See Note [6]
Derived Data	See Note [8]	See Note [8]	See Note [8]

Notes:

[1] From the weapon's own rest or mount

[2] From the prone position (with all possible configurations of the weapon, using the bipod, sling [individual and light support weapons], tripod or other [e.g. vehicle] mounting [medium and heavy support weapons]. Where appropriate, firing will also be carried out from a machine rest (stand).

[3] At 100, 200, 300m and upwards by increments of 200m until the maximum operational range of the weapon is reached. Results are to be studied for evidence of a linear dispersion range (the range beyond which dispersion ceases to be linear). This range to be recorded if it is reached within the maximum operational range of the weapon.

[4] For Individual Weapons, firings to be repeated from the standing position at ranges of 25, 50, 100 and 150m.

[5] Magazines or belts pre-loaded with at least three rounds are to be used for weapons that do not have a controlled burst device.

[6] Measure and record X and Y coordinates for all hits, ideally in order of firing. Careful consideration should be given to : the method coordinates are entered into the computing system ; the group (hit pattern) data reference coding used [for example, that shown in Section 2.4.5.], the media used for recording the data for subsequent analysis.

[7] Particular emphasis should be given to recording the first round of the burst, so that mean point of impact for each controlled burst and the spread of rounds within the burst can be calculated.

[8] The following data are to be derived from the firing results, using the formulae given in Section 2.4.4. Mean Point of Impact; Spread (horizontal/vertical and extreme); Variance; Standard Deviation; Spread Ellipse (90%); Correlation Coefficient; Mean Value of j-mpi-s; "Consistency", "Accuracy"; "Characteristic Values" (Precision).

2.4.3 Method: Area Target Weapons

2.4.3.1 To select weapons for the accuracy and dispersion tests a dispersion and velocity test should be conducted. This test should be conducted when the weapons are in a new condition. Four 10-round groups are fired from each launcher, using inert projectiles, at a vertical target 50 metres away (100 metres, if required). If the launcher is capable of more than one mode of fire, repeat the firing in each mode. Hand-held weapons should be fired from a rest, other weapons from their mounts (tripod, bipod, etc.). Horizontal and vertical dispersions should be measured on all targets. From this data, select the best, worst and average weapons for the accuracy-dispersion test. Measure the velocities of the projectiles 3 metres from the muzzle. All rounds to be fired in the velocity tests are to be conditioned at 21°C +/- 2°C for at least four hours before firing. If necessary, conduct a separate 30-round velocity test.

2.4.3.2 For crew-served and independent grenade launchers the weapons selected from the dispersion and velocity test should be used. Requirements for specific weapons may dictate that certain parts of the test be repeated at the mid-point and end of the gun life. At least 4 groups of 10 grenades will be fired for each firing mode, type of ammunition and range (minimum, mean and maximum) specified or required for each weapon. Velocity should be measured at 3 metres to assure the quality of the rounds. A horizontal target will be used so that an impact against the ground will result. The point of aim is to be determined by a boresight reading, test mount sight, or with the gun sights, if provided. The weapon will be re-aimed after each grenade or group of grenades, wherever possible. Firings are to be conducted from a rest or the weapon's own mount. Wind velocity during the firings should be no greater than 4.5 m/s for ranges up to and including 200m and no greater than 2.25 m/s for ranges above 200m.

2.4.3.3 For rifle attached grenade launchers three previously selected grenade launchers and three rifles will be tested firing from a bench rest or other support. An expert marksman will zero the rifles at 100m range on a vertical target and will record the sight settings for each. Three groups of 10 cartridges will then be fired from each rifle. The grenade launchers will then be attached and a further 3 groups of 10 cartridges will be fired under the same conditions (for permanently attached launchers this step should be omitted). Three groups of 10 grenades will then be fired from each grenade launcher at a vertical target at a range of 50m. Three groups of 10 cartridges will then be fired from the rifle under the same conditions as perviously. Subsequent firings will be as specified for the crew-served and independent grenade launchers.

2.4.3.4 For rifle grenade launchers, fire a 5-grenade adjustment in flat trajectory fire with each weapon, on an appropriate mount. Next, fire a 5-grenade group at a vertical target measuring at least 1.8m x 1.8m at a range of at least 50m. Measure and record the x and y impact coordinates, if possible in order of arrival and the semi-rectangle of dispersion H + L. Next, fire a group of at least 10 of any anti-armour grenades, at battle elevation, from the prone position, using a rest, at ranges of 25, 50 and 80m, at a fixed target at a NATO standard 2.3m x 2.3m target and at a target measuring 2.3m x 4.6m moving across at a speed of 5m/s. The number of hits is to be recorded. Next, fire a group of at least 40 anti-personnel grenades from a kneeling position at a horizontal target at three ranges (maximum, mean and minimum). The x and y coordinates will be noted and the semi-rectangle of dispersion H + L will be determined. If possible, these tests are to be conducted with grenade dischargers manufactured to minimum, mean and maximum tolerances. Rounds fired for accuracy and dispersion may be taken into account for the endurance test. Automatic target systems may be used.

2.4.3.5 The x and y co-ordinates of every grenade will be noted (if possible in the order of arrival of the grenades). The following data will be derived from the firing results ;

- Standard deviation for range and direction
- Dispersion for range and direction
- Mean radius, if relevant, and deviation between mean point of impact and the aiming point

The formulae to be used for these calculations are given in Section 2.4.4.

2.4.4 Calculation of Results

The mathematical formulae for use, as appropriate, for the calculation of results are given in the following sections.

2.4.4.1 Mean Point of Impact (MPI)

Vertical : $\overline{y} = \frac{1}{n}\sum_{i=1}^{n} y_i$

$i = 1 \ldots 10$

Horizontal : $\overline{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$

2.4.4.2 Spread

Vertical : $\left|Y_{max} - Y_{min}\right|$, Lateral: $\left|X_{max} - X_{min}\right|$

Extreme :

2.4.4.3 Variance

Vertical : $S_y^2 = \frac{1}{n-1}\sum_{i=1}^{n} (y_i - \overline{y})^2$

Horizontal : $S_x^2 = \frac{1}{n-1}\sum_{i=1}^{n} (x_i - \overline{x})^2$

2.4.4.4 Standard Deviation (SD)

Vertical : $s_y = \sqrt{S_y^2}$

Horizontal : $s_x = \sqrt{S_x^2}$

2.4.4.5 Spread Ellipse
(90% spread, statistical independence of measured values)

Semi-axis : $a = kS_y$, $b=kS_x$, when $k = 4,6052$

Area : $A=ab\pi$

2.4.4.6 Correlation Coefficient:

$$c = \frac{S_{xy}}{S_x S_y}, \text{when } S_{xy} = \frac{1}{n-1}\sum_{i=1}^{n} (x_i - \overline{x})(y_i - \overline{y})$$

Evaluation of the "characteristic values" off a system by summarising hit patterns as special calculation.
(For example, every firer shoots 3 hit patterns m=3, j=1...m)

2.4.4.7 Mean value of j-mpi-s

$$\overline{\overline{x}} = \frac{1}{m}\sum_{j=1}^{m} \overline{x}_j \ , \ \overline{\overline{y}} = \frac{1}{m}\sum_{j=1}^{m} \overline{y}_j$$

2.4.4.8 "Consistency"

$$S_c^2(x) = \frac{\sum_{j=1}^{m}\sum_{i=1}^{n}(x_{ij}-\overline{x}_j)^2}{m.n}, S_c^2(y) = \frac{\sum_{j=1}^{m}\sum_{i=1}^{n}(y_{ij}-\overline{y}_j)^2}{m.n}$$

i =1…n=10

2.4.4.9 "Accuracy"

$$S_a^2(x) = \frac{1}{m-1}\sum_{j=1}^{m} (\overline{x}_j - \overline{\overline{x}})^2, S_a^2(y) = \frac{1}{m-1}\sum_{j=1}^{m} (\overline{y}_j - \overline{\overline{y}})^2$$

2.4.4.10 "Characterisation values" (Precision)

$$S^2(x) = S_a^2(x) + S_c^2(x), S^2(y) = S_a^2(y) + S_c^2(y)$$

S(x), S(y)

2.4.5 Example of Group Hit Pattern Data Reference Code

2.4.5.1. Abbreviations

• Ammunition	Ball ammunition	B
	Tracer ammunition	T
• Type of Fire	10 rounds single shot	SS
	10 bursts each of 3 rounds	BU
	10 rounds automatic	AU
• Weapon	A, B, C, D, E, F, G, H, J, K, L, M with the weapon reference number	
• Firing distance (range)	The firing distance (range) will be entered in figures in full	
• Firing position	Sitting at bench rest	SB
	Prone supported	PP
	Prone using bipod	PB
	Standing unsupported	SU
• Firer	Figure 1, 2, 3, 4, 5 or 6	
• Group (Hit pattern Number)	Figure 1, 2 or 3	

2.4.5.2. Example of Data Reference Code

B - BU - D15 - 300 - PB - 4 - 2

- 2: Second Group (Hit Pattern)
- 4: Firer 4
- PB: Firing position : Prone using bipod
- 300: Firing distance (range) : 300m
- D15: Weapon system D : Weapon No. D15
- BU: Type of fire : 10 bursts, each of 3 rounds
- B: Ball Ammunition

2.5 ENDURANCE

2.5.1 Object

2.5.1.1 To determine the functioning and endurance performance of the weapon and behaviour and serviceability of all parts. To investigate the nature of malfunctions, faulty operation and deterioration in performance occurring during the firing of large numbers of rounds and to obtain information on reliability, the level of maintenance and the human factor.

2.5.1.2 When specific parts are under study, the tests will continue only long enough to determine their useful life.

2.5.1.3 The number of rounds fired are based on current weapon systems. Test sponsors may have specific endurance requirements other than those specified. The number of rounds specified to be fired for crew served, individual and rifle grenade launchers are to be used as a guide for establishing endurance requirements for testing other weapons of these types.

2.5.2 Method: General Requirements

2.5.2.1 Weapon systems are to be cleaned and lubricated before the test and firing will be conducted without further maintenance or lubrication unless otherwise specified in the detailed testing procedure or if this becomes necessary owing to a deterioration in performance. In the latter case further lubrication should be carried out to compensate for the deterioration. If this does not suffice, the weapon system should be disassembled, cleaned and lubricated before being fired again. This maintenance should then be repeated at regular intervals for the duration of the test.

2.5.2.2 For point target weapons, in addition to the firings at least 6000 manipulations of each test weapon, unloaded, shall be carried out, with firing pin movement or electric initiation action. Any malfunction or broken parts shall be noted.

2.5.2.3 For point target weapons, firings should normally be of the mix of natures (types of ammunition) used in the field, but could be of those natures giving most barrel wear.

2.5.3 Method: Individual Weapon and Light Support Weapon

2.5.3.1 Each weapon will fire a minimum of 6000 rounds (Individual Weapon) or 10000 rounds (Light Support Weapon), unless otherwise specified in the test plan. 1400 of these rounds will be fired in 100 round serials, as specified in paragraph. 2.5.3.10.c below.

2.5.3.2 Firings should be carried out without barrel change, unless the manufacturer states that this is not feasible, or the requirement is purely for a weapon with a changeable barrel, or preliminary firings indicate endurance firing without barrel change to be impracticable. In any of these circumstances, firing with barrel change will be allowed, but with a clear note being made of this in the test report.

2.5.3.3 The weapon and barrels are to be forced air-cooled such that the barrel shall be cool enough to allow it to be grasped with a bare hand.
Weapons are to fire 1000 rounds without additional lubrication, which will only be done when operation has become less efficient.

2.5.3.4 All types of firing (single shot, semi-automatic, automatic (controlled and free bursts) are to be used; in the semi-automatic firing the rate of fire will be at least 15 rounds per minute and in free bursts, the manufacturer's minimum recommended rate of fire for satisfactory functioning shall be used.

2.5.3.5 The durability and performance of all parts is to be recorded. Parts are to be replaced when they become unserviceable, with a clear note being made of this in the test report.

2.5.3.6 The usual failure criteria will be whichever occurs first of; a drop in velocity exceeding 5%, an enlargement of the group size by a per-determined amount, or a situation where 20% of rounds exhibit yaw exceeding 15^{o}, may be used as a guide in establishing acceptance criteria.

2.5.3.7 Tests should only be conducted when the ambient temperature is within the range of 21 ± 4 ^{o}C.

2.5.3.8 Decoppering should only be carried out during the disassembly and cleaning phases only when the build-up of copper begins to adversely affect the weapon's performance, with a clear note being made of this in the test report.

2.5.3.9 The characteristics of the ammunition used are to be specified in the test report.

2.5.3.10 The procedure to be used for the tests is as follows:

a. Disassemble, clean thoroughly and reassemble at least three test weapons. Record headspace and barrel bore measurements for each weapon.

b. Fire the necessary number of rounds with each test weapon to verify velocity, accuracy (at 100m), yaw (at 25m and 100m range), also firing pin energy (if a reliable method of doing this is available) and record bore and headspace measurements.

c. Fire the prescribed number of rounds for the type of weapon from each test weapon, in 100 round series, as described below. The prescribed total includes 1400 rounds fired in alternated 100 round serials, as shown below in Table 2.6.

Table 2.6 WEAPON ORIENTATIONS

Mode of Fire (100 rounds each)	Held in the Hand	Weapon Attitude
A, B	Prone Supported	Horizontal
A , B	Hand Held (without support)	Horizontal
A , B	Right side up	Horizontal
A , B	Left side up	Horizontal
A , B	Supported	Elevated +80^o
A , B	Hand Held (without support)	Elevated +80^o
A , B	Supported	Depressed -80^o
A , B	Hand Held (without support)	Depressed -80^o
A = as specified in (1) below B = automatic		

(1) Fire all rounds in 100 round serials as specified in the established requirements
Note : Weapons without semi-automatic fire capability are to be fired in three to five round bursts instead of the semi-automatic mode. Weapons without an automatic fire capability are to be fired in the semi-automatic mode only. Firing of a control weapon will be identical to that of the test weapon.

(2) Measure and record the cyclic rate for automatic fire.

(3) After every 800 rounds, whilst the barrel is hot, fire the number of rounds needed to check velocity, accuracy (at 100m) and yaw (at 25m). In addition, inspect, disassemble, clean and lubricate the whole mechanism, unless otherwise specified. Forced air cooling may be used to reduce the temperature, if required. Repeat the measurements of velocity, accuracy and yaw, with a cold barrel prior to firing the next 800 rounds.

(4) Record all malfunctions, breakages and replacement of parts.

(5) After carrying out the specified number of firings for the weapon type, carry out the firings specified in 2.5.3.10.b with a cold barrel.

2.5.4 Medium and Heavy Support Weapons

2.5.4.1 Unless otherwise specified, each of the three test weapons should fire at least 25000 rounds, in accordance with the basic outline firing schedule given in para.2.5.4.6.

2.5.4.2 Weapons are to be fired from a bipod, tripod and / or any other suitable mechanical mount representing the support weapon's mount in service (such as a vehicle mounting for a vehicle-mounted weapon, etc.).

2.5.4.3 Initially, 200 rounds are to be fired from each endurance and reliability test weapon, using each specified bipod, tripod or other mechanical mount, to record the rate of fire and to observe whether there are any obvious problems in operation. If a major problem in operation arises during these firings, or during subsequent firings, a kinematic investigation is to be carried out. (see Section 2.2).

2.5.4.4 After the 200 rounds have been fired from each rest or mount involved, each weapon is to be subjected to the firings described below until 25000 rounds have been fired from each weapon. Where the weapon has more than one rest or mount (vehicle mounting, etc.), then the rest or mount shall be changed every 5000 rounds. In all instances, the largest number of rounds shall be fired from the rest or mount which earlier firings have shown to be the one most likely to affect functioning critically, or cause unacceptable wear or breakage of components (this will probably be the most rigid mount). Thus, for a support weapon which could be fired from both a vehicle mounting and a ground rest (bipod / tripod), with the vehicle mounting more likely to affect functioning critically, the sequence could be :

Mount representing vehicle mount	5000 rounds
Ground rest / bipod / tripod	5000 rounds
Mount representing vehicle mount	5000 rounds
Ground rest / bipod / tripod	5000 rounds
Mount representing vehicle mount	5000 rounds

2.5.4.5 For operational information on functioning during the ground mount phases, the test plan should include:

a. Firing at extreme left and right tilt, with maximum elevation and maximum depression.

b. Firing with and without the mount sandbagged; also firing from sandy, grassy and hard (tarmac, stone, concrete) surfaces.

2.5.4.6 During the tests two barrels per support weapon are to be used except for fixed barrel weapons). The barrels are to be changed after every 1000 rounds, the firing plan being arranged so that cook-off level will not be reached therefore allowing malfunctions to be safely evaluated. Each barrel will, therefore, fire at least 12500 rounds. Where necessary, some barrels can be fired until they are completely worn out.

2.5.4.7 The weapons are to be fired without additional lubrication and without cleaning (up to 5000 rounds). Extra lubrication is only to be carried out when there is degradation in performance. Initially, relubrication is to be carried out to correct functional defects (reduction in the rate of fire, or jamming) ; if this fails to restore satisfactory performance then disassembly, cleaning, inspection and relubrication are to be carried out before firing begins again. These intervals for lubrication and maintenance are then to be applied throughout the remainder of the firings in this sub test.

2.5.4.8 The endurance Firing Schedule is specified below in 2.7 below:

Table 2.7 FIRING SCHEDULE - ENDURANCE

Stages	No. of Rounds	Feed (a)	Firing Schedule (b), (c)
1	1000	Left	1, 2, 3, 4, 5
2	1000	Right	1, 2, 3, 4, 5
3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25	Repeat Stage 1	Repeat Stage 1	
4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24	Repeat Stage 2	Repeat Stage 1	

a. Alternative left and right hand feeding only if applicable

b. Use the firing schedules in numerical order for each stage, firing 200 rounds per schedule (these schedules may be adapted to suit specification)

c. Firing schedules :

(1) 1 round every 3 seconds
(2) 5-round burst every 3 seconds
(3) 50 rounds in small bursts at a rate of 85 rounds per minute
(4) 50-round burst every 30 seconds
(5) Continuous fire

Note: Malfunctions, life of parts, lubrication, cleaning and rates of fire (where applicable) are to be recorded throughout the firings.

d. All checks planned for the individual weapon (velocity, accuracy, yaw [hot and cold barrels], firing pin energy and the recording of measurements (headspace, bore) on cold barrels are to be done at the beginning and end of each firing cycle and every 5000 rounds.

2.5.4.9 Measurements to be Made

Note: The number of rounds required for measurement purposes will be additional to the rounds fired in the Endurance series themselves.

a. General The ambient test temperature is to be measured throughout the duration of the test.
b. Measurements with Hot Barrel After the last shot of each firing cycle has been fired, the following measurements are to be taken at the times shown:

(1) 30 seconds afterwards:
Firing a 20-round burst, measurements to be made of velocity (at 10m), cyclic rate of fire and yaw (the yaw card being set up at a distance of 25m).

(2) 70 seconds afterwards: Firing 10 rounds single shot to establish accuracy at 100m.

c. Measurements with a Cold Barrel Before the start of each firing series, the measurements required in paragraph. 2.5.4.9 (b) are to be obtained, but without any time limits. In addition, barrel bore, firing pin protrusion and cartridge headspace are to be measured.

d. Weapon Inspection Following the measurements with a hot barrel the weapon is to be disassembled, cleaned and visually checked for any damage. Before reassembly of the weapon all parts are to be lubricated as recommend by the manufacturer.

e. Measurements to be Recorded The following measurements are to be made after completion of the full Endurance Test (i.e. firing of the required number of rounds specified for the weapon type:

(1) The measurements required in (c) and (d) above
(2) Weapon inspection measurements:
- Barrel bore
- Firing pin protrusion
- Headspace (not applicable to caseless ammunition)
- Trigger pull
- Cocking effort
- Plastic cast of chamber and lead
- Magnetic particle inspection of most important component groups, such as receiver, barrel, bolt
- Visual check of important springs
- Unstressed length of springs important to weapon functioning

2.5.4.10 Results to be Recorded

a. Firing record in which the following details are to be included :

(1) Malfunctions (see Annex M)

(2) Stoppages due to component breakage

(3) Necessary replacement of parts

(4) Other occurrences

b. Bore measurements in graphic and tabular form

c. Results of the weapon inspection measurements compared with the results obtained in Section.2.1

d. Results of measurements of muzzle velocity, cyclic rate of fire and yaw for each series, with separate listing of results with hot and cold barrels

e. Results of accuracy firings

2.5.5 Individual Grenade Launcher Independent System

2.5.5.1 Three launchers to fire 1000 rounds each (2500 rounds for semi / fully auto). Rounds previously fired for dispersion and velocity may be counted as part of the total rounds fired. Because launchers will normally have been cleaned and lubricated before testing, weapons are to be fired without additional lubrication or maintenance until required due to degradation in performance (rate reduction or malfunction). Initially, only relubrication is to be applied to attempt to restore performance. If this fails, disassemble, clean, inspect and lubricate before resuming firing. Apply these lubrication intervals throughout the remaining firing in this subtest.

2.5.5.2 After each 250 rounds fired, or after each maintenance interval, whichever is most applicable, conduct Non-Destructive Testing (NDT) inspections of weapon components subjected to high stress during firing. At the same intervals, record the following suggested measurements and any others required for control :

a. Firing pin protrusion
b. Headspace
c. Firing pin indent
d. Force and stroke required to manually operate the trigger
e. Charging (cocking) force
f. Force / displacement curves for all springs, within the design operating range (if specified in the guidance documents)
g. Barrel bore measurements
h. Muzzle velocity (a loss of 6% of the original could indicate a worn out barrel)

2.5.5.3 After each 250 rounds record the degradation in dispersion and velocity performance of the test launchers, using the data from paragraph.2.4.3.1 for the criteria.

2.5.5.4 If the launcher can be fired both semi and fully automatically, fire 100 round cycles, alternating semi-automatic, short burst and fully automatic modes of fire.

2.5.5.5 If the launcher can only be fired single shot or semi-automatically, fire in 100 round cycles, employing a rate of fire applicable to the weapon design.

2.5.6 Individual Grenade Launcher, Attachment Type

2.5.6.1 Three launchers are to be used, each launcher is to fire 1000 rounds. The rounds previously fired for dispersion and velocity may be counted as part of the total rounds fired. Because launchers will normally have been cleaned and lubricated before testing, weapons are to be fired without additional lubrication or maintenance until required due to degradation in performance (rate reduction or malfunction). Initially, only relubrication is to be applied to attempt to restore performance. If this fails, disassemble, clean, inspect and lubricate before resuming firing. Apply these lubrication intervals throughout the remaining firing in this subtest.

2.5.6.2 At the beginning of the cycle, fire the launcher and weapon to which it is attached alternately. If the parent weapon only fires automatically, fire 60 rounds in 2 or 3 round bursts.

2.5.6.3 Fire 20 rounds from the launcher, with the parent weapon fully loaded , with the safety set to "off". Do not attempt to fire the parent weapon until 20 rounds have been fired from the launcher, then fire 20 rounds from the parent weapon.

2.5.6.4 Fire an additional 230 rounds from the launcher, at convenient rate.

2.5.6.5 After 250 rounds fired, or after each maintenance interval, whichever is most applicable, conduct NDT inspections of weapon components subjected to high stress during firing. At the same intervals, record the following suggested measurements and any others required for control:

a. Firing pin protrusion.
b. Headspace.
c. Firing pin indent.
d. Force and stroke required to manually operate the trigger.
e. Charging (cocking) force.
f. Force / displacement curves for all springs, within the design operating range (if specified in the guidance documents).
g. Barrel bore measurements.
h. Muzzle velocity (a loss of 6% of the original could indicate a worn out barrel).

2.5.6.6 After each 500 rounds record the degradation in dispersion and velocity performance of the test launchers, using the data from paragraph.2.4.3.1 for the criteria.

2.5.6.7 If the launcher can be fired both semi and fully automatically, fire 100 round cycles, alternating semi-automatic, short burst and fully automatic modes of fire.

2.5.6.8 If the launcher can only be fired single shot or semi-automatically, fire in 100 round cycles, employing a rate of fire applicable to the weapon design.

2.5.7 Crew Served Grenade Launchers

2.5.7.1 Three launchers are to be used, each launcher is to fire 25000 rounds. The rounds previously fired for dispersion and velocity may be counted as part of the total rounds fired. Because launchers will normally have been cleaned and lubricated before testing, weapons are to be fired without additional lubrication or maintenance until required due to degradation in performance (rate reduction or malfunction). Initially, only relubrication is to be applied to attempt to restore performance. If this fails, disassemble, clean, inspect and lubricate before resuming firing. Apply these lubrication intervals throughout the remaining firing in this subtest.

2.5.7.2 After each 250 rounds fired, or after each maintenance interval, whichever is most applicable, conduct NDT inspections of weapon components subjected to high stress during firing. At the same intervals, record the following suggested measurements and any others required for control :

a. Firing pin protrusion.
b. Headspace.
c. Firing pin indent.
d. Force and stroke required to manually operate the trigger.
e. Charging (cocking) force.
f. Force / displacement curves for all springs, within the design operating range (if specified in the guidance documents).
g. Barrel bore measurements.
h. Muzzle velocity (a loss of 6% of the original could indicate a worn out barrel).

2.5.7.3 After each 1000 rounds record the degradation in dispersion and velocity performance of the test launchers, using the data from paragraph 2.4.3.1 for the criteria.

2.5.7.4 If the launcher can be fired both semi and fully automatically, fire 100 round cycles, alternating semi-automatic, short burst and fully automatic modes of fire.

2.5.7.5 If the launcher can only be fired single shot or semi-automatically, fire in 100 round cycles, employing a rate of fire applicable to the weapon design.

2.5.7.6 Function firings with the weapon on a mount will include extreme left and right deflection and maximum elevation and depression. Firings from a ground mount are to include :

- Mount sandbagged
- Mount not sandbagged
- Mount on sand
- Mount on soft ground
- Mount on hard ground (tarmac, concrete, etc.)

2.5.8 Rifle Grenades

2.5.8.1 For muzzle-launched grenades, fire the rifles for a total of 1000 rounds cartridges / grenades each. Non-destructive tests of key base weapon parts should be performed at 1, 5, 10, 50 and 100 rounds and thereafter at increments of 100 rounds. The wear on the launcher / flash suppressor should be checked at the same intervals.

2.5.8.2 A firing of at least 20 grenades should be carried out with the weapon at an angle giving maximum range, held in a flexible brace and supported by a duralumin (US 2024-T3) rest with 4cm of the butt plate in contact with the rest.

2.5.8.3 A firing of at least 400 grenades should be carried out with the weapon in the same position as in 2.5.8.2, but with the entire length of the butt plate in contact with the rest. Throughout the firing, all malfunctions, breakages of parts, distortion, etc. should be noted.

2.5.8.4 Initially and at each interval specified in 2.5.8.1 the launching rifle's accuracy and dispersion are to be assessed by firing three 10-round target groups with ball ammunition. In addition, after each interval, the cyclic rate of fire should be recorded.

2.5.8.5 The barrel should be examined during or after the endurance tests, in accordance with the methods described in Section 2.6.3.

2.6 BARREL EXAMINATION AND REPORTING PROCEDURES

2.6.1 Introduction

Normal weapon assessment will, as a matter of course, include barrel measurement and examination at various test stages as firing proceeds. A variety of methods are available and these are generally well known. It is, however, necessary to describe them so that all member countries may have a clear understanding of the proposed methods to enable the interpretation of barrel examination reports more readily.

2.6.2 Object

2.6.2.1 To determine the wear pattern in barrel bores as the assessment proceeds.

2.6.2.2 To relate the wear to the firing cycles completed by the weapon (this applies particularly to Section 2.5 - Endurance).

2.6.2.3 To report the wear condition, both in terms of measurement and, where necessary, by description, including photographs.

2.6.3 Method

2.6.3.1 Internal bore measurement - five methods are suggested. They are :

- Standard "running" plug gauges) for general
- Expanding head gauges) "everyday"
- Air gauging) application

Note: the above three techniques may be used either singly or in combination

- Adjustable probe gauge) for special applications
- Casts) as and when required

The principles employed in these methods are described below.

2.6.3.2 Standard "running" plug gauges: The bore is checked by the insertion of short plug gauges which are available in suitable small-diameter increments (typically 0.0127mm). The plug gauge is screwed to a rod which is graduated throughout its length to allow measurement of the distance of entry of the gauge into the bore. The method of application is ;

a. A suitable size of gauge is selected which will just pass through the bore freely.

b. The next size larger gauge is inserted into the bore at the breech end and its distance of entry is recorded. This is repeated until a "nil" reading is obtained.

c. The same procedure is repeated from the muzzle end of the barrel

Notes: In order to check the diameter of rifling grooves special "winged" plug gauges are occasionally used. These consist of a normal plug gauge, with a raised portion to engage the groove. Their application is limited since, owing to the number of dimensions involved, they can only be used to check that the dimensions are within drawing limits. The gauges are normally made up in sets of four, as follows ;

- Minimum diameter of plug with minimum diameter of groove
- Minimum diameter of plug with maximum diameter of groove
- Maximum diameter of plug with minimum diameter of groove
- Maximum diameter of plug with maximum diameter of groove

This method is not suitable for use with hot barrels

Plug gauges have a limited value in chromium plated bores, because the "lifting" of plating obstructs gauge intrusion

2.6.3.3 Air Gauging This principle is one which is widely employed. In this application the diameter of the bore will regulate the escape of air to the atmosphere, thus producing differing pressures within the equipment which can be used to provide a direct reading of the bore diameter. A probe is used, having an air jet control connected to a column of liquid (manometer) through a microvalve. The probe is passed down the bore. Any irregularities in the bore will move a stylus in the end of the probe, thereby affecting the airflow and the internal pressure, raising or lowering the column of liquid. The tube containing the column of liquid is graduated to give bore diameter readings to within 0.0127mm. The probe is graduated to give the position of the reading in the bore. The equipment is calibrated by means of a cylindrical check-piece and controlled adjustment of the height of the column of liquid.

The air gauging method is considered to be more accurate than the plugging method, with the additional advantage that it will detect local irregularities (with this type of gauge the microvalve can be replaced by a dial indicator).

2.6.3.4 Expanding Head Gauge This consists of a tube with a slotted head which is divided into three sections. A cone action opens or closes the gauging head and transmits the movement to a micrometer head at the other end of the tube, from which the bore diameter may be read. The gauge enables bores to be measured at any point to an accuracy of 0.0127mm.

2.6.3.5 Adjustable Probe Gauge The gauge consists of a tube with a deep-probing stylus at the end. It can measure the depth of local cavities. The stylus is connected to a rod, passing through the centre of the tube, which transmits movement to a dial indicator at the other end of the tube. The tube is graduated to indicate the position of the readings. The gauge is used where there is a requirement to measure deep erosion or cavitation.

2.6.3.6 Casts In instances where more detail of internal features such as width of grooves, radii, etc. is required, the full form of the bore and rifling may be checked by taking a cast. Shrinkage is allowed for by measuring the actual bore diameter and that as indicated by the cast. From the difference a correction factor can be determined that can be applied to any dimension measured on the cast.

2.6.3.7 Non-contact Capacitance Probe This is a very accurate method of measuring land and groove diameter and rifling profile. The method uses a probe in which electrodes are mounted. Measurements are made of the capacitance between the electrodes and the barrel. This capacitance measure is fed through signal amplifiers and a direct digital reading of the bore is given. This reading, if required, can be fed to a computer, where the bore profile can be displayed. Hard copy can be taken for future reference and the results stored on magnetic or other media. This method has an accuracy better than 10 micrometres.

2.6.4 Bore Examination and Photography

2.6.4.1 Visual Examination This is normally done with an "introscope" - a hollow tube containing a small electric light bulb, a reflector and a prism at the front end and an eyepiece giving a 2X magnification at the rear end. Straightness of bore may be checked qualitatively by the commonly used "shading" method, in which the shadow pattern in the bore, resulting from light broken by a straight bar, is examined by a skilled barrel viewer. Various instruments may be used to measure straightness, including a collimator. Another method is to use bore straightness plug gauges. This is not considered to be as reliable as the first two methods.

2.6.4.2 Internal Photography of Bores Owing to the small calibres involved, very little internal photography has been done. Possible methods include :

a. Camera plus introscope : the camera replaces the eyepiece, allowing photographs of limited areas of the bore to be obtained.

b. Photography of sectioned barrels : this is a useful method of illustrating and supporting reports. It can, of course, only be used on limited occasions, e.g. when a barrel has been "shot out" during endurance firings, or when a significant "event" has taken place within the barrel.

c. Photography from an external position : this is of limited value, but has been used to illustrate wear near the commencement of rifling. It is obvious that only short distances can be photographed and, even then, part of the barrel must generally be cut away.

d. Video recording using an introscope and television camera : this is a very useful method to inspect the whole of the bore of the barrel and record it on videotape. With the use of a soundtrack, additional data and observations can be made. For reporting purposes, a video printer can be used to give a hard copy of any appropriate video frame.

2.6.5 **Results to be Recorded** Results must be recorded in a particular manner to suit the method used. Typical abstracts from plug and air gauging records, showing examples of measurements and barrel bore condition, are shown below in Tables 2.8, 2.9, and 2.10.

Table 2.8 PLUG GAUGING

	Start of Test		After Cycle 1		After Cycle 2	
	Enters		Enters		Enters	
Plug Diameter mm	Breech mm	Muzzle mm	Breech mm	Muzzle mm	Breech mm	Muzzle mm
7.557	runs	runs	runs	runs	runs	runs
7.569	505	2.5	505 2.5		505 2.5	
7.582	470	nil	470	nil	350 1.3	
7.595	330		69		86	nil

Table continues until nil readings are obtained throughout, for increased plug diameters.

Table 2.9 BARREL CONDITION

Barrel bore condition	Chromium plated bore, condition good	Chromium plating Lifted on all lands and centre of grooves, from commencement of rifling for a distance of 38mm. Lifted for a distance of 25mm in front of gas hole.	Chromium plating Increase in areas of lifting, with some pitting from commencement of rifling, for a distance of 51mm. Lifted on top of lands as well as grooves, for a distance of 25mm in front of gas hole.

Table 2.10 AIR GAUGING

	Start of Test	After Cycle 1	After Cycle 2
Distance from Breech mm	Bore Diameter mm	Bore Diameter Mm	Bore Diameter mm
63.5	7.595	7.607	7.684
114	7.633	7.645	7.709

Table continues at 51mm intervals (distance from breech) until distance of 470mm

2.6.6 **Determination of Condemnation Limits** The barrel wear data will be correlated with the performances obtained during the endurance tests (Section 2.5) with the notice or gauges given by the manufacturer, with the object of determining the dimensions of the field intrusion gauges which will be used in service to check the serviceability of barrels.

2.7 POSITION DISCLOSING EFFECTS

2.7.1 Introduction

2.7.1.1 The requirement for a test of infra-red radiation, in addition to noise, flash, smoke and sand cloud has been considered. It is suggested , however, that since all small arms are likely to emit detectable infra-red radiation after roughly similar firing cycles, there is little point in arranging a test of this feature. Regarding noise, it is considered that, if noise is to be measured as a possible hazard (Section No.2.8.1), the results obtained will suffice for the dual requirements of hazard and position disclosing effects.

2.7.1.2 The tests for flash, smoke and sand cloud which follow are representative of the methods currently in use in various NATO countries. Whilst it may be considered that these tend to rely too much on subjective opinion or that, when more quantitative results are obtained, they do not fully correspond to the effects apparent to the human senses, it is considered that they will meet the requirement reasonably well. Other, more suitable, methods should remain under consideration as a future requirement.

2.7.1.3 Flash, smoke and sand cloud not only disclose the firer's position, but can also affect the sight picture, thereby reducing hit probability.

2.7.1.4 All the tests are also to be conducted with a control weapon and control ammunition. The ammunition used in the test weapon is to be the appropriate type for the weapon under test and a precise definition of its characteristics should be given.

2.7.2 Flash

2.7.2.1 Object To compare the flash of the test weapon with that of a nominated control weapon firing the various ammunition types representative of those in service.

2.7.2.2 Method The following methods are to be used:

a. Photographic measurement
b. Human observation

Note: Photographic methods currently used do not accurately represent the position disclosing effect apparent to the human eye.

2.7.2.3 Photographic Measurement The cumulative muzzle, breech and gas regulator flash occurring during the firing of 20 rounds is to be photographed using a suitable camera in a completely darkened range. The rounds are to be fired in continuous fire in bursts of 5 rounds at 10 second intervals. New and old barrels are to be fired, both hot and cold. Test and control weapons are to be similarly fired and photographed. Before the photography of the firing of cold barrels one round is to be fired to remove any traces of oil in the bore. Before the hot barrel tests, a heating cycle of 180 rounds is to be fired at a rate of 60 rpm (this cycle may be varied to suit the weapon and its role). The camera is to be positioned 1.4m from the line of fire. A scaled grid for the measurement of flash size is to be included in each photograph. This is to be established by photographing a grid board behind the gun muzzle prior to the flash firings. A shielded flash light is to be used to illuminate the front end of the barrel assembly so that it will show clearly in the photograph. Cumulative flash results should be accompanied, wherever possible, by observers' remarks on the variation of flash during the firings. Panchromatic film (400 ASA) should be used with the camera's aperture diaphragm set to f2.5. If possible, attempts should be made to determine the colour as well as the intensity of the flash. The layout of the equipment used for the 1977 -79 NATO Tests is shown in Figure 2.1 - Muzzle Flash Test Layout.

MUZZLE FLASH TEST LAY-OUT USED FOR
1977-79 NATO TESTS

Dispositif d'essai de lueur à la bouche
utilisé pour les essais OTAN 1977/1979

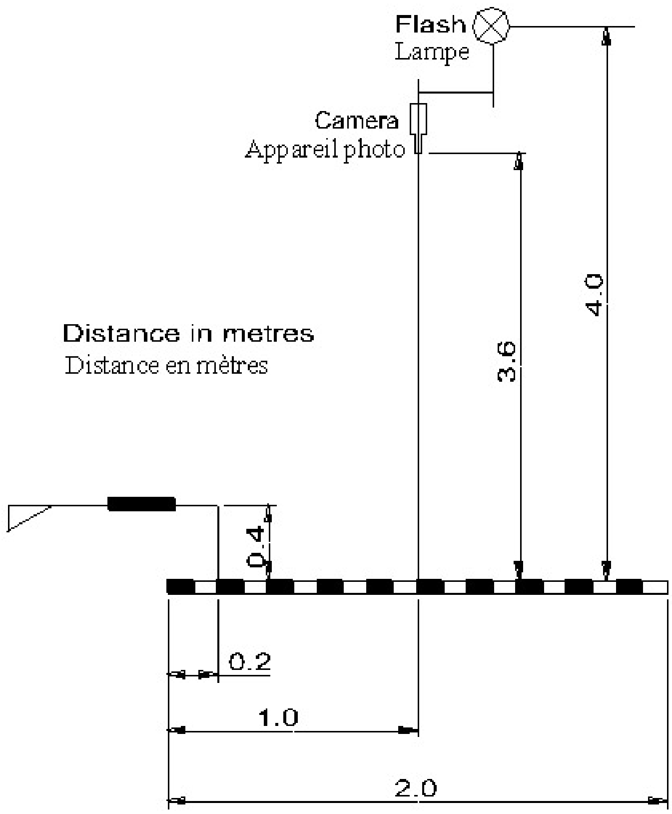

FIGURE 2.1

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2.7.2.4 Human Observation The test should be conducted by night with a maximum light level of 100 millilux on the ground.

a. Automatic Fire Observers should be placed in positions at angles of 30^o and 60^o to the line of fire at downrange distances of 50m, 100m, 200m and 300m. They should have good visual acuity and not be subject to colour blindness and should spend 20 minutes in darkness before commencement of the test, in order to become dark adapted. The test should then be conducted as follows :

(1) the control weapon and weapon under test are to fire, simultaneously, three bursts of ten rounds from new, cold barrels. This is to be repeated with the second control and test weapons

(2) the procedure in (1) should be repeated with new, hot barrels (heating cycle to be as defined for the photographic measurements - paragraph. 2.7.2.3)

(3) the procedure in (1) should be repeated with worn, cold barrels

(4) the procedure in (1) should be repeated with worn, hot barrels (heating cycle to be as defined for the photographic measurements - paragraph. 2.7.2.3)

b. Semi-Automatic Fire This test should only be fired if considered necessary. The test is to be the same as for automatic fire, except that the test and control weapons will each fire five single shots (or five "trigger pulls" if single shot firing is not possible) alternatively for each part of the test.

c. Recording of Results For each burst, or single shot, each observer should record whether the test weapon gave more or less flash than the control weapon.

2.7.2.5 Results and Assessment

a. Photographic measurement will serve to corroborate the subjective opinions of observers. This method should not outweigh, in cases of doubt, the results obtained by human observation.

b. The test weapon will be considered to have shown a significantly greater (or lesser) flash than the control weapon if ;

(1) human observation -the observer considers that the flash from the test weapon is significantly greater (or lesser) in at least 60 of the total flash observations made.

Note: The term "significantly greater" does not refer to a marginal difference, but to one which is clearly distinguishable.

(2) photographic measurement - the total cumulative flash areas on four of the photographs is more than 50% greater (or lesser) in the test weapon than the control weapon. This must be a provisional criterion, to be correlated with human observation in due course. Details are to be given in the test reports of the methods of photographic observation employed

(3) The test reports are to be accompanied by codes (to exclude mix-ups). An example of the code used in the 1977-79 NATO Tests is given at Figure 2.2.

(4) The following data should also be recorded:

(a) Number of rounds fired with the test barrel.
(b) Heating cycle.
(c) Ambient temperature.
(d) Relative humidity in tunnel.

Fig 2.2 EXAMPLE OF CODE USED FOR MUZZLE FLASH MEASUREMENTS IN 1977-79 NATO TESTS

(a) Test No.
(b) Weapon System
Test Prefix wih weapon no.
(c) State of barrel:

1 = new barrel
2 = old barrel

(d) Barrel condition

HOT = hot barrel
COLD = cold barrel

(e) Type of Fire:

AUTO = 20 rounds automatic fire
LBS = 4 bursts of 5 rounds

Example of Code

2.12.1 - D12 - 2 COLD - AUTO

20 rounds automatic fire
Cold Barrel
Old barrel
Weapon system, weapon no: 12
Test No:

2.7.3 Smoke

2.7.3.1 Object To compare the smoke cloud produced by the test weapon and the resultant obscuration of the target with the effects produced by a nominated control weapon.

2.7.3.2 Method The following methods are to be used :

a. Photographic measurement :

- Target obscuration conditions
- Position-disclosing effects

b. Human observation

Notes :

(1) As smoke effects may be particularly pronounced at low temperatures and in warm, humid conditions, tests are to be carried out at low temperature (ambient winter temperature) and in warm, humid conditions. Temperature and humidity conditions are to be recorded for each test.

(2) In order to take into account the effect of air moisture content and the smoke, relative humidity values are to be recorded for each firing. Firings for test and control weapons should be under conditions of similar relative humidity.

(3) Tests are to be carried out in still weather (wind velocity not exceeding 1.50m/s) and, as far as possible, sheltered from wind and in daylight.

2.7.3.3 Photographic Measurement The smoke cloud produced by the weapon is to be evaluated from the point of view of obscuration of the target and from that of position-disclosing effects. In both cases, the camera is to be actuated 15 milliseconds after the last round fired by synchronising the shutter of the round and the round counting. This should be done automatically, for example by photo-electric cell, infra-red detector, or similar means. Panchromatic film (400 ASA) should be used with the camera's aperture diaphragm set to f2.5.

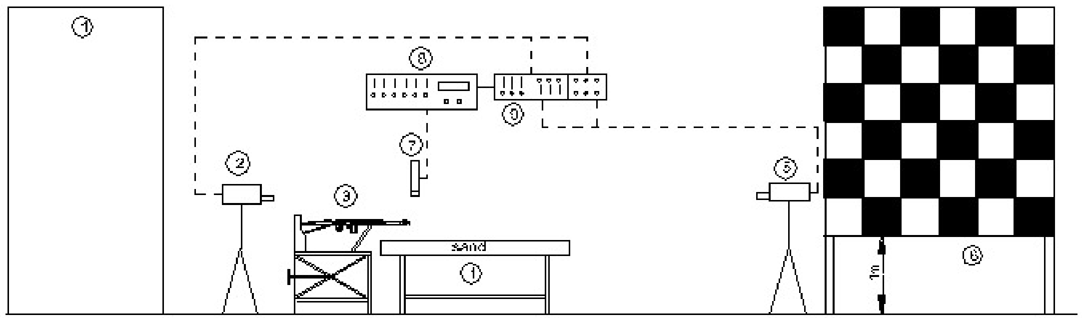
a. Obscuration of the Target A number of different bursts or rounds / grenades are to be fired to establish whether or not obscurations of the target will occur and under what conditions, using tactical firing plans where these exist. The size and density of the smoke cloud and the degree of obscuration of the target are to be determined by the use of a chessboard-pattern target 2.4 metres square, with black and white squares of 0.3 metres, with a weapon to target distance of 100 metres. Also by the use of a special test target to allow evaluation of variations in density caused by firing. The target is to be photographed immediately after the end of the burst or firing (under the conditions defined above) using a cine camera or video recorder fitted with an appropriate lens. The camera is to be placed behind and as close as possible to the weapon, without hindering the firer. To determine the degree of obscuration of the target the photograph is to be compared with a photograph of the target taken before firing.

Note : A high speed video camera may be used in place of the 35mm camera.

b Position-Disclosing Effects The smoke cloud resulting from a 25-round burst (kinetic energy weapon) or 10 round burst (grenade launchers) or from a full magazine is to be photographed against a black background after the end of the burst (under the conditions defined above) by a cine camera or video recorder situated 100m in front of the muzzle and 20m to the right of the line of fire. A similar control weapon is to be used for comparison purposes.

c. The lay-out is shown in Figure 2.3

SMOKE/SAND CLOUD LAY- OUT OF TEST USED FOR 1977/1979 NATO TESTS
Fumée / nuage de sable utilisé pour les essais OTAN 1977/1979



1 - Backround-weapon, matt-black
2 - Camera-weapon→ target
3 - Mount with weapon and pneumatic firing mechanism
4 - Sand box (Test 2.7.4 only)
5 - Camera-target→ weapon
6 - Chessboard-pattern target
7 - Flash actuator
8 - Rounds counter with timer
9 - Power and control unit for camera

1 - Arrière plan arme, noir mat
2 - Caméra côté arme direction cible
3 - Affût support d'arme et mécanisme pneumatique de mise de feu
4 - Bac à sable (essai 2.7.4 seulement)
5 - Caméra côté cible direction arme
6 - Cible à damier
7 - déclencheur de la lampe éclair
8 - Compteur de coups avec minuterie
9 - Tableau de contrôle et d'alimentaion de la caméra

FIGURE 2.3

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2.7.3.4 Human Observation The smoke cloud produced is to be assessed from the aspect of position-disclosing effects only. The test is to be conducted under the same still wind and sheltered conditions as in paragraph 2.7.3.3 above and in daylight. Observers are to be placed in flanking positions at angles to the line of fire of 30^o and 60^o at downrange distances of 50m, 100m, 200m and 300m and out to the maximum range at which the smoke can be seen. The test is then to be conducted as follows:

a. The control and test weapons are to fire four bursts of five rounds simultaneously at ten-second intervals from new, cold barrels. This firing will then be repeated twice. The three firings are then to be repeated with a second pair of control and test weapons, giving a total of six firings.

b. The above test is then to be repeated with new, hot barrels heating cycle as defined for the photographic measurement tests paragraph 2.7.3.3.

c. The above test is then to be repeated with worn, cold barrels.

d The above test is then to be repeated with worn, hot barrels, heating cycle as defined for the photographic measurement tests paragraph 2.7.3.3.

e Recording of Results

For each of the 24 firings all observers are to record whether the test weapon emitted more or less smoke than the control weapon.

2.7.3.5 Results and Assessment

a. As with the flash tests, results obtained by photographic measurement should not, in cases of doubt, be allowed to outweigh the results obtained from human observation.

b. The test weapon will be considered to have caused significantly greater (or lesser) smoke than the control weapon if :

(1) if for human observation out of the 96 comparative observations, the observers consider that the smoke from the test weapon is significantly greater (or lesser) on more than 58 occasions.
(2) if for photographic measurement the smoke from the test weapon gives a difference in density of 30% or more. This is a provisional criterion which need corroboration with human observation in due course.

c. Details are to be given in the test reports of the methods of photographic observation employed

d. Results data sheets are to specify:

- Old and new weapon
- Firing sequence
- Obscuration of the target and position-disclosing effects

On each data sheet there should be a calibration shot and a shot taken after firing. Additionally, the following data is to be recorded:

- Type of fire
- Type of ammunition and lot number
- Ambient temperature
- Relative humidity

2.7.4 Sand Cloud

2.7.4.1 Object To compare the sand cloud produced by the test weapon with that of a specified control weapon, during the firing of various types of ammunition representative of those in service.

2.7.4.2 Method An area 5m wide by 6m long is to be covered with suitable sand to a depth of 2cm. The weapon is to be positioned such that the muzzle is 20cm above the sand and 30cm in front of the rear edge (on the firer's side) of the sanded area. The test weapon is to be fired in each of its possible firing modes (5 rounds single shot, 5 controlled bursts and one burst of 20 rounds), using both ball and tracer ammunition. The sand is to be smoothed, if necessary, after each trigger pull. The tests are to be carried out in calm air conditions (wind speed not exceeding 1.5 m/s). Photographic measurement and human observation are to be used to record results.

2.7.4.3 Photographic Measurement The sand cloud produced by the weapon is to be evaluated with regards to its position-disclosing effects. The cine camera or video recorder is to be placed 100m in front of the muzzle of the weapon and 20m to the right of the line of fire and is to be activated at the moment of firing.

2.7.4.4 Human Observation The sand cloud produced by the weapon is to be evaluated solely with regard to its position-disclosing effects. Observers are to be placed in flanking positions at angles to the line of fire of 30^o and 60^o at downrange distances of 50m, 100m, 200m and 300m. Additional testing should be carried out to determine the maximum distance at which the sand cloud is visible.

2.7.4.5 The lay-out is shown previously in Figure 2.3, with the details of the sand/dust mixture used given in Figure 2.4.

2.7.4.6 Results and Assessment

a. The results obtained by photographic measurement shall not, in case of doubt, take precedence over human observation.

b. The projection of sand from the test weapon is to be evaluated and compared with that from the test weapon.

c. Details are to be given in the test reports of the methods of photographic observation employed

d. Unless otherwise stated, test results are to be recorded as for Section 2.7.3.

Notes on Layout Diagrams

(1) All measuring apparatus is represented schematically.

(2) Photographic Measurement: To be able to take photographs of the obscuration of the target and the position disclosing effects after firing at the same time, it is necessary to position one camera behind the weapon and one camera 23m in front of the weapon, to the left of the line of fire. Both cameras are to be actuated by means of a flash actuator, a rounds counter and a timer set to 45ms after the firing of the last round.

(3) Chessboard Pattern Target: A chessboard pattern target 2.4m square with 0.3m black and white squares, placed 25m in front of the weapon. The distance between the lower side of the target and the ground is to be 1m. The target is to be illuminated using a flash light with a power of 5000 watts. Illumination at the target is to be 11000 lux.

(4) Mount: The weapon is to be mounted in the same way as for the noise Sections. At the mount there should be a pneumatic firing mechanism, controlled by the rounds counter. The weapon is to be positioned in such a way that the line of fire is just below the chessboard pattern target.

SAND FOR SAND CLOUD TEST

PARTICLE SIZE OF MIXTURE

Total weight of sample : 200 g

Mesh [mm]	Remainders R [g]	Remainders $\frac{R}{\Sigma R} \cdot 100$ [%]	Total [%]
2,0	-	-	100,0
1,0	-	-	100,0
0,63	-	-	100,0
0,4	4,8	2,4	97,6
0,2	160,0	80,0	17,6
0,1	35,0	17,5	0,1
0,063	0,2	0,1	-
Total ΣR	200,0	100,0	

Grain diameter shown graphically

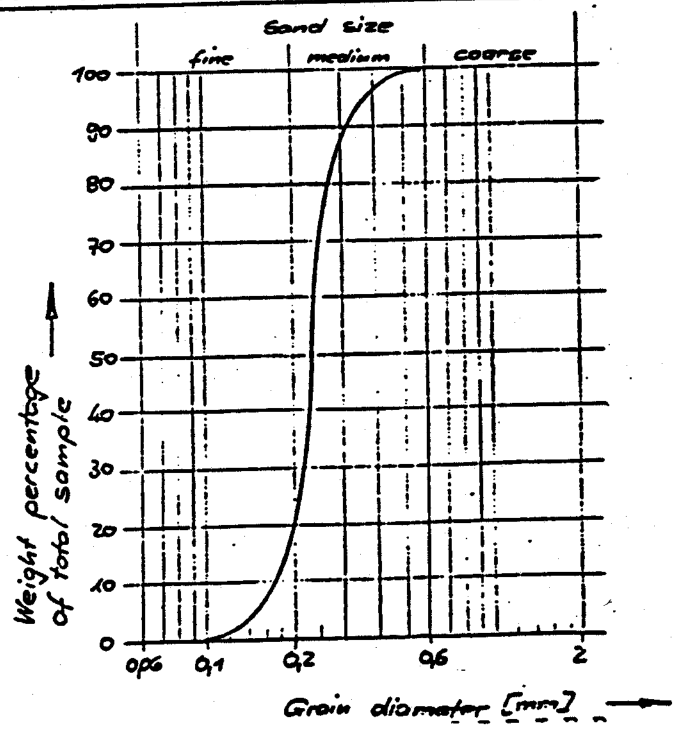

Fig 2.4 SAND FOR SAND CLOUD

2.8 POTENTIALLY HAZARDOUS EFFECTS

Note:The characterisation of the ammunition (ball, blank, tracer, etc.) must be clearly defined for all these tests and their definitions are to be included in the test reports.

2.8.1 Noise

2.8.1.1 Introduction The evolution of high velocity, small calibre weapons has resulted in a level of firing noise such that a degree of permanent impairment of hearing can be caused to both the firer and instructor, as well as others in the immediate vicinity. The damage caused is likely to be not only a function of the peak sound pressure level, but perhaps also the pulse duration and rise time (ambient to peak). Data on the relationship between the physical characteristics of the noise caused by small arms firing and the effects on hearing which it causes remains incomplete.

2.8.1.2 Background to Test Procedure This test is concerned with field conditions where, in general, the angle of incidence and the nature of sound reflecting surfaces is such that reverberation adds little to the noise hazard. The only exception is when firing from armoured vehicles. In this case it is reasonable to assume that weapon barrels will be projecting through apertures in such a way that the noise level reaching the firer will be reduced to a non-hazardous level, despite reverberance (but this assumption requires checking :- should it be considered necessary, tests of noise levels under "typical" reverberant conditions are also to be undertaken). This test will, therefore, normally only cover single shot effects.

2.8.1.3 Object To compare the peak sound pressure level, pulse duration and rise time of the noise caused by shots fired from the test weapon with those from a nominated control weapon.

2.8.1.4 Method

a. Instrumentation

(1) Suitable pressure transducers having a frequency response up to at least 20kHz (although wider bandwidths should be used if considered advantageous), readable to 200 decibels sound pressure level, with sufficient robustness to withstand such pressure pulses.

(2) Cathode Ray Oscilloscope (CRO) with a variable sweep time such that traces to a suitable scale are produced separately of :

- pulse duration (approximately 0.25 milliseconds)
- rise time (approximately 10 microseconds)

- duration of sound envelope (initial and subsequent pulses)
- density of pressure fluctuations within the envelope (if considered necessary for evaluation purposes)

(3) Suitable CRO camera for rapid verification

b. General Arrangements

(1) Pressure transducers are to be placed close to the ear and 1m and 2m from the muzzle and 1m from the ground at 45°, 90°,180°, 270° and 315° relative to the line of fire and also in the position that would be occupied by the firer's ear.

(2) The weapon is to be fired from a suitable rest, with the barrel horizontal, 1m from the ground.

(3) The firing platform is to be mounted on flat, grassy ground with no sound-reflecting obstructions within a distance of 10m from the weapon. Remote firing control is to be used to avoid possible interference with the sound waves.

(4) Firing is to be conducted under still, dry conditions (for example wind velocity not exceeding 1.5m/s and relative humidity not exceeding 60%).

(5) A transducer is to be placed in a suitable position between the muzzle and the measuring transducer, to trigger the CRO (triggering may be a problem in the measurement of rise time).

2.8.1.5 Firing and Results to be Recorded

a. For Point target weapons, five rounds are to be fired in single shot at ambient temperature in each position from each test weapon and from the control weapon. The CRO trace from each round is to be photographed and the results listed below measured from the photographs :

(1) Peak positive pressure
(2) Decay time (by 20 decibels) of the main envelope of pressure pulses
(3) Density of pressure fluctuations within the envelope
(4) Duration of main pressure pulse
(5) Rise time of main pressure pulse

These tests are then to be repeated with five rounds conditioned at 52°C ±2°C.

b. The tests for area target weapons are to be based upon the same principles, with measurements taken under similar conditions. In the case of riles with grenade dischargers, firing is to be carried out from the kneeling position, with the weapon at an angle giving maximum range and with the butt of the weapon resting on the ground, as appropriate. For crew-served launchers that are fired from vehicles, measurements should be recorded at the various crew positions (driver, commander, etc.) for that vehicle.

2.8.1.6 Assessment Tables are to be produced showing all results obtained. Accompanying photographs are to be included. Comparative results, mean values and gamut of values are to be discussed. Normally, the results will have to be forwarded to suitable specialists for expert assessment and advice on potentially hazardous effects.

2.8.1.7 Test Detail Full details of the equipment and layout used in the 1977-79 NATO Tests, based upon the advice of a special International Group of Experts on Acoustics, are given at Annex M.

2.8.2 Toxicity

2.8.2.1 Introduction This section and the test methods described applies to both point and area target weapons. The toxicity hazard, absorption of carbon monoxide (CO) into the bloodstream, is of particular importance when support weapons are fired at sustained rates from occupied enclosed spaces such as the fighting compartments of armoured personnel carriers (APCs). The modern practice of firing from within stationary or moving APCs, in particular, increases the importance of toxicity from infantry individual weapons. It is also desirable to know the likely effects upon the occupants of enclosed spaces, such as bunkers, pill boxes, etc. from which these weapons are fired. Owing to the variety of vehicles employed within NATO countries it is not realistic to relate the test directly to vehicle conditions. A number of countries already possess this data related to current weapons and ammunition. It is envisaged that, if a suitable known control weapon / ammunition system is used, some correlation will be obtainable between this test and actual vehicle conditions.

2.8.2.2 Object To determine the toxicity effects arising from CO concentration, by comparison firings within a test chamber from test weapon(s) / ammunition with those from a nominated control weapon system.

2.8.2.3 Method

a. Toxicity Chamber : standard toxicity box or chamber, approximately 1.8m x 0.9m x 0.9m is to be used. This is to contain means of mounting the test weapon(s). The muzzle, including any flash eliminator, should be outside the chamber, but any gas port should be within the chamber. The chamber should contain a fan for general circulation of the gases and arrangements for solenoid trigger operation and change of magazines without gas loss. A transparent viewing panel should be placed at a suitable position in the chamber. Weapons with a gas port are to be subjected to a further test with the gas port outside the chamber.

b. Toxicity Measurement : A suitable direct reading analyser is to be used to determine the % CO content of samples of gas obtained from the chamber by means of an appropriate pump or aspirating system. A system based on infra-red absorption may be the most suitable for this purpose. This should incorporate a pointer and scale to enable readings to be recorded with a suitable degree of accuracy. The instruments must, at least, cover the range from 0.01% to 0.2% CO content and should have a calibration accuracy of not more than ±2% over the full scale. The number of samples is to be specified.

c. Firing Cycles : These will depend upon the tactical role of the weapon and on its characteristics. Wherever possible, the firing cycles are to be the same as those which give known toxicity conditions in vehicles when fired from the control weapon / ammunition system.

d. Ammunition : Tracer and ball ammunition is to be fired, either separately or mixed, as appropriate. Where necessary, the influence of different propellants also needs to be taken into consideration.

e. Details of the Test Chamber and measuring system used for the 1977-79 NATO trials are shown in Annex N.

2.8.2.4 Results to be Recorded The following results are to be recorded, for both the control and test weapons :

a. Rate and duration of fire and number / mix of rounds fired per trigger pull.
b. CO concentration as % of volume.
c Total CO concentration in litres

2.8.3 Firing Residue Dispersions, Debris and Rear Projections

2.8.3.1 Object To determine whether the residues created by the firing of the test weapon / ammunition constitute a safety hazard to the user. In the case of area target weapons there is a likelihood of danger from firing residues such as rear projections in addition to those normally found with point target weapons.

2.8.3.2 Criterion Firing of the weapon systems must not expose the firer or other personnel in close proximity to residues that may cause injury.

2.8.3.3 Test Procedures

a. Testing shall be carried out in general accordance with paragraph 17 of US TOP 4-2-016

b. For point target weapons firing residues (unburnt propellant, projectile components, cartridge case fragments, etc.) are to be collected by firing into a kraft paper lined tube of the dimensions shown in Figure 2.5.1. One end of the tube encloses the weapon muzzle, whilst the other end has a small diameter port (20cm) to allow unrestricted exit of the projectile. The weapon itself is to be surrounded by a kraft paper screen approximately 90cm high and 120cm diameter. The residue is to be collected and catalogued after each trial. Firing is to be conducted in three cycles, each of 3, 5 and 10-round bursts. Testing is to be repeated with the cartridges preconditioned at -51^{o}C, +21^{o}C and +68^{o}C. The weapon is to be mounted in a universal test stand and hand fired.

c. For cartridges that utilise a sabot as a projectile launch vehicle, further testing is required. The same firing schedule is to be utilised to fire through a series of Cellulosic Fibre (ASTM-C208) screens 12.7mm (0.5in) thick to determine the residual dispersion and damage potential. The screen sizes and spacings are shown in Figure 2.5.2. This test is to be performed under no-wind conditions.

d. For area target weapons, where appropriate, a check also needs to e carried out to determine whether debris or rear projections are present. This is achieved by placing a thin sheet of paper (typically of 100g/m^2) in the normal position for the gunner's head, whilst conducting a firing of 20 grenades, 10 of which have been heated to +40^{o}C and 10 of which have been cooled to a temperature equal to or below -31.5^{o}C for a period of six hours, the firing being made from appropriate positions. Thin plastic sheet may be used in place of the paper to determine whether any of the rearward projections are hot. Muzzle Impact / Safe Distance shall be tested in accordance with Section 5 Specific Tests for Bursting Munitions.

e. For each trial the following data shall be recorded to the extent allowable by the weapon / ammunition performance :

(1) Number of rounds fired
(2) Cyclic rate of fire
(3) Air temperature and relative humidity
(4) Particle identification and size
(5) Sabot dispersion
(6) Cartridge case ejection pattern

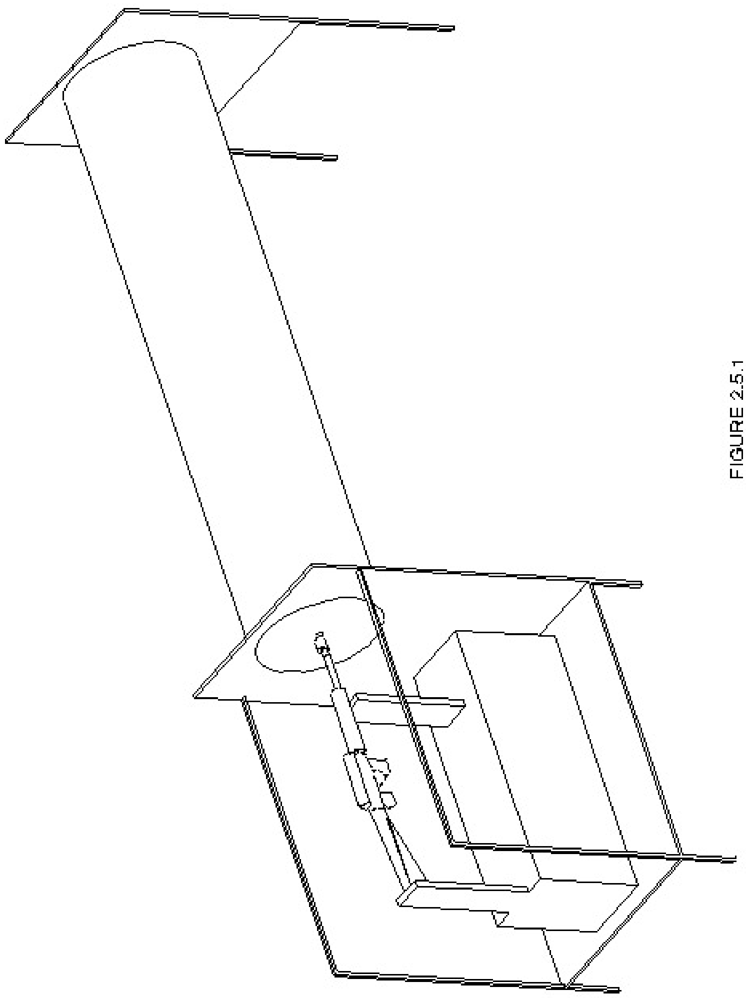

FIGURE 2.5.1

GR64202 ISS B (MOD NO: 1'054/99)

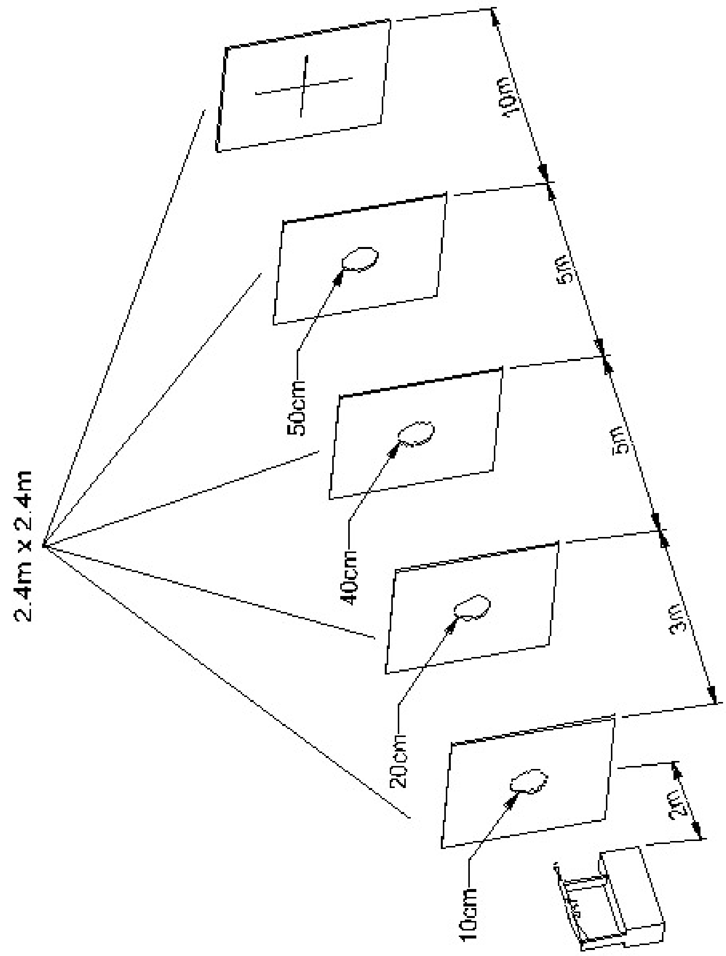

FIGURE 2.5.2

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2.8.4 **Hand Guard Temperature** This section is mainly applicable to hand held individual weapons, but the principles may also have relevance to certain types of area target weapons, such as rifle mounted grenade launchers.

2.8.4.1 Object To ascertain which firing modes, if any, cause heating of the weapon's hand guards to an unbearable degree.

2.8.4.2 Method

a. Firing Detail : 200 rounds are to be fired from the test weapon in a fixed rest in a climatic chamber, at each of the following rates of fire :

(1) Automatic fire at the weapons natural firing rate
(2) Rapid single shots, approximately 60 rounds / minute
(3) Controlled bursts, normally of 3 rounds, every 5 seconds

b. The weapon and 600 rounds, where possible in magazines or belts, is to be kept in a suitable climatic chamber for 12 hours at a temperature of +52^{o}C. Firing is to be carried out at the same temperature. Loading and servicing of the weapon is to be carried out through openings for hands in the side of the chamber. The weapon is to be fired by remote control. There is to be a pause of 3 hours between the firings of 200 rounds at each of the different rates of fire.

c. Temperature Measurement

(1) Measurement of Hand Guard Temperature
Two thermo-elements are to be attached to the outside of the hand guard or, if there is no hand guard, at the place where the weapon would be grasped when making a rapid change of firing position. The measuring points are to be under the hand guard 50mm either side of its mid point or at equivalent points for weapons without a hand guard.

(2) Measurement of Test Temperature
The temperature within the climatic chamber is to be recorded throughout the course of the test.

2.8.4.3 Results to be Recorded The following results are to be recorded :

a. Timings of firings
b. Temperature measurements of:

(1) Hand guard
(2) Climatic chamber

c. The hand guard temperatures from Section No 2.14 (Cook-Off and Barrel Heating) are also to be shown for comparative purposes.

2.9 CLIMATIC EXTREMES

The weapons used for this test must previously only have undergone firing tests carried out in normal operational conditions. In all types of test the ammunition is to be subjected to the same conditions as the weapon. All firings will be conducted at the appropriate conditioning temperature in accordance with STANAG 4370 - Environmental Testing and Allied Environmental Conditions and Test Publications (AECTP) 300 Climatic Environmental Tests. See Annex A.

The climatic extremes of temperature stated in STANAG 2895 form the basis for the test temperatures used throughout the document. Should the requirement for a particular weapon system specifically demand other, differing, extremes of climatic temperature, then the temperatures in the test should be adjusted accordingly. For both point target and area target weapon systems the ammunition should be tested in the **UNPACKAGED** condition to two levels of climatic extremes of temperature:

a. To the less extreme “operational use” level;

b. In the purely ammunition tests (Section 3), at more extreme levels, to demonstrate, in a relatively short test period, the basic ability of the ammunition to withstand the full NATO “storage” levels for the long period required of packaged ammunition. (The tests then agree with those used for “in-service” NATO small arms ammunition and eliminate the variable factor of different types of packaging and allow a reasonable extrapolation of performance from short-term periods unpackaged to long-term storage when packaged).

c. Rough handling tests of ammunition (see Section 3.19), which include testing at the upper and lower “operational use” temperatures are, however, to be carried out with packaged ammunition.

d. In addition, for area target ammunition, some fuse testing, under special conditions, is required.

e. Military testing should also include testing at high and low “operational use levels” (see Section 9.)

2.9.1 Cold Test

2.9.1.1 Object To determine the effects of extreme cold at temperatures lower than or equal to -54°C on functioning performance, endurance, lubrication and convenience of operation of the weapon. If necessary, a special cold weather oil may be used at temperatures of -18°C and under.

2.9.1.2 Method - Kinetic Energy Weapons

a. The weapons and at least 1000 rounds in magazines or in belts is to be conditioned at a temperature lower than or equal to -54°C for 12 to 24 hours. Then a firing of at least 50 rounds in an enclosure cooled to a temperature lower than or equal to -54°C will be conducted, with conditioning of the weapons and ammunition at a temperature lower than or equal to -54°C for at least 3 hours between each series of 50 rounds. (When firing cannot be finished in a single day, the same conditioning is effected during the night). The modes of fire available with the weapon (semi-automatic, automatic, controlled burst) may be used in each series. The weapon may be lubricated, without disassembly, after every 500 rounds and cleaned and lubricated every 1000 rounds.

b. Each series of 50 rounds to comprise of :

(1) Individual Weapons

- 10 rounds single shot
- 20 rounds in short bursts (3 to 5 rounds)
- 20 rounds automatic

(2) Light Support Weapons

- 20 rounds in short bursts (3 to 5 rounds)
- 30 rounds automatic

(3) Medium / Heavy Support Weapons

either: as for the Light Support Weapon
or: 50 rounds automatic

c. Results to be recorded

(1) Temperature of climatic chamber
(2) Rate of fire (on automatic)
(3) Problems encountered by weapon, such as :
- Increased loading forces
- Increased mechanical power requirements

2.9.1.3 Method: Bursting Munitions Weapons Three grenade launchers and their ammunition will be conditioned at a temperature lower than or equal to -54°C for 12 to

24 hours before firing begins. Failure to function may require a retest at a warmer temperature to determine the system's functioning cold temperature.

a. For rifle grenades fire 50 rounds from each of the three weapons

b. For single shot grenade launchers fire at least 100 rounds from each of the three weapons

c. For semi-automatic or fully automatic grenade launchers fire at least 1000 rounds from each of the three weapons in 50 round cycles, alternating, as applicable, amongst single shot, short burst and fully automatic.

d. Allow at least one hour between cycles for reconditioning to the test temperature.

e. Observe conditions peculiar to operation at low temperature, such as increased charging forces, sluggish operation and maintenance difficulties, including minor adjustments and problems when using cold weather gear. In addition, observe the need for additional lubrication and cleaning.

2.9.2 High Temperature Test

2.9.2.1 Object To determine the effects of extreme heat (+52^{o}C minimum) on the functioning performance, endurance, lubrication and ease of handling of the weapon.

2.9.2.2 Method: Kinetic Energy Weapons

a. The weapons and at least 1000 rounds in magazines or in belts are to be conditioned at a temperature greater than or equal to +52^{o}C for 12 to 24 hours at a humidity level of less than 5%. Then a firing of at least 20 series of 50 rounds are to be carried out in an enclosure conditioned at +52^{o}C (minimum), with pauses between each serial to allow the temperature to return to +52^{o}C . The weapon may be lubricated, without being disassembled, after every 500 rounds. The weapons may be cleaned and lubricated every 1000 rounds. Firing modes available with the weapon will be used in each series.

b. Each series of 50 rounds to comprise of:

(1) Individual Weapons
- 10 rounds single shot
- 20 rounds in short bursts (3 to 5 rounds)
- 20 rounds automatic

(2) Light Support Weapons
- 20 rounds in short bursts (3 to 5 rounds)
- 30 rounds automatic

(3) Medium / Heavy Support Weapons
either :
as for the Light Support Weapon
or : 50 rounds automatic

There is no scheduled time interval between series. However, as a precaution against cook-off, barrels are to be replaced by other barrels previously conditioned at +52^{o}C after every 200 rounds.

c. Results to be recorded

(1) Temperature of climatic chamber
(2) Rate of fire (on automatic)
(3) Problems encountered by weapon, such as :
- Increased loading forces
- Increased mechanical power requirements

2.9.2.3 Method: Bursting Munitions Weapons Three grenade launchers and their ammunition will be conditioned at a temperature greater than or equal to +52^{o}C for 12 to 24 hours before firing begins. Failure to function may require a retest at a warmer temperature to determine the system's functioning cold temperature.

a. For rifle grenades fire 50 rounds from each of the three weapons

b. For single shot grenade launchers fire at least 100 rounds from each of the three weapons

c. For semi-automatic or fully automatic grenade launchers fire at least 1000 rounds from each of the three weapons in 50 round cycles, alternating, as applicable, amongst single shot, short burst and fully automatic. Allow at least one hour between cycles for reconditioning to the test temperature. Take precautions against cook-offs.

d. Observe conditions peculiar to operation at high temperature, such as need for additional lubrication and cleaning.

2.9.3 Temperature and Humidity

2.9.3.1 Object This test investigates the effects of temperature and humidity ("warm-wet" climatic conditions) over a period of 10 days, without the benefit of protection, cleaning or lubrication between firings.

2.9.3.2 Method - Kinetic Energy Weapons

a. Expose at least three test weapons and 3000 rounds of ammunition (1000 rounds per weapon), divided into series of 125 rounds, to the temperature and humidity conditions shown below, for 10 days. Storage schedule for humidity according to the following daily sequence in Table 2.11:

Table 2.11 TEMPERATURE AND HUMIDITY STORAGE SCHEDULE – KINETIC ENERGY WEAPONS

Conditioning	Temperature of	Chamber		Relative Humidity
Time	Increasing to:	Steady at:	Falling to:	
Hours	°C	°C	°C	%
2	+41(B3)			90
16		+41(B3)		90
2			+21	95
4		+21		95

b. Firing Sequence :

On each of the third, fifth, eighth and tenth days of this conditioning, 250 rounds are to be fired in 125 round series without any further cleaning or lubrication.

The firing sequence in a series will be :

- 25 rounds single shot
- 50 rounds in short bursts of 3 to 5 rounds
- 50 rounds automatic

Weapons without single shot capability are to fire short bursts instead of single shot. For weapons with a burst controller, this is to be used when firing in short bursts.

c. Weapon inspection

At the end of this conditioning the weapons are to be disassembled, cleaned and checked visually for damage.

d. Results to be recorded

(1) Temperature and relative humidity of climatic chamber
(2) Rate of fire (on automatic)
(3) Problems encountered by the weapon, such as :
  - Increased loading forces
  - Increased mechanical power requirements.

2.9.3.3 Method: Bursting Munitions Weapons

a. Expose at least three test weapons and ammunition to the temperature and humidity conditions shown below, for 10 days without cleaning or adding lubricant. Storage schedule for humidity according to the following daily sequence as shown in Table 2.12:

Table 2.12 TEMPERATURE AND HUMIDITY STORAGE SCHEDULE: BURSTING MUNITIONS WEAPONS

Conditioning	Temperature of	Chamber		Relative Humidity
Time	Increasing to:	Steady at:	Falling to:	
Hours	°C	°C	°C	%
2	+41(B3)			90
16		+41(B3)		90
2			+21	95
4		+21		95

b. Firing Sequence :

On each of the first, third, fifth, eighth and tenth days of this conditioning, 10 rounds are to be fired without any further cleaning or lubrication (50 rounds total).

c. Weapon inspection

At the end of this conditioning the weapons are to be disassembled, cleaned and checked visually for damage.

2.9.4 Icing Tests (-10 °C)

2.9.4.1 Object To determine the operability of a weapon exposed to freezing rain conditions (-10 °C) following an accumulation of ice of various thicknesses.

The procedure is generally the same for both kinetic energy and bursting munition weapon systems, the main difference being in the numbers of rounds fired during the trial.

2.9.4.2 Method

a. A spray facility is to be used, similar to that shown in Figures 2.6.

b. Testing the weapon with icing to various thicknesses.

(1) Conditioning :

The firing and ammunition rooms of the climatic test installation are to be set at -20 ^{o}C .
Conditioning of the weapon and ammunition at -20 ^{o}C will be carried out for 12 to 24 hours in the ammunition room end of the spray facility in the firing room.

(2) Icing :

Mount the weapon horizontally in the spray apparatus. Close the muzzle with adhesive tape. Weapons fired from a closed bolt position are to be loaded ready to fire, with the safety catch applied. Weapons firing from an open bolt position will be "charged", that is loaded but with the bolt closed and no round loaded in the chamber. If available, the ejection open cover will be closed. On belt-fed weapons, the free end of the belt will be made fast to the weapon.

The distance from the water spray heads to the bore axis shall be adjusted to 900mm.

The geared motor will be switched on (the weapon will turn on a horizontal axis at a rate of two revolutions per minute).

The weapon will be sprayed for 10 minutes. The water pressure should not exceed approximately two atmospheres. Following this the weapon is to be conditioned for one hour in the spray apparatus (with the geared motor switched off) and for one hour in the ammunition room.

(3) Firing

The ice on the weapon and ammunition is to be removed manually (with gloves) as far as possible. The weapon may be bumped vigorously against a piece of wood in order, for example, to free the feed system.

The total time for bringing the weapon to functional readiness is to be limited to five minutes. Following this an attempt should be made to fire the weapon in accordance with the defined firing sequence.

If trouble-free functioning is not achieved, then a further attempt at firing should be made with a conditioned, but not iced, magazine or belt.

c. Testing the weapon after freezing rain :

(1) Conditioning of the test rooms
The firing room is to be conditioned at +2 ^{o}C, the ammunition room at -10 ^{o}C.

(2) Spraying the weapon
The weapon is to be placed in the spray apparatus in the firing room, then loaded ready for firing, with the safety catch applied. The muzzle must not be covered with adhesive tape. The geared motor should be switched on and the weapon sprayed for 15 minutes, with the water pressure limited to 5 atmospheres, Following this, the weapon is to be removed from the spray apparatus and, with the muzzle held down, shaken hard three times in order to expel water from the barrel.

(3) Conditioning of the weapon
The loaded weapon, also extra ammunition which has not been sprayed, is to be placed in the ammunition room and conditioned for at least 2 hours at -10 ^{o}C.

(4) Firing
After spraying, the firing room is to be conditioned to a temperature of -10 ^{o}C. Without any further preparations an attempt should be made to fire the weapon in accordance with the defined firing sequence.

If trouble-free functioning is not achieved, a further attempt at firing should be made with a conditioned, but not iced, magazine or belt.

d. Firing sequence - Kinetic Energy Weapons

(1) Individual Weapon
Using two filled magazines, fire 5 rounds single shot followed by the firing of the remaining ammunition in short bursts of fire of 3 to 5 rounds

(2) Support Weapons
Using two belts, each of 50 rounds, or two filled magazines

e. Firing sequence - Bursting Munitions
10 rounds for single shot launchers
20 rounds for semi and fully automatic launchers

2.9.4.3 Results to be Recorded

a. Timings, temperatures and amounts of spraying
b. Rate of fire (on automatic)
c. Particular problems due to icing
d. Thickness of ice in different spots

Figure 2.6 **A Spray Facility**

2.9.5 Description of Apparatus Used for Trials

a. Rotating Apparatus

The rotating apparatus is to be set up on a baseplate of dimensions 2000mm x 700mm. The weapon should be mounted with the butt clamped in a holder capable of adjustment both laterally and vertically. The muzzle should be supported by a cone which can be adjusted vertically. Rotation should be effected at the butt holder, using a geared motor which produces a final rotation rate of 2 complete revolutions per minute.

b. Water Sprays

The water spray heads, which should be capable of both lateral and vertical adjustment, should be mounted using an upright pole at the side of the apparatus. A total of 10 water spray heads are to be arranged in two rows, each of 5 heads. The mean distance between the water spray heads is to be 11.5cm within each row and 19.5cm between the rows. The water spray heads are to be positioned at a height of 0.9m above the bore axis of the weapon, such that the centre point of the total water spray head configuration is over the middle of the weapon.

A pressure regulating valve, together with a water pressure gauge is to be fitted into the water input pipe, in order to allow regulation of the required water pressure. The water spray heads are to be so designed that the “rainfall” is produced at a rate of 300mm/hour at 2 bar and 580mm/hour at 5 bar.

2.10 SAFETY (INCLUDING MECHANICAL AND APPLIED SAFETY)

2.10.1 Introduction

Safety and strength of design in regard to chamber pressures and maintenance of cartridge headspace is covered in Section 2.1. This section covers other aspects of safety.

2.10.2 Safety Design Appreciation

2.10.2.1 Object To assess and report on the design characteristics of mechanical and applied safety incorporated into the test weapon. This must be in the form of a design appreciation rather than a normal test.

2.10.2.2 Method The test weapon should be subjected to a thorough visual and dimensional examination (1), with the additional kinematic and other checks, including firing tests, as necessary, to ensure that the general principles of safety, including those listed in paragraphs 2.10.2.3 to 2.10.2.7 below, are satisfactorily incorporated into the design.

2.10.2.3 Mechanical Safety

a. Weapons with Positive Locking The mechanism must be such that:

(1) firing cannot be initiated until locking has been completed. The firing pin (or hammer) should be so controlled by the movement of the locking component of the working parts that it cannot operate until the mechanism is positively locked.

(2) unlocking cannot occur, after firing, until the chamber pressure has fallen to a safe level. The mechanism operating the unlocking action should not allow unlocking to commence until after a positive interval from the instant of firing (interval arising from "free travel" of the working parts).

b. Weapons with no Positive Locking It is assumed that weapons in this category will employ a "delayed blowback" or "case projection" type of operation. In this instance the design should be such that the delaying arrangement is fully operative when firing occurs and that the delay imposed on the bolt head is sufficient to ensure that, as he empty case is projected from the chamber, the pressure falls to a level which can be safely contained by that proportion of the case which is unsupported in the chamber. Rounds which are fully chambered before the trigger is pressed must function correctly in all respects when fired.

c. Firing Pin Inertia It must not be possible, with weapons which are fired from a closed breech, to fire the weapon inadvertently upon closing the breech, due to insufficient spring retraction of the firing pin and / or inertia resulting from a heavy firing pin. The firing pin should be designed in such a way that firing cannot occur if it is broken.

d. Rebound of Working Parts Any rebound of the working parts that may occur at the end of the run out stroke in positively locked weapons must be limited to a distance which cannot leave the cartridge case unsupported, or cause unlocking to commence.

2.10.2.4 Applied Safety The weapon should incorporate a safety system which operates in a positive manner, with the safe and fire positions easily identifiable by touch and which so locks the firing mechanism when the trigger is placed at ”safe” that the weapon cannot be fired by trigger pressure, when dropped or submitted to other similar rough usage, including the effects of brushing against foliage.

2.10.2.5 Firing and Trigger Operation The weapon should be such that it cannot be fired unless the trigger is operated, i.e. Precautions should be taken against the possibility, in an open breech system, of the firing mechanism (or other working parts) being inadvertently held to the rear, i.e. Other than by normal sear or other engagement. It should not be possible for a short recoil stroke to load a fresh round inadvertently when the trigger is released. On single shot settings only one round must be fired for each application of trigger pressure.

In particular, the trigger mechanism, when in the “safe” position, should provide a fully effective blocking action of the firing mechanism which will not allow any ignition of a round, even during;

a. Normal operation of the trigger

b. Horizontal or vertical drop from a height of 1.5m onto a concrete surface (the area of impact being covered with a 2mm thick layer of rubber surfacing).

2.10.2.6 Security of the Barrel With weapons that have a quick change barrel facility, the method of fitting the barrel should be such that the firer is given a positive indication that the barrel is properly locked into the receiver and that the weapon cannot be fired unless the barrel is properly locked into the receiver.

2.10.2.7 Double Feed In the event of double feed, the impact of the nose of the cartridge being fed should not fire the chambered round. To test this, a primed case should be introduced into the barrel chamber and a live round fed by means of the cocking handle. This test must be repeated 10 times.

2.10.3 Obstruction in Barrel

2.10.3.1 Object The use of projectiles of smaller calibre and new design increases the possibility of barrel blockages. The purpose of this test is to ascertain the danger to personnel and the damage to the weapon resulting from over pressure due to firing when the barrel is obstructed.

2.10.3.2 Method

2.10.3.2.1 Obstruction by Projectile

a. The test weapon shall be placed on a rest equipped with a remote firing device.

b. An ultra rapid cine camera is to be placed at right angles to the weapon and a cardboard half cylinder placed longitudinally above the upper part of the weapon in order to measure any fragments. The cine camera should be activated immediately prior to firing.

c. The barrel should be obstructed by ramming a projectile into it by mechanical means until a given point is reached. A live round should then be introduced and fired when all the necessary safety precautions have been taken.

d. The firing should be carried out with the obstruction in two different positions in the barrel :

(1) with the rear face of the jamming projectile 0mm from the tip of the bullet after the breech has been locked.
(2) with the rear face of the jamming projectile level with the forward edge of the gas escape, or, where there is no gas escape, 100mm from the muzzle.

2.10.3.2.2 Obstruction by Water Barrel blockage can be caused by water, particularly in weapons of smaller calibre (7.62mm and below). The weapon, with its muzzle pointing slightly upwards (5 degrees) should be mounted in a test stand and fed with a live round. Two (2) cc of water should be introduced to the barrel and, after having waited 30 seconds, the round should be fired.

2.10.3.2.3 Results to be Recorded

a. Damage to the weapon and any fragments likely to be received by personnel should be noted.

b. Details should be given in the test reports of the method of photographic observation employed.

2.10.4 Unconventionally Designed Weapons

In the case of a weapon of unconventional design, particular attention should be given to all features affecting safety, some of which may not have been covered in the above paragraphs.

2.10.5 Debris in Barrel

Consideration should also be taken of unburned debris which could be left in the barrel. The use of paper witness sheets may be useful in this regard.

2.11 RECOIL BY BALLISTIC PENDULUM

2.11.1 Introduction

2.11.1.1 Recoil energy has, for many years, been measured by ballistic pendulum in most NATO countries. Recoil energy can be measured using a ballistic pendulum, or the recoil force may be measured using load cells mounted in a fixture against which the stock of the weapon is placed.

2.11.1.2 In many circumstances the NATO requirement might be met by deriving the recoil energy from the established data on projectile weight, charge weight, muzzle velocity and weapon weight.

2.11.1.3 In each case the ammunition used to carry out the measurement must be defined with precision and its characteristics should be given in test reports.

2.11.1.4 The recoil of crew served bursting munition weapons may require a different test procedure or test apparatus, due to the weapons weight or extreme recoil. In such cases, alternative procedures may be substituted, provided that the same data is recorded. Alternative test procedures must be outlined in the test results or test plan.

2.11.2 Object

To measure the recoil energy of the test weapon, by means of ballistic pendulum.

2.11.3 Method

The method described below is given as an example, but any other method providing the same results can be employed.

2.11.3.1 Equipment and Installation

a. Installation : The pendulum should be housed in a substantial brick or concrete building, which excludes the vibrational effects of wind, draughts and loud noise. The suspension should be supported by steel girders, set in concrete, with no of roof or ceiling attachments. The bearing and suspension should be capable of supporting a dead weight of at least 450kg.

b. Suspension : The ballistic pendulum should be suspended on eight wires (or a lesser number which will give satisfactory, comparable, results), with one direct supporting wire and one diagonal stay wire on each corner. All wires should be fitted with adjustable screw strainers.

c. Ballistic Pendulum: The ballistic pendulum should be a rigid rectangular metal platform, between 68 and 71 cm long and between 43 and 45 cm wide, weighing no more than 36 kg, capable of supporting small arms of various types, weighing up to about 6.8 kg. The platform should be slotted longitudinally to provide weapon seating close to the centre of gravity (CofG) of the ballistic pendulum. The ballistic pendulum should incorporate the following features :

(1) A means of trigger release

(2) Brackets above and below the platform to take additional fixed loading weights and counterbalance weights

(3) Spirit levels

(4) A rest position datum point on the rear face, in the horizontal and longitudinal planes of the CofG

(5) Indication of the location of the CofG when the above fittings are in position

d. Dimensions : These should be as follows :

(1) The effective length of the ballistic pendulum should be 305cm +/- 2.5cm

(2) Overhead bearing points :

side to side - 137cm
front to rear - 71cm

(3) Pendulum support points are to be located in the horizontal plane of the CofG at distances of 23cm and 36cm, respectively, from the longitudinal and lateral centre lines of the ballistic pendulum

e. Bearings : Bearing edges are to be such as to ensure the stability of seating and to minimise friction.

f. Recoil Measurement : Recoil distance should be measured by a micrometer graduated to read to an accuracy of .025mm, the micrometer scale datum being fixed in the vertical plane relative to the suspension bearing points.

Note : A suitable form of micrometer consists of a flat, adjustable, linear scale 20cm long, read in conjunction with a vernier scale hinged to a sliding, light alloy index rod, which registers the backward movement of the ballistic pendulum from the rest position datum.

g. Protection from Blast : The pendulum should be protected from muzzle blast by a rigid screen (with a clearance opening for the barrel) placed between the muzzle and the ballisitc pendulum.

h. Period of Swing : A stop watch should be used to measure the period of swing. The control switch, actuated by the ballistic pendulum, should have "in" and "out" settings and be located at a ballistic pendulum displacement distance of about 7.6cm.

i. Pendulum Stop : An adjustable stop should be fitted to contact the forward face of the ballistic pendulum, immediately before firing, to damp inadvertent motion of the pendulum.

2.11.3.2 Preparation, Measurement and Calculation

a. Record weight, in kgs, of :

(1) The ballistic pendulum, complete with fittings, plus one third of the weight of suspension wires and strainers = W

(2) Weapon and spent cartridge case = w

Notes :

(1) the weight of the ballistic pendulum should be adjusted to suit the anticipated recoil energy from the ammunition; the following figures give a rough guide shown in Table 2.13:

Table 2.13 SAMPLE DIMENSIONS FOR PENDULUM CALCULATIONS

Calibre	Bullet Weight (g)	Muzzle Velocity (m/s)	Adjusted Ballistic pendulum Weight (kg)
7.62mm	9.3	845	82
5.56mm	4.0	940	41

a. Once the weights have been recorded, the same, consistent, set of units (metric [International standard] or US engineering units] must be used for all further measurements and calculations ([f], [g] and [h], below).

b. Prepare the pendulum for recoil measurement by mounting the weapon with the butt and point of balance clamped to the ballistic pendulum and with the barrel projecting about 15cm forward of the ballistic pendulum, so that the axis of the bore :

c. Passes through the CofG of the ballistic pendulum

(1) Is parallel to lines joining the front and rear points of support on each side of the ballistic pendulum

(2) is horizontal level when the ballistic pendulum level is in both planes

d. Adjust the suspension strainers to give equal tension.

e With the equipment thus prepared, swing the pendulum freely on an amplitude of 15cm (i.e. 7.5cm displacement each way). Measure, by stop watch, the time for 25 full cycle (to and fro) swings and obtain:

The number of swings per second = n.

f. Load the weapon. Secure the micrometer in the rear of the ballistic pendulum, with the index rod aligned in prolongation of the bore axis. With the ballistic pendulum at rest, adjust the pendulum stop and slide the rod into contact with the datum point. Adjust the micrometer scale to zero setting on the vernier. Withdraw the index rod and vernier to 12.7mm short of the estimated recoil displacement. Fire the weapon and record the displacement of the pendulum due to recoil = a.

g. Measure the retardation effects of suspension and inertia of the index rod on the amplitude of swing, as follows :

- Swing the pendulum freely at an amplitude of approximately 15cm. Measure, by micrometer, the displacement for the first, b, and last, c, of the eleven full cycle swings, resetting the index rod for each swing, so that it is moved 12.7mm by the ballistic pendulum at the end of each cycle. Loss of amplitude, due to retardation, over a quarter cycle swing, is:

$$\frac{b - c}{40} = r$$

h. The recoil energy of the weapon can then be derived, as follows :

(1) the initial velocity of recoil of the pendulum ballistic pendulum, V, is given by :

$$V = 2\pi n(a + r)$$

(2) the initial velocity of recoil of the weapon, v, is obtained from :

$$v = \frac{V(W + w)}{w}$$

(3) the recoil energy of the weapon, e, is obtained from:

$$e = \frac{wv^2}{2}$$

These basic formulae are valid for any consistent set of units (see Note 2 to [a] above)

2.11.3.3 Measurement of Recoil Force Measurement of recoil force can be carried out using piezo-electric load cells, mounted in a fixture, against which the butt of the weapon is mounted.

The weapon is fired by a marksman, with the load cell between the butt of the weapon and the marksman's shoulder. Output from the load cells can either be fed into a meter to record the maximum force or into a digital recording oscilloscope, for recording the complete impulse. For each weapon the force should be measured whilst firing a minimum of three single shots, in firing positions appropriate for the weapon being tested. Results should be compared with those from a control weapon.

2.11.4 Recoil Impulse - Grenade Launchers

2.11.4.1 Object This test is conducted to determine the amount of energy that is directed rearwards against the shoulder of a rifleman or the mounting system of a weapon and to ensure that the firing of the test ammunition from the area target weapon does not impose recoil forces in excess of those that can be tolerated by the weapon, gunner or mount.

2.11.4.2 Method

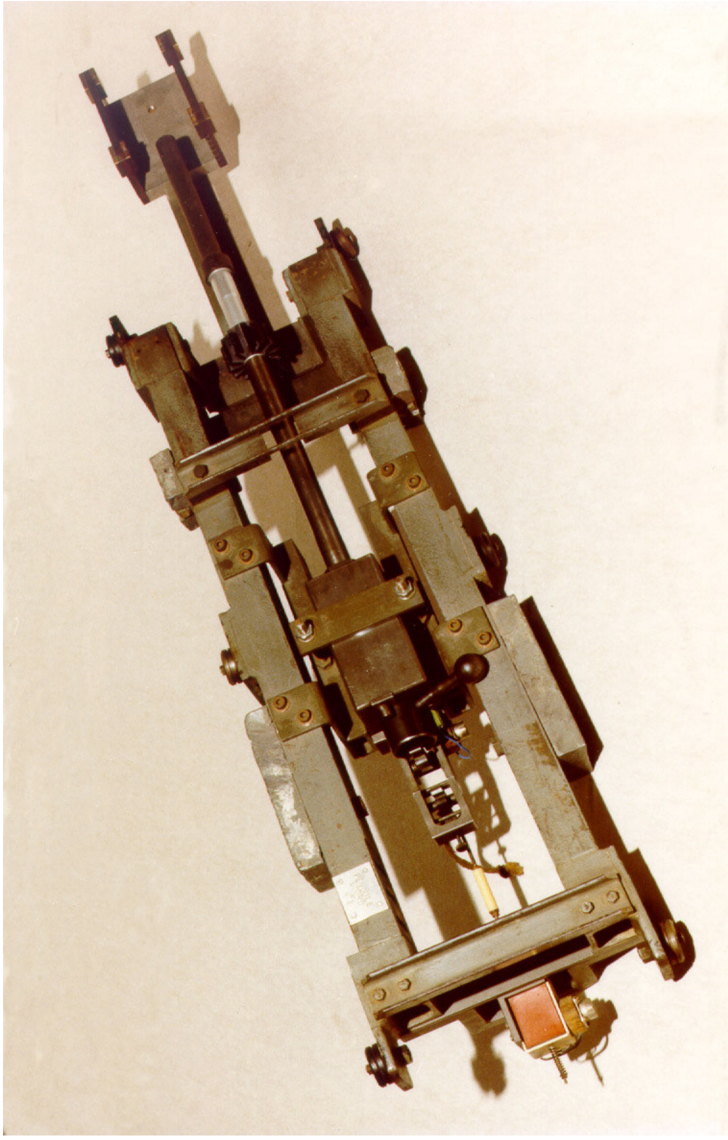
a. The test should be conducted using a ballistic pendulum of the type described above. An approximation of the measurements, to within 5 to 10 % may be calculated using the projectile weight. The methods and equations for the use of the pendulum, or approximate calculations, are shown in US TOP 3-2-826

b. In addition to the test ammunition, a sample of other in-service ammunition types should be fired from the standard weapon in a ballistic pendulum. These rounds will serve as control rounds, for comparison purposes. Velocity of the projectile should be measured, as should the horizontal deflection of the cradle-weapon system during firing. Other relevant data (weight of weapon, cradle, length of pendulum suspension, etc.) is to be recorded, as required. Recoil forces can be computed from the data generated by this test and compared with that tolerable by the gunner or mount.

c. For grenade machine guns, alternative tests include measurement of trunnion loads and / or time-displacement measurements of the weapon's bolt (see Kinematic Analysis, section 2.2).

2.11.5 Example Drawing of Ballistic Pendulum

2.11.5.1 An example drawing of a ballistic pendulum is given at Figure 2.7.



2.12 ANCILLARY ITEMS

2.12.1 Background This test is limited to ancillary items which have a direct effect on weapon performance. It is not intended to be comprehensive, but to serve as a guide only.

2.12.2 Method Wherever appropriate a nominated control weapon should be used in order to provide comparative results. The following design / functioning characteristics should be considered during the tests of ancillary items:

a. Bayonet. Method and security of attachment. Effect during firing on mean point of impact.

b. Blank Firing Attachment (BFA). Weapon performance with BFA attached. Method and security of attachment to weapon. Likelihood of effects of inadvertently firing ball ammunition. Barrel and gas regulator wear to be checked. Rates of fire and comparative noise level to be recorded. BFA to be tested under conditions of :

(1) small gas port and strong return spring.
(2) large gas port and weak return spring.

c. Mountings / Rests. Where a bipod or other mounting is provided, this should be examined for method and security of attachment to the weapon, adjustment for height, height of sight line above the ground, etc. If appropriate, the correct feed of ammunition from belts, clips, boxes and magazine should be checked with the weapon mounted. Particular attention should be given to ensuring that the weapon functions normally at an angle of elevation of $+80^{o}$ and at an angle of depression of -30^{o} , not only from the upright position but also tilted or lying on its left or right side, as appropriate. The weapon must also perform properly when the mounting is completely rigid.

The maximum length of hanging ammunition belt which the weapon can fire should also be determined (see also Annex B).

d. Rifle Launched Grenades. Weapons with the ability to launch rifle grenades should be evaluated in accordance with the appropriate sections of this manual.

e. Sighting Devices (for rifle grenades, grenade launchers etc. - other sighting system tests are covered in Section of this manual). Ease of assembly and use, including interchangeability requirements, of the various day and night sights available. Probability of using the sighting system for both flat trajectory and battle elevation grenade firing, in the three usual positions : prone, kneeling and standing

f. Sling. Possibility of using the sling as a recoil shock absorber (when firing rifle grenades, etc.) and flat trajectory grenade firing from the three usual positions : prone, kneeling and standing.

g. Magazine / Ammunition Containers. The availability of special magazines for grenade launching cartridges, their bulk and the ease with which they can be inserted.

h. Vehicle Mounting. The mounting of crew served grenade launchers should be evaluated for compatibility. Interface dimensions, max. And min. Elevation and depressions should be evaluated. Human Factor testing (Section 8) should evaluate mounted weapon systems.

j. Support Weapon Mountings. For support weapons required to fire from particular mounts (vehicle mountings, anti-aircraft mountings), both technical and military tests must be extended to cover firings from these mountings under both normal and the most adverse conditions stated in the relevant NATO requirements. These tests should include firings from specific vehicles in which the support weapon would be mounted. Assessment of the following aspects may then require particular emphasis :

- Maximum / minimum elevation / tilt (combinations of support weapon relative to vehicle and vehicle relative to horizontal)
- Overheating
- Toxicity
- Feed
- Ejection
- Loading / unloading
- Ammunition storage
- Sighting arrangements
- Firing from moving vehicle
- Ease of maintenance
- Ease of clearing stoppages

2.13 ADVERSE CONDITIONS

Firings specified in this Section shall be carried out using a mounting if required for reasons of safety. STANAG 4370 and AECTP 300 shall be used where appropriate.

2.13.1 Unlubricated

2.13.1.1 Object To investigate the performance of the weapon or launcher in an unlubricated condition. This then forms the opposite extreme to full lubrication with the best lubricant available, which can be used in all the tests under adverse conditions and in functioning tests. It is possible - and sometimes advisable - to obtain further information on the functioning problems by adding a test with an intermediate lubrication oil O-190 defined in Annex C to STANAG 1135 .

2.13.1.2 Method

a. Three weapons or launchers are to be cleaned in a dry cleaning solvent taking due regard of manufactures instructions (for example: gasoline or cleaning solvent S 752 or manufacturers specification) and fired in an un-lubricated condition. The weapons may require disassembly in order to apply the solvent to internal parts (Note: Before using the dry cleaning solvent it is necessary to ensure that it is compatible with the internal parts). The solvent used must leave no traces. Its type, characteristics and method of use are to be given in the test reports and shall comply with the appropriate weapon technical manual. The solvent should comply with the Montreal Protocol. Reassemble the weapons or launchers in an un-lubricated condition. The firing schedule is to be as follows:

(1) Individual weapons :- fire 500 rounds, employing all modes of fire (single shot, semi- automatic, automatic, controlled bursts)

(2) Support weapons :- fire 1000 rounds, employing all modes of fire (semi- automatic, automatic, controlled bursts)

(3) Single shot grenade launchers :- fire 50 rounds

(4) Semi / fully automatic grenade launchers :- fire 100 rounds

b. If unsatisfactory functioning occurs attributable to lack of lubrication, attempt to pinpoint the trouble spot or area. Apply lubricant to that area and fire 25 rounds to affirm that the application of lubricant corrected the unsatisfactory condition. If the condition is not corrected, apply lubricant to a second selected area, fire a further 25 rounds. Repeat until satisfactory functioning is restored to the weapon.

2.13.1. 3 Results to be Recorded

- Dry cleaning solvent details
- Record of firing
- Stoppages and malfunctions
- Details of any lubrication effected
- Rate of fire on automatic (where applicable)

2.13.2 Accelerated Water Spray Test

2.13.2.1 Object The water spray test is an accelerated test to determine the effect of heavy rainfall on the performance of the weapon or launcher, simulating about 12 hours of heavy rainfall in about 84 minutes of real time.

2.13.2.2 Method The weapon or launcher is to be lubricated beforehand, without any special precautions, using the products normally employed. The test can then be repeated, particularly in the event of faulty operation, using a special lubricant recommended by the manufacturer. Rainwater is to be used, in preference, for this test. The weapon or launcher is to be exposed to the rain in a condition of readiness to fire.

a. The test consists of a spray of water falling at a rate of approximately 1cm per minute or 60 ± 7.5cm per hour. The spray of water is to be directed over the entire weapon by means of a special shower head, or other device, positioned about 1 metre above the weapon or launcher. An example of a water spray facility is shown on Figure 2.6.

b. The basic sequence of test operations is contained in Table 2.14 and 2.15, entitled "Water Spray Test Parts 1 and 2".

c. Satisfactory performance in Part I of the table is considered essential and continued satisfactory performance through Part II desirable.

d. In addition to measuring and adjusting the rate of fall to 60 ± 7.5cm per hour, the water and air temperatures are to be recorded.

e. Firings are to be from a mount, due to the risk of water left in the barrel leading to increased gas pressure and possible risk to the firer.

Table 2.14 WATER SPRAY TEST PART I

Test Condition	Exposure time (minutes)	Cumulative exposure time (minutes)	Rain (cm)	Cumulative rain (cm)
a) Unloaded. Bolt open and ejection cover open	5	5	5	5
b) Loaded. Bolt closed and ejection cover closed	5	10	5	10
c) Fire according to list (A) below	4	14	4	14
d) Unloaded. Bolt open and ejection cover open	5	19	5	19
e) Loaded. Bolt closed and ejection cover closed	5	24	5	24
f) Fire according to list (B) below	4	28	4	28

Table 2.15 WATER SPRAY TEST PART II

Test Condition Weapon Muzzle Up (2)	Exposure time (minutes)	Cumulative exposure time(mn)	Rain (cm)	Cumulative rain (cm)
a) Unloaded. Bolt open and ejection cover open	5	33	5	33
b) Loaded. Bolt closed and ejection cover closed	5	38	5	38
c) Fire according to list (A) below	4	42	4	42
d) Unloaded. Bolt open and ejection cover open	5	47	5	47
e) Loaded. Bolt closed and ejection cover closed	5	52	5	52
f) Fire according to list (B) below	4	56	4	56
Test Condition Weapon Muzzle Down (2)	Exposure time (minutes)	Cumulative exposure time (mn)	Rain (cm)	Cumulative rain (cm)
a) Bolt open and ejection opening cover open	5	61	5	61
b) Loaded. Bolt closed and ejection opening cover closed	5	66	5	66
c) Fire according to list (A) below	4	70	4	70
d) Bolt open and ejection opening cover open	5 (3)	75	5 (3)	75
e) Loaded. Bolt closed and ejection opening cover closed	5 (3)	80	5 (3)	80
f) Fire according to list (B) below	4 (3)	84	4 (3)	84

Notes :

(1) Throughout the tests, firing is to be carried our with the weapon held horizontally

(2) Before attempting to fire, hold the weapon with muzzle down, unlock bolt slightly and attempt to remove water accumulated in bore.

(3) Or as required to finish programme, with at least 81 cm cumulative rain total.

(A) 100 rounds semi-automatically (kinetic energy weapons), 20 rounds (single shot grenade launchers, 20 rounds (semi and fully automatic grenade launchers)

(B) 100 rounds automatically [controlled burst and fully automatic] (kinetic energy weapons), 20 rounds (single shot grenade launchers, 20 rounds (semi and fully automatic grenade launchers)

2.13.2.3 Results to be Recorded

a. During automatic firing the cyclic rate is to be measured and is to be included in the firing record.

b. Rain totals and timings.

c. Throughout the test the water and air temperatures are to be measured after each firing and are to be included in the firing record.

2.13.2.4 Description of Water Spray Apparatus

a. Water Spray Apparatus

A weapon mounting should be so fitted into a tubular frame so that it can be rotated through 360 degrees. A post at the side allows the water sprays to be adjusted for height and direction.

The water sprays, a total of 10 in 2 rows, each of 5 sprays, should be positioned so that they are 1m above the barrel axis of the weapon and so that the centre point of the whole water spray configuration is over the centre point of the weapon.

The water sprays should be constructed to allow control, through water pressure, of both the required quantity of water (600mm +/- 75mm per hour) and the necessary fine spray droplet size. The water pressure of a head of water of approximately 50m can be provided by a fire engine fitted with a variable pump and a pressure gauge.

The separation of the rain sprays should be 112.5mm between the rows and 195mm within each row.

b. Protective Cabin

If the water spray test is to be carried out in the open then the rain test facility must be protected from the influence of wind. Protection may be achieved by using a cabin with an interior 1.8m long, 1.25 wide and 2.18m high. Entry to the cabin should be from the rear and most of the wall area should be plexi-glass, to permit good observation of the water spray facility and of the weapon under test.

c. Measuring and Control System

The measuring and control system should consist of a water-collecting funnel of 100cm^2 area and a two-part measuring container. The two parts of the measuring container should be placed beside each other, in order to minimise height. The measuring containers should be provided with graduations to enable the quantity of water sprayed to be measured. Using this system the water spray apparatus can be adjusted initially and then controlled during the water spray of the test weapon.

2.13.3 Salt Fog Test

Firings in this section shall be carried out in accordance with US MIL-STD-810E, Method 509.3 and STANAG 4370 and its accompanying AECTP 300, Method 309.

2.13.3.1 Object To determine the degree to which the test weapon/launcher can withstand the deleterious effects of salt fog atmosphere. A minimum of three test weapons are to be used for the tests.

2.13.3.2 Method

2.13.3.2.1 Saline Solution Preparation The salt used for this test shall be sodium chloride containing (on a dry basis) not more than 0.1% sodium iodide and not more than 0.5% total impurities. A solution for the tests is to consist of 4 ± 1% salt (sodium chloride). This is prepared by dissolving 5 parts by weight of salt in 95 parts by weight of water. Before injection into the test chamber, the salt solution shall be heated to within ±6°C of the test chamber temperature. All water used during the salt fog tests shall be from steam or distilled, demineralized , or deioninzed water, and have a pH between 6.5 and 7.2 at 25°C, or have a resistivity of not less than 250,000 ohm centimeters at 25°C. Air velocity in the test chambers shall be minimal (essentially zero). The oil and dirt-free compressed air used to produce the atomized solution shall be preheated (to offset the cooling effects of expansion to atmospheric pressure) and pre-humidified such that the temperature is 35 ± 1°C and the relative humidity is in excess of 85% at the nozzle (see Table 2.16). A minimum exposure period of 48 hours is recommended. Figure 2.8 shows a typical Salt Fog Tank

Table 2.16 TEMPERATURE AND PRESSURE REQUIREMENTS AT 35°C SALT FOG

Air Pressure (kPa)	83	96	110	124
Preheat Temperature (°C) Before atomizing	46	47	48	49

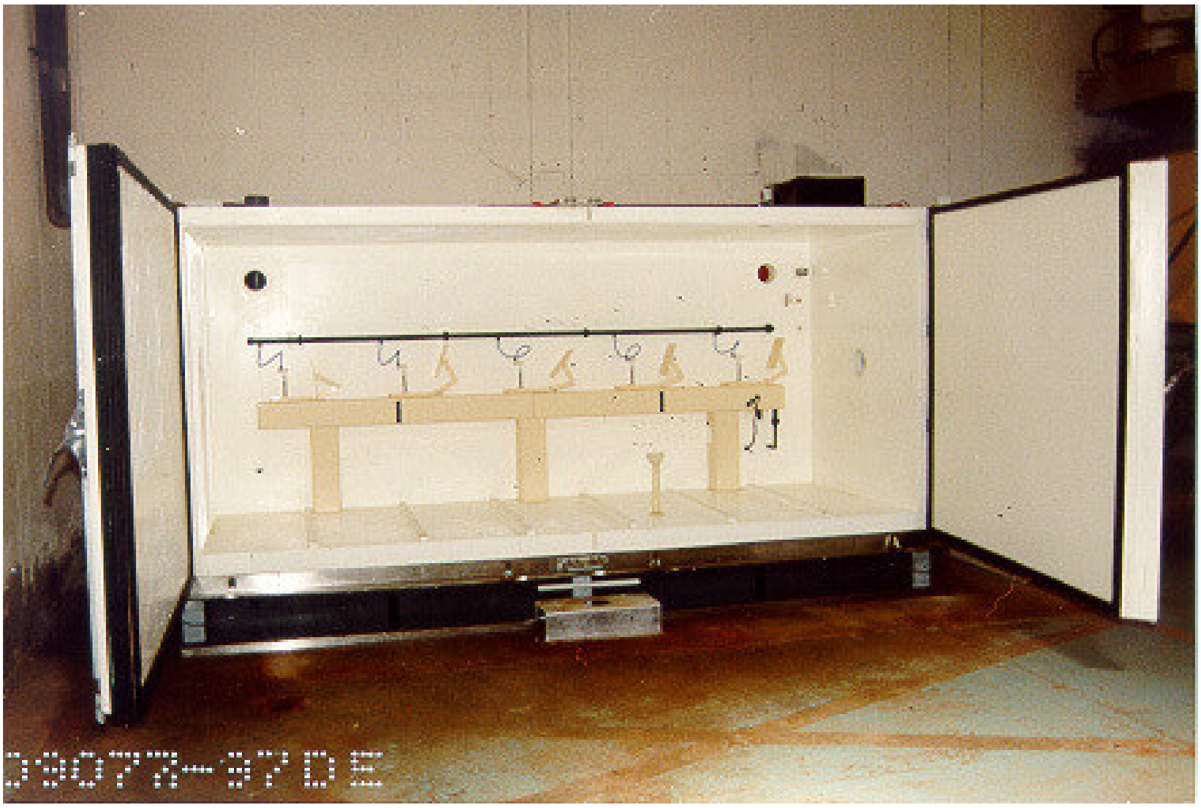


Figure 2.8 **Salt Fog Tank**

2.13.3.2.2 Method - Individual Weapons Disassemble, clean, lubricate and reassemble the test weapons. Load the weapons fully and apply the safety catch. Subject the fully loaded magazines to the salt fog environment, together with enough loaded magazines (or belts) to fire 60 rounds. Remove the weapons from the salt fog environment. Firing shall be conducted as follows:

(1) Weapons with semi-automatic fire capability : fire 60 rounds.

(2) Weapons with semi and fully automatic fire capability : 60 rounds are to be fired, 20 rounds in semi-automatic mode, 20 rounds in short bursts, 20 rounds in continuous burst, measuring the rate of fire.

(3) Weapons with automatic fire capability only : 20 rounds fired in continuous burst, measuring rate of fire and 40 rounds in short bursts.

The following procedure is then to be carried out to establish whether the weapons can be restored to serviceable condition in the field. The weapon should first be lubricated, without being disassembled, and then manipulated by hand several times. Firing should then be attempted. If this fails, a field stripping operation should be performed, additional lubricant applied and another attempt made to fire.

2.13.3.2.3 Method - Support Weapons The details of the test for the Individual Weapon tests (2.13.3.2.2) are to be followed, except for changed details, as follows: The test weapons are to be fully loaded (with a 100 round belt of ammunition or a loaded magazine). Magazine-fed weapons should be accompanied by sufficient loaded magazines to make up 100 rounds. When belt fed weapons are provided with a belt container attached to the weapon, this container is to be used. Firing is to be 100 rounds, fired in 5 round bursts every 3 seconds. The attempt should be made to establish whether serviceability can be restored as above for the Individual Weapon tests (2.13.3.2.2).

2.13.3.2.4 Method - Grenade Launchers The details of the test for Individual Weapons test (2.13.3.2.2) are to be followed, except for the changed details, as follows : If the launchers are semi or fully automatic a belt of 10 grenades is to be used (or 10 grenades in a magazine). In the case of belt fed weapons equipped with a belt conveying device, this is to be used. In the case of a magazine launcher, four grenades on a belt, or loose, are to accompany each weapon. Each launcher is then to fire the specified number of grenades. In the event of non-operation, the cause is to be sought and the components lubricated to ensure proper operation. The attempt should be made to establish whether serviceability can be restored as above for the Individual Weapon tests (2.13.3.2.2).

2.13.3.3 Results to be Recorded Particular attention must be paid to the description of the damage from corrosion, including the use of colour photographs, where appropriate. The results of this test shall be compared against results obtained from firings in which the weapons were not subjected to any adverse conditions.

a. Test duration, salt concentration, salt solution fallout rate, pH, specific gravity, resistivity of initial water and type of water.

b. Test weapon, magazines, ammunition and any ancillary equipment identification

c. Cylic rate for any burst or fully automatic firing

d. Any weapon stoppages or defects and any case casualties shall be recorded and it shall be ascertained whether the salt fog environment may have been responsible

2.13.4 Salt Water Immersion Test – Resistance to Corrosion

2.13.4.1 Object To determine the degree to which the test weapon or launcher can withstand the deleterious effects of immersion in salt water. The test is to take place over at least a 10 day period. A minimum of three test weapons should be used for the tests.

2.13.4.2 Introduction Small Arms are likely to be utilised in amphibious operations during their service life and are susceptible to being immersed in salt water or exposed to a salt laden atmosphere prior to functioning. This will provide a particularly corrosive environment which may adversely affect protective finishes and some plastic/composite material components. The DA is required to produce details of such materials used for weapon components. The test is applicable to all small arms to determine the resistance to corrosion of weapon components. It is not normally one of the sequential environmental tests. Figure 2.9 shows a typical Salt Water Immersion Tank

Figure 2.9 Salt Water Immersion Tank

2.13.4.3 Purpose The purpose of the test is to determine the resistance of the weapon to the deleterious effects of salt water immersion.

2.13.4.4 Stores Required

a. Weapons. One weapon and associated ancillaries are required.

b. Ammunition. The following ammunition is required:

(1) PDW/SMG/IW/Grenade Launcher. 300 rounds Ball or 4B/IT or Practice (Grenade launcher).

(2) LSW/LMG/MG. 500 rounds Ball or 4B/IT

c. Mount. Weapons should be fired from a mount that permits remote firing. For hand held weapons, it should simulate manned firing as closely as possible.

2.13.4.5. Test Facilities. A saline bath in which weapons and ancillaries may be submerged, and a storage chamber with a temperature range + 21°C to + 40°C and relative humidity range 90-95%,

2.13.4.6. Instrumentation. Instrumentation is required to measure cyclic rates of fire. A camera is to be used to photograph damage and corrosion.

2.13.4.7 Saline Solution. A saline solution is to be prepared consisting of 20% salt (sodium chloride) to 80% water by weight. The salt should not contain more than 0.1% sodium iodide or more than 0.2% impurities.

2.13.4.8 Test Procedure

a. General. The test is to be conducted in 4 parts:

(1) Preliminary weapon inspection/preparation.
(2) Salt water immersion and firings.
(3) Temperature and humidity storage/firings.
(4) Post test weapon inspection.

b. Preliminary Weapon Inspection/Preparation. The weapons are to be inspected for general serviceability, cleaned and lubricated in accordance with the DA's instructions. The texture and condition of both metallic and composite material components is to be noted. Where appropriate, ancillaries such as sights and magazines are to be fitted.

2.13.4.9 Salt Water Immersion and Firing.

a. The weapon is to be loaded and the safety catch applied. The fully loaded weapon is to be submerged in the saline solution for 60 seconds together with enough loaded magazines or belts to fire 60 rounds (ODW, SMG, ICW grenade launcher) or 100 rounds (LSW, LMG, MG). Where belt containers are available they should be attached to the weapon.

b. Weapons are to be removed from the solution, the muzzle held down and the bolt retracted slightly to allow the salt water to drain from the weapon.

c. The weapon is then fitted into the mount and fired as follows:

(1) PDW, SMG, ICW, Grenade Launcher

(a) Semi Automatic Weapons - 60 rounds, single shot.
(b) Semi Automatic & Automatic Weapons: 20 rounds single shot followed by 20 rounds in short bursts of 2 - 3 rounds and 20 rounds in a continuous burst..
(c) Automatic Only Weapons - 20 rounds one burst, measuring cyclic rate of fire, followed by 40 rounds in short bursts (2 - 3 rounds).

(2) LSW, LMG, MG - The 100 rounds in bursts of 5 rounds every 3 seconds.

2.13.4.10 Temperature and Humidity Storage/Firings.

a. The weapon is then placed in the storage chamber for 10 days. It is removed on the third, fifth, eighth and tenth days and a further 60 rounds of clean ammunition are fired on each occasion without cleaning or adding lubricant.

b. Between firings the storage conditioning schedule in Table 1 is followed:

Conditioning	Temperature of Chamber			Relative
Time (hours)	Increasing to (°C)	Steady at (°C)	Falling to (°C)	Humidity (%)
(a)	(b)	(c)	(d)	(e)
2	+40			90
16		+40		90
2			+21	95
4		+21		95

Table 2. Storage Chamber Conditioning Schedule

c. If firing malfunctions occur owing to seizure of parts on build up of rust, the following procedure is carried out to establish whether the weapon can be restored to serviceable condition in the field:

(1) The weapon is first lubricated without being disassembled and manipulated by hand several times before an attempt is made to fire it.

(2) A field stripping operation is performed, additional lubricant is applied and another attempt is made to fire.

2.13.4.11 Post Test Weapon Inspection. Weapons and ancillaries are to be inspected on completion of the test. Particular attention is to be paid to the location and extent of corrosion or deterioration of plastics/composite materials.

2.13.4.12 Observation and Records The following data are to be recorded:

a. Weapon type and serial numbers.
b. Ammunition nature and Lot numbers.
c. Test programme and events.
d. Conditioning temperatures and timings.
e. Applied and cyclic rates of fire; time interval between firing sequences.
f. Malfunctions and stoppages.
g. Corrosion; location and extent.

Reference:

1. NATO Document AC/225 (Panel III)(Edition 1992) - Evaluation Procedures for Future NATO Small Arms Weapon Systems.

2.13.5 Sand and Dust: Static and Dynamic Tests

2.13.5.1 Static Sand and Dust Test

2.13.5.1.1 Object To investigate the effects of sand and dust on the weapon's performance

2.13.5.1.2 Method

a. The static sand and dust test is performed by subjecting the weapon to a sand and dust blast in a specially constructed box fitted with a blower. (Photographs of such a box are shown in Figure 2.10).

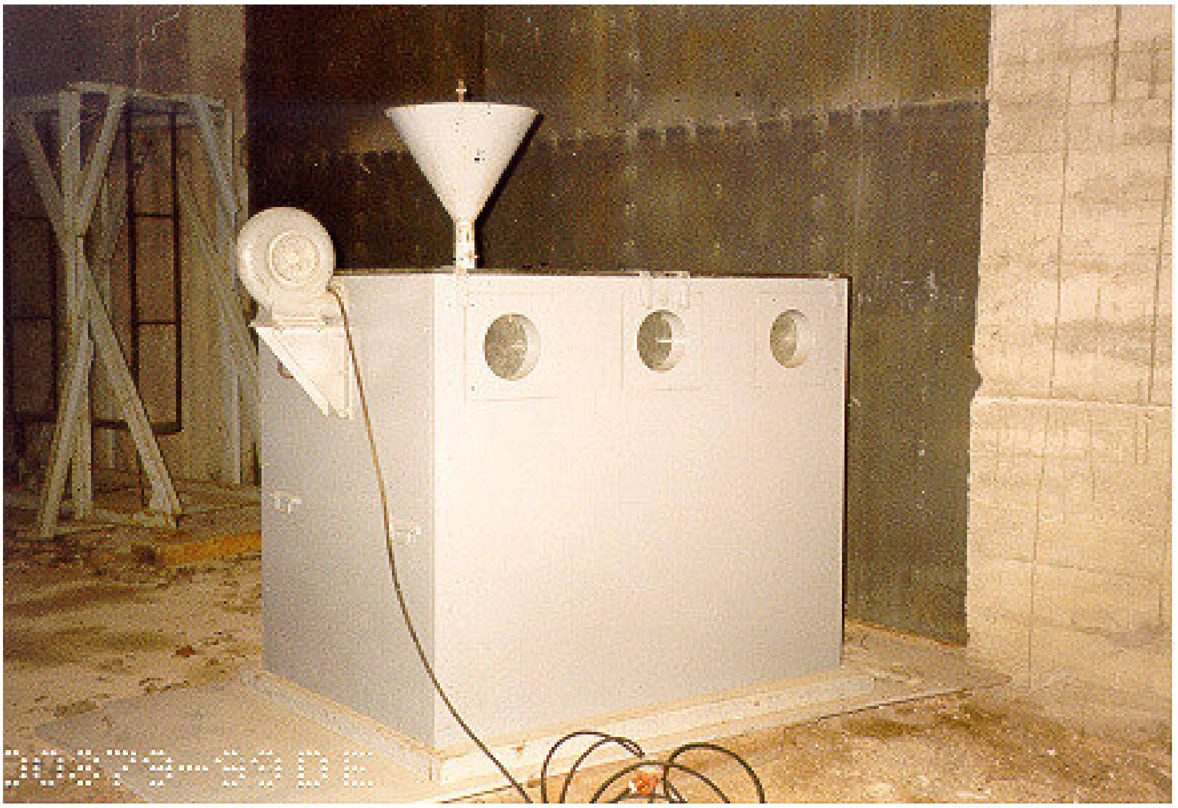


Figure 2.10 Sand and Dust Box

b. The sand and dust box is to be constructed from 19mm plywood and should be 0.90m wide, 0.90m deep and 1.8m long with a removable top and an interior shelf to support the test item. A rotary blower should be mounted at one end of the box midway between the sides, 7.5cm below the top and venting into the box. An additional 7.5cm vent hole, aligned with the blower, should be incorporated at the other end of the box. A 5cm pour hole for the sand and dust mixture should be incorporated in the box cover, 38cm from the blower end of the box and directly in line with the blower opening. The composition of the sand and dust mixture should be as shown in Table 2.17 below:

Table 2.17 SAND AND DUST MIXTURE

	Remaining			
Sieve mesh width (mm)	R (g)	R.100 (%) SR	Total (%) through Mesh	Remarks
2.0	-	-	100.0	
1.0	-	-	100.0	
0.63	19.4	9.7	90.3	
0.4	20.0	10.0	80.3	
0.2	63.2	31.6	48.7	
0.1	34.0	17.0	31.7	
0.063	53.2	26.6	5.1	
-	10.2	5.1	-	
Total SR	200.0	100.0	-	

c. Individual Weapons Clean and lubricate three test weapons and close the muzzles with adhesive tape. For weapons fired from a closed bolt put one round in the chamber. Weapons fired from and open bolt are to have the bolt closed on an empty chamber. Close the dust cover and engage the safety catch. Insert a fully loaded magazine into the weapon. Expose the weapon as follows ;

(1) place the weapon in the centre of the box, forward of the pour hole and fasten the box lid;

(2) operate the blower to have an air speed of approximately 16 m/s as the sand and dust mixture is poured through the hole at a rate of 2270g per minute;

(3) after one minute, stop the blower, remove the lid and turn the weapon upside down in the box. Replace the lid and repeat the sand and dust blast for another minute.

Remove the weapon from the box and wipe clean with bare hands. Clean congested parts as well as possible, either by blowing sharply on them or by shaking the weapon. Remove the tape from the muzzle and fire the weapon. If repeated malfunctions make this impossible, attempt to fire with a clean magazine loaded with clean ammunition. Record the number of attempts made to overcome each malfunction. Repeat the test with the other two weapons. If necessary, the test is to be repeated with a weapon which has been wiped clean of lubricant and also with dry film lubricants, as recommended by the manufacturer.

d. Support Weapons The general procedure for Individual Weapons is to be followed, with the following exceptions:

(1) Weapon is to be loaded into the box fitted with either a 50 round belt or a fully loaded magazine, as appropriate;

(2) Following the removal of excess sand and dust, an attempt should be made to fire a 50 round burst (or a full magazine). If the weapon fails to function, the weapon feed or breech cover is to be opened and additional cleaning should be carried out, as specified above, and a further attempt made to fire the weapon;

(3) If performance is still not satisfactory, another attempt is to be made to fire with a belt or magazine of clean ammunition;

(4) If the weapon fires from an open bolt position and fails to function satisfactorily with clean ammunition, the test is to be repeated with the bolt closed and the weapon half loaded before exposure;

(5) If necessary, repeat the test with a dry weapon or one lubricated using dry film lubricant.

e. Grenade Launchers The general procedure for Individual Weapons is to be followed, with the following exceptions:

(1) In the case of a magazine weapon there are to be 9 grenades on a belt, or loose, in the sand and dust box during the test. If the launcher is a single shot weapon 10 grenades are to be fired from each launcher in the course of this test. If the launcher is semi or fully automatic 20 grenades are to be fired from each launcher during the course of the test.

f. Results to be Recorded

(1) Details of the sand and dust mixture and the rate blown into the box;

(2) Details of weapon mounting in box;
(3) Number of attempts made to overcome each malfunction

2.13.5.2 Dynamic Sand and Dust Test

2.13.5.2.1 Object To investigate the effects resulting from pouring a mixture of sand and dust onto the weapon whilst it is being fired.

2.13.5.2.2 Method

a. Individual Weapons

(1) Installation

The sand and dust box is to be constructed from 25mm plywood and should be 0.90m wide, 1.20m deep and 1.40m long with perspex sides and a gun cradle inside to hold the weapon. A rotary blower, with 30cm blades, either hand operated or motorised, similar to those commonly used in a blacksmith's forge, should be mounted at one end of the box midway between the sides, 7.5cm below the top and venting into the box. An additional 7.5cm vent hole, aligned with the blower, should be incorporated at the other end of the box. A 5cm pour hole for the sand and dust mixture should be incorporated in the box cover, 38cm from the blower end of the box and directly in line with the blower opening.

One pair of rubber gauntlet-type gloves for the firer at to be attached on the left hand side of the box and another pair on the right hand side. These gloves provide dust-sealed access to the weapon and permit full control of the weapon, including loading the magazines and firing. For tests involving grenade launchers the test equipment must have a 15cm opening through which the grenades will pass upon firing. The composition of the sand and dust mixture should be as shown in the table for the static sand and dust test.

(2) Procedure

(a) Clean and lubricate three test weapons and load 150 rounds per weapon. The test is to be conducted with each weapon exposed to the dynamic dust environment during firing.

(b) Install the test weapon in the gun cradle, insert a loaded magazine and put the first round in the chamber. If the weapon has a dust cover, close this before firing the first round. Cover the remaining magazines with plastic bags and place them in the dust box.

(c) While the dust is being poured through the pour hole at the rate of 1kg per minute and the blower is turning at 60rpm, fire 150 rounds in 20 round series. The firing rate is to be one 20 round series every 20 seconds, resulting in a total test time of approximately two and a half minutes. One third of each magazine is to be fired single shot, the remainder in short bursts of 3 to 5 rounds;

(d) Use a firing rate recorded continuously throughout each test, so that a chronological record of the total test time, the time elapsed up to the first malfunction, the time taken to remedy it, etc. As well as the rate of fire itself, is obtained. The total time during which the bolt remains open (to remedy malfunctions, change magazines, etc.) is a critical measurement in this test;

(e) If the firings are completed without the occurrence of a malfunction which cannot be remedied by immediate action (i.e. A malfunction necessitating the use of tools or disassembly of the weapon), continue the test until such a malfunction occurs, or until the 150 rounds have been fired. Repeat the test with the other two weapons;

(f) if necessary, the test is to be repeated with the weapon wiped clean of all lubricants, also with dry film lubricants, as recommended by the manufacturer.

b. Support Weapons The general procedure for this test will follow that for the Individual Weapons, with the following exceptions;

(1) The test chamber dimensions are to be 1.77m long, 0.87m wide and 0.95m high. Side walls and removable top to be made from a transparent material, such as plexi-glass. The test chamber and the methods used for weapon mounting may be similar to those used for the toxicity tests, except that the system used to catch fired cases in the toxicity measurement trials would hinder the free access of the sand and dust mixture to the test weapon. Suitable rubber mats are to be hung in front of the plexi-glass, appropriate to the direction of ejection, to protect it. The sand and dust blower is to be dismountable and is to be designed so that it can be used for both the static and dynamic sand and dust tests. The electrically powered rotary blower (as manufactured, for example, by Electrostar, Type 59180) should have a nominal power of 250 Watts (220v AC supply). The sand and dust mixture should be poured from a container into the blower at a regulated rate. A deflector plate within the test chamber at the blower

output opening is to be used to ensure an equal distribution of the sand and dust mixture within the chamber.

Blower performance is to be monitored and maintained within the following values :

(a) Air speed - approximately 45 m/s

(b) Air throughput - approximately 0.043 m^3/s

Note should be made that, in previous tests, test personnel have experienced problems in correctly handling weapons from outside of this chamber, particularly for the clearance of malfunctions. It is desirable that a future chamber should allow a man to sit inside (or partially inside) the chamber, with full protection against the dust and with an external air supply. Only then will normal handling of the weapons give comparable results.

(1) Ammunition (belted or in magazines) is to be limited to a quantity at least 25 rounds below the number of rounds required to produce cook-off. A single belt of ammunition is to be housed in the storage container for the weapon's accessory equipment and is to be fired in seven equal series, beginning at intervals of 20 seconds:

(2) The firing sequence is to be :

(i) Light Support Weapon:
Magazines or belts are to be fired alternately, as follows;
1st, 3rd, 5th, 7th magazine or belt - Automatic fire
2nd, 4th, 6th magazine or belt - short bursts of 3 to 5 rounds

(ii) Medium / Heavy Support Weapon:
As for Light Support Weapon, or all belts automatic

c. Grenade Launchers
The general procedure for this test will follow that for the Individual Weapons, with the following exceptions;

(1) If belted ammunition is used it should remain in the belts during this test procedure. The rate of fire during these tests is to be 6 rounds per minute for magazine and 20 rounds per minute for semi and fully automatic launchers:

(2) In all cases the total duration of the test must be 2½ minutes. If no malfunction occurs during the test of a type

which cannot be rectified on the spot, the test is to be repeated until such time as a malfunction of this type occurs, or until the test has been carried out three times.

d. Results to be recorded

(1) Details of the sand and dust mixture and the rate blown into the box;
(2) Details of weapon mounting in box;
(3) Number of attempts made to overcome each malfunction;
(4) Limitations (because of interface hand openings; weapon controls - cocking lever, etc.) on rectification of malfunctions;
(5) a chronological record of the total test time, the time elapsed up to the first malfunction, the time taken to remedy it, etc. As well as the rate of fire itself, is obtained. The total time during which the bolt remains open (to remedy malfunctions, change magazines, etc.) is a critical measurement in this test.

2.13.6 **Sand Drag Test**

2.13.6.1 Object To determine the effects of sand on the functioning performance of the weapon, by simulating the conditions to be expected when the user is crawling in sandy terrain.

2.13.6.2 Equipment

a. The sand trough should be 4.5m long, 45cm wide and 25cm deep. It should contain four tubular heaters, each about 183cm long, with an output of 60 watts per 0.3m run. These should be run at about 44^{o}C throughout the test. The weapon to be dragged should be secured in a carriage, designed to hold the weapon in the correct orientation and depth throughout the drag, riding along the top of the trough. An example of a suitable carriage is shown in Figures 2.11

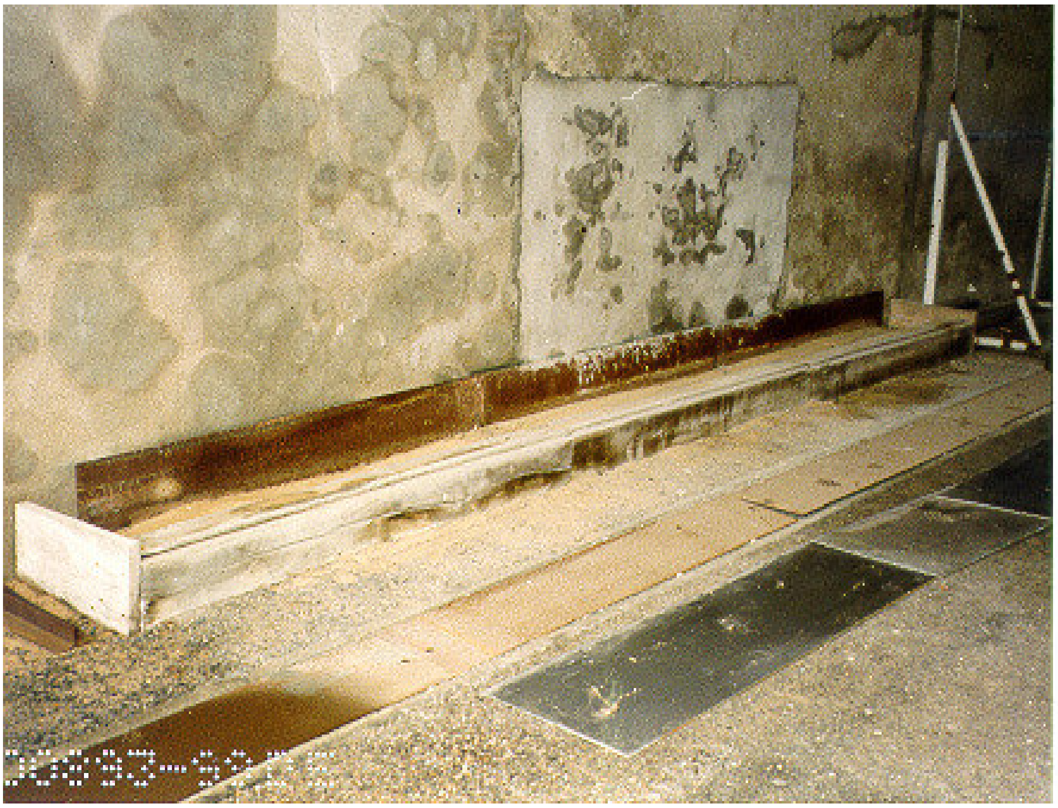


Figure 2.11.1 Sand Drag Carriage Trough

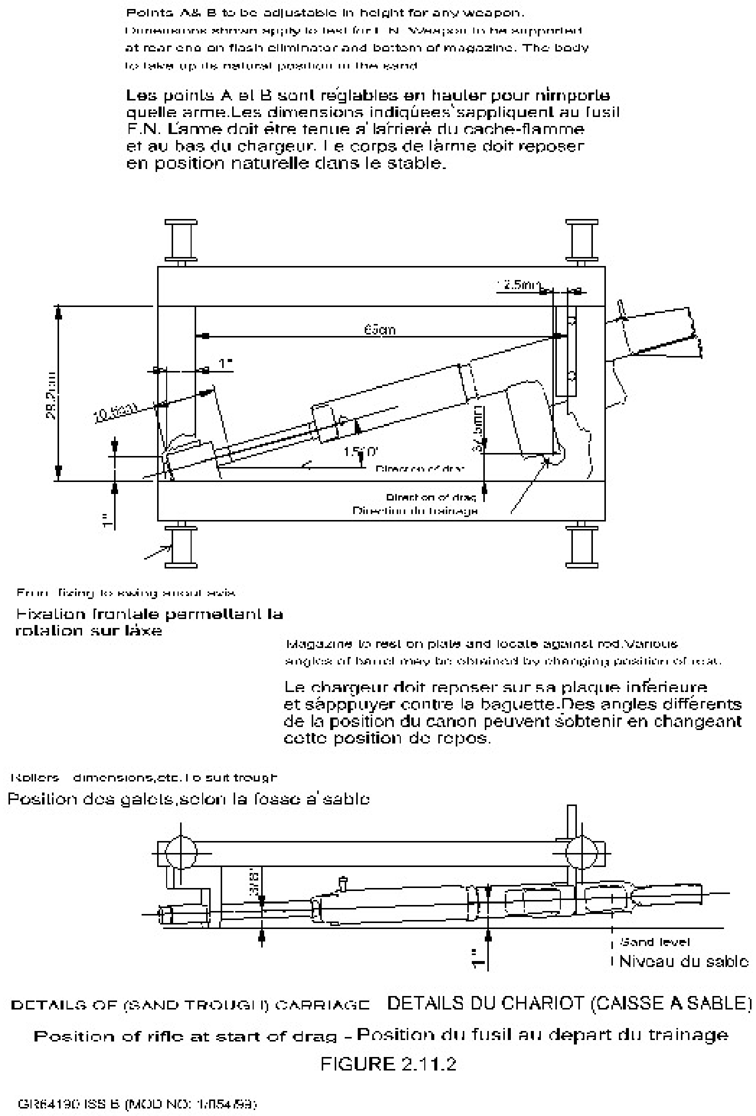


Figure 2.11.2 Sand Drag Carriage Support

a.The trough is to be filled with sand as used for the blown sand tests, to 7.5cm from the top in accordance with 2.13.5.1.2.b.

a. The weapon is to be prepared for dragging as for the blown sand test. It is to be wiped dry and is to have a loaded magazine or belt fitted.

2.13.6.3 Method

a. A control weapon should be subjected to the test under identical conditions.

b. Before the test the weapon is to be shown to be functioning correctly by the firing of one magazine (20 rounds) or 1 belt (50 rounds). The first half of the magazine or belt shall be fired at a slow rate or in single shots, the second half in bursts

c. The loaded weapon, with the muzzle protected, should be placed with its right side on the surface of the sand, with the muzzle pointing in the direction in which it is to be dragged and at about 15^{o} to the line of the trough. A slight downward pressure of the hand will establish the weapon position. The carriage should then be moved over the weapon and adjusted to secure it in the position it had taken up. Data establishing the position of the weapon is to be recorded, as will the position of any adjustable components which may materially affect the result of the drag (e.g. bipod removed / folded / open, carrying handle raised / lowered, etc.)

d. The weapon should be dragged by moving the carriage, to the furthest end of the trough at the speed of a fast crawl, i.e. approximately 1 m/s.

e. Upon completion of the drag the loaded weapon should be removed from the carriage and loose sand shaken or blown off for a period not exceeding 5 seconds. The muzzle plug should then be removed and five single shots fired at intervals of 3 seconds. The safety device and muzzle plug should then be re-applied and the dust covers closed. The weapon should then be returned to the carriage, positioned on its left side, ready for another drag.

f. A total of 20 drags are to be conducted, 10 with the weapon on its right side and 10 with the weapon on its left side, or until the weapon fails to fire after immediate action drills or the immediate action drill is necessary in three consecutive drags.

g. The immediate action drill if the weapon fails to fire, or if a stoppage occurs, is to unload the weapon (i.e. remove the magazine or belt), cock and press the trigger three times, reload and continue the test.

h. Whenever a magazine or belt becomes empty as a result of firing, or through loss of rounds because of malfunctioning, it should be replaced with a clean, fully loaded one. A round should be fed into the chamber and the test continued.

2.13.6.4 Results to be Recorded

a. All stoppages and malfunctions.
b. Where possible, all ejection paths (direction and distance from weapon). Single shot ejection paths should, where possible, be recorded individually, but rapid or automatic fire should be recorded by the average of each burst.
c. Details of the manner in which the weapon was supported on the carriage and any deviations from the general instructions.

2.13.7 Mud

2.13.7.1 Object To determine the functioning threshold or performance level of the weapon after immersion in mud baths of increasing density. The period of time elapsing between the removal of the weapon from the mud bath and firing must be as short as possible (and ideally should not exceed 60 seconds).

2.13.7.2 Method

a. Each weapon should be prepared for the mud test in the same manner as for the static sand and dust test (2.13.5.1). The weapon, fully loaded, should be submerged and agitated in a mud bath for 60 seconds prior to being prepared for firing as in the dust test. The test weapon should fire a complete magazine or belt, using the following modes of fire, in turn :

- Limited bursts
- Automatic
- Semi-automatic

b. Each weapon should be subjected to this test, using 12 successive mud baths, having been thoroughly cleaned and prepared in the same way as for the sand test prior to immersion in each bath. The successive mud baths should have the following compositions as shown in Table 2.18:

Table 2.18 MUD BATH COMPOSITION

	Ingredients		
Bath No.	**Clay (kg)**	**Sand (kg)**	**Water (l)**
1	0.1	-	10
2	0.3	-	10
3	0.5	-	10
4	1	-	10
5	3	-	10
6	5	-	10
7	1	0.5	10
8	1	1.0	10
9	3	0.5	10
10	3	1.0	10
11	5	0.5	10
12	5	1.0	10

The clay used should be obtained at depths sufficient to ensure that it is the non-sandy type. The sand used should be of the same kind as that used for the sand and dust tests (for sand analysis see section 2.13.5.1.2)

c. Firing Sequence

(1) Individual Weapon : a filled magazine is to be fired in 5 single shots and the remainder in short bursts of 3-5 rounds

(2) Light Support Weapon : a 50-round belt is to be fired in 6 short bursts of 3-5 rounds each, the remainder in automatic fire

d. Method

(1) The test is to start with mud bath no. 6, followed, in sequence, by baths nos. 8, 10 and 12. If premature failures of functioning occur, one of the intermediate baths (no. 9 or no. 11) should be used.

If the weapon fails to function after immersion in bath no. 6, the test should continue with bath no. 1.

(2) Loading of the Weapon:

(i) Closed -Bolt Weapons : the filled magazine should be inserted, a cartridge fed into the chamber, the dust cover closed and the weapon set to “Safe”

(ii) Open-Bolt Weapons : the bolt is to be put into its forward position, a filled magazine, or a 50-round belt, inserted and the dust cover closed.

(3) Immersion in the Mud Bath and Preparation for Firing.

The loaded weapon is to be immersed and agitated in the mud bath for 60 seconds. The weapon should then be removed from the bath and cleaned, as far as possible, within 30 seconds by heavy shaking and by blowing off. The adhesive tape covering the muzzle may now be removed.

(4) Firing Stages

Firing is to commence 60 seconds after removal of the weapon from the mud bath.

Firing Stage 1 : A filled magazine, or belt, is to be tried and fired in the specified sequence.

Firing Stage 2 : If any malfunctions occur during the first firing stage a second firing is to be attempted, using a clean magazine or belt.

2.13.7.3 Results to be Recorded

a. Details of the mud mixture and tank

b. Sequence of baths used

c. Bath at which failure to function occurred

2.14 COOK-OFF AND BARREL HEATING

This test must be completed early in the test programme to provide information on the safety limitation of the weapons during certain other tests.

2.14.1 Object

2.14.1.1 Small Arms Small arms weapons cook-off tests are designed to identify cook-off levels as a function of rounds fired at various firing rates and to evaluate certain potentially hazardous conditions which may occur during sustained firing exercises. The major considerations are as follows :

a. To evaluate the structural integrity of the weapon during sustained fire;

b. To determine the number of rounds fired, at various firing rates, that will produce cartridge cook-off;

c. To determine, in the event of a cook-off, if weapon damage or injury to personnel may occur in addition to the hazard of inadvertent fire;

d. To determine where HE ammunition is being fired , in the event of a cook-off, if the HE projectile will be safely launched or whether the HE material may itself cook-off prior to the propellant cook-off.

2.14.1.2 Grenade Launchers

a. High explosive ammunition must not be tested for cook-off in the tactical weapon until an Ammunition Cook-Off test (see Section 5.3) has been completed. This is carried out by artificially heating, by remote control, the chamber area of a slave mechanism until a propellant cook-off of HE ammunition occurs in each of five separate trials. (The cartridges for grenade launchers usually contain high explosive or some chemical solution for which deflagration data must be provided, or an investigation must be made to determine whether the components in the projectile cook-off before the propellant or primer). Limited cook-off firings may then be conducted with high explosive ammunition in the test weapon, but firing must be done by remote control.

b. As a rule, cook-off in grenade launchers does not present any great problems, since the rate of fire is usually fairly low, leaving time for a cooling process. A special test must be carried out whenever there is thought to be a possibility of cook-off, for example, if the grenade launcher is capable of continuous fire, or if it is mounted on a weapon with a very high rate of fire, the heat transmitted from the weapon being considered sufficient to cause the possibility of cook-off.

2.14.2 Method

2.14.2.1 Test Environment Normally a partially enclosed firing shelter which protects the test weapons and ammunition from exposure to direct sunlight, wind and precipitation is considered permissible, provided that the ambient air temperature is 21 +/- 11^{o}C. Where ambient air temperature exceeds the limits, a heated or air-conditioned fully enclosed firing chamber, incorporating a firing port and an air exhaustion system to avoid carbon monoxide hazards is necessary. The temperature of the environment of the weapon is to be recorded with a maximum and minimum thermometer, the distance from the point of measurement to the weapon being noted in the test report.

2.14.2.2 Instrumentation and Range Equipment

a. Iron-constantan lead-wire thermocouples are to be attached to the weapon by miniature arc welding on the exterior muzzle device (or on the exterior of the barrel at the muzzle if no muzzle device is present), on the exterior of the barrel immediately over the chamber mouth and on the exterior of the barrel proper at the point of smallest outside diameter. Four single-channel recorders are to be employed in conjunction with the thermocouples to provide ambient air temperature data as well as continuous traces of temperature information as a function of time. The capability to record temperatures to +815^{o}C is required.

b. For measurement of hand guard temperature (where appropriate) two thermo-elements are to be attached to the outside of the hand guard or, if there is no hand guard, at the place where the weapon would be grasped when making a rapid change of firing position. The measuring point used for each weapon is to be shown in the test report. Measurements are to be made at a practical rate of fire (rate of fire with magazine change), using suitable apparatus.

c. A stop watch is to be used to measure the time between chambering of the round and cook-off.

d. A test fixture to support the weapon is required. Belt fed weapons may be fired remotely but magazine fed weapons require a 25mm thick perspex shield to protect personnel during testing. Test personnel must be supplied with, as a minimum, ear protection, safety glasses, a face shield and gloves.

e. For weapons which fire from an open bolt position a specially prepared cook-off round will be required, to permit chambering, but not firing, of the final round. This can often be achieved by attaching a thin shim over the primer face and allowing the breech mechanism to run out gently under control. It can also be accomplished, although less desirably, by employing an inert or dummy primer in an otherwise live round, if the primer is known to be less sensitive to cook-off than the propellant.

f. A facility to provide a source of compressed cool air through a hose and metal fitting which is then positioned in the chamber of a heated weapon permits testing to be completed at a faster pace than by natural cooling.

g. A single shot mechanism and barrel may also be required to conduct preliminary HE ammunition firing, as discussed in section 2.14.2.6.

2.14.2.3 Weapon Inspection A thorough inspection of the weapon is to be made before initiation of the firing tests. Weapon components that will be subjected to the greatest stresses during firing (bolt, locking lugs, barrel, muzzle device, etc.) should be visually examined and then subjected to magnetic particle inspection. At the conclusion of firing the weapon components are again to be visually and magnetic particle inspected.

2.14.2.4 Weapons Firing Conventional Ammunition

a. Method

(1) Three series of firings are to be carried out, each series at a different rate of fire. Unless otherwise advised by the manufacturer, the first series is to begin with 200 rounds;

(2) If, on the first firing of a series, cook-off occurs, then the number of rounds should be progressively decreased by 10 rounds in each subsequent firing, until no cook-off occurs. To confirm this result, four further firings are to be carried out;

(3) If, on the first firing of a series, no cook-off occurs, then the number of rounds should be progressively increased by 20 rounds per firing either until cook-off occurs or a specific number of rounds is reached (e.g. 400 for an Individual weapon, 500 for a Light Support Weapon);

(4) When the manufacturer has advised the number of rounds for cook-off the first firing of each series should begin with this number of rounds.

b. Firing Detail The rates of fire are to be as follows :

(1) Automatic fire :- the highest rate of fire possible;
(2) Rapid single shots :- approximately 60 rounds per minute;
(3) Controlled bursts :- normally 3 rounds every 5 seconds

c. Other Firing Schedules Other firing rates, in addition to firing as rapidly as possible (rapid, single shot fire in particular) using the same amount of ammunition, may also require evaluation. Certain described tactical firing rates may be worth evaluating as well as technical consideration concerning weapons which employ dual automatic firing rates or incorporate variable burst length devices. However, once the maximum rate schedule has been completed limited single trials at other rates can be compared to the maximum rate schedule which will then usually provide sufficient time, temperature, and route fired information.

d. Types of Ammunition

(1) The initial firing trials are to be conducted with ordinary ball-type ammunition. Following these trials other types of ammunition may be fired in limited exercises and the time-temperature data compared to ball ammunition firings. In those instances were a different propellant type is employed it will be necessary to conduct a full schedule of cook-of and confirmatory trials.

(2) HE-type ammunition should not be tested for cook-off in the tactical weapon until a simulated exercise employing a single shot slave mechanism and barrel has confirmed that propellant cook-off occurs before HE cook-off can occur, and that the HE projectile is safe to launch. This is conducted by artificially heating, by remote control, the chamber area of the slave mechanism until a propellant cook-off of HE cartridges occurs in each of the five trials. Limited cook-off firings may then be conducted with HE ammunition in the test weapon but firing must be done remotely.

2.14.2.5 Crew Served Grenade Launchers

a. If the launcher can be fired at a continuous rate, so that a possibility for cook-off exists, a firing exercise must be conducted. This consists of firing a predetermined number of rounds using the most severe firing schedule anticipated to be employed with the weapon. The number of rounds fired is to be based on experience with the test weapon, or one that is similar. Fire the predetermined number of rounds and chamber the last round of the belt or magazine by automatic gun action. When the weapon fires from an open bolt the last round is to be specially prepared to permit bolt closure without firing. This can be accomplished by assembling a primer without an anvil, or by recessing the primer 0.25cm.

b. After chambering the final round and closing the bolt, wait 30 minutes. If the round fails to cook-off, fire it. In the open bolt design gun, extract the modified cartridges that failed to cook-off, eject into suitable metal containers filled with water and then destroy it. If cook-off does not occur with the maximum number of rounds estimated, increase the number fired until the cook-off point is determined. Substantiate the cook-off point by firing five trials during which cook-off does not occur. The confirmatory firing (non cook-off level) is to consist of 10 rounds less than the number to produce cook-off in continuous firing, or one burst less than the number that produced a cook-off during burst firings.

2.14.2.6 Individual Grenade Launchers

a. The test is to be conducted by firing a number of rounds (calculated on the basis of past experience) under the most stringent firing conditions that the weapon can withstand. The planned number of rounds is to be fired, the last round of the belt or magazine being chambered automatically (in the case of an open bolt weapon the last round is to consist of specially prepared ammunition which enables the bolt to be closed without firing, by using, for instance, a primer without an anvil, or by recessing the primer 0.25cm).

b. After chambering the final round and closing the bolt, wait 30 minutes. If the round fails to cook-off, fire it. In the open bolt design gun, extract the modified cartridges that failed to cook-off, eject into suitable metal containers filled with water and then destroy it.

c. If the launcher is an attachment type (e.g. US M203) for a weapon from which sufficient heat could be conducted to cause cook-off of a chambered cartridge in the launcher. An exercise must be conducted to determine whether the chamber area in the launcher remains safely below the cook-off temperature of the components in the grenade cartridge. This exercise consists of attaching thermocouples to the components of an inert grenade cartridge chambered in the launcher, The weapon is then fired, using the most severe firing schedule which can be employed and the heat conducted to the chambered cartridge is recorded. These firings are to be conducted in a range environment of $+21 \pm 5^{o}C$ with both weapons shielded to prevent direct exposure to the sun and rapid cooling from air circulation.

2.14.2.7 Rifle Grenades With this type of weapon the risk of cook-off of the grenade is nil. This risk only exists with the launching cartridge and the method described in Section 2.14.2.6 must then be used.

2.14.3 Results to be Recorded

a. Timings of firing;

b. Number of rounds fired until :

(1) cook-off;
(2) NO cook-off.

c. Continuous temperature measurement :

(1) barrel;
(2) hand guard;
(3) ambient temperature.

d. Weapon inspection details and comparison with those obtained in Section 2.1.

e. Damage to weapon or any unusual event

f. The measurement obtained for the hand guard temperature is to be used subsequently in Section 2.8.4 (Hand Guard Temperature)

2.15 ROUGH HANDLING

2.15.1 Object The purpose of the rough handling test procedure is to simulate, under laboratory conditions, the type of handling to which the weapon will be subjected when in transit and in the hands of troops. Sniper's weapons with telescopic sights and weapons with special sighting devices may require amendment to this test procedure to allow the use of tactical packaging. For grenade launchers, it is possible that damage may occur to the weapon during the tests. If rough handling drop tests are required on a grenade launcher, these should be conducted after the completion of all other tests. Tests should be conducted in accordance with STANAG 4370 and AECTP 400.

2.15.2 Mechanical Stresses During Transport

2.15.2.1 Definition of the Tests The weapon systems should be able to withstand up to 4800 km of ground transport and three hours of air transport. The stresses occurring during this transport can be simulated in a laboratory by the vibration tests, jolting tests and bouncing tests described below: As far as possible, these tests should be carried out at temperatures of -32°C, +21°C and +54°C, or after conditioning the material at these temperatures.

a. Sinusoidal Vibration The equipment, firmly attached to the test bench, should be excited according to the following procedure :

- rectilinear sinusoidal vibration ;
- frequency range : 5 to 500 Hz;
- levels : ± 6mm from 5 to 10 Hz
  ±2.5g from 10 to 36 Hz
  ±0.5mm from 36 to 50 Hz
  ±5g from 50 to 500 Hz
- (regardless of the weight of the equipment)
- control of acceleration at the points where the equipment is attached to the bench :
- speed of logarithmic scanning : one 5 - 500 - 5 Hz scan in 15 minutes

- duration of the test : 3 hours (1 hour for each of the three perpendicular axes of the equipment).

b. Jolting The equipment, firmly attached to the test bench (as for the previous test), should be subjected to repeated jolts under the following conditions :

- rate : approximately two jolts per second
- characteristics of jolts : these correspond to a free fall from a height of 38mm onto a resilient surface :
- form : semi - sinusoidal :

- duration : 6 milliseconds
- amplitude : 40 g +/- 20%
- extent of the tests : 1000 jolts for each of the three perpendicular axes of the equipment and in each direction (a total of 6000 jolts per equipment).

Bouncing (transportation in a cross-country vehicle)

The equipment should be placed on the wooden tray of a package tester, which consists of a horizontal bench which oscillates in the vertical plane (amplitude of oscillations : 12.5mm ; frequency : 248 +/- 2 oscillations per minute). The equipment should be placed on each of the possible supporting surfaces in turn. In each case lateral movements of the equipment should be limited to 5cm in any direction by wooden barriers. An example of the test sequence is given below in Table 2.19.

Table 2.19 VIBRATION, JOLTING, BOUNCING – WEAPON ATTITUDE AND DURATION

Test Position of the Weapon	Test Conditions
Horizontal, top up	Mounting / Attaining test temperature
	Vibration - one hour Jolting - 2000 jolts
Horizontal, on left side	Repositioning / Attaining test temperature
	Vibration - one hour Jolting - 1000 jolts
Vertical, butt down	Repositioning / Attaining test temperature
	Vibration - one hour Jolting - 2000 jolts
Horizontal, on left side	Mounting / Attaining test temperature
	Bouncing - one hour
Horizontal, on right side	Turning weapon over / Attaining test temperature
	Bouncing - one hour
Vertical, butt down	Repositioning / Attaining test temperature
	Bouncing - one hour
For Light Support Weapons ONLY	Repositioning / Attaining test temperature
Horizontal - top up - using bipod	Bouncing - one hour

The duration of the test shall be three hours total, with each of the possible positions of the equipment being allotted equal time.

2.15.2.2 Equipment Tested and Results to be Recorded

a. The weapons, without ancillary equipment (with safety catch released and with a magazine or belt filled with inert rounds) should be firmly attached for the vibration and jolting tests., Weapons are to be subjected to the bouncing test singly and are to be laid on the right and left sides in turn and, where appropriate, rested on their stand, bipod, tripod, etc.), also held upright by the barrel and rested on the butt so as to simulate the bouncing movement experienced by a weapon held by a combatant seated in a truck. The test should be repeated with the change lever in each position.

b. At the end of the tests a visual inspection should be carried out (to record unscrewing of parts, damaged parts, etc.) and the functioning of the weapon should be tested. A report on the handling and operational safety should be drawn up.

See also STANAG 4242 – For vibration tests in armoured vehicles and AOP 34.

2.15.3 **Dropping Test** Rough handling is likely to occur during parachute jumping, parachute dropping, jumping off a vehicle and handling operations.

2.15.3.1 Parachute Jumping

a. Position of Weapon: Vertical, butt folded (where appropriate), weapon in parachute pack.

b. State of Weapon: Cocked, full magazine of ball and blank ammunition in position, safety catch released and change lever in each position. The weight of the magazine has to be equal to that of a magazine filled with live ammunition. The first cartridge in the magazine must be a blank cartridge.

c. State of Ground at Point of Impact: Firm ground, either natural or a boxed sample, with no exposed rocks. It should have a cone penetrometer reading (cone index) of 122 +/- 5, which equates to 17.13 ± .685 kPa. Cone penetrometer test equipment and procedures are presented in Annex J.

d. Test Conditions: Three free falls from a height of 12m (40 ft), that is covered by STANAG 4375: Safety Drop, Munition Test Procedures. Before and after each fall carry out inspection of the weapon and optical verification of parallelism between the axis of the bore and the line of sight. Accuracy firings should be carried out before and after the test. A report on handling and functioning safety should be produced.

2.15.3.2 Dropping (Free Fall and with Parachute)

a. State of Ground at Point of Impact : Details as for test 2.15.3.1

b. Test Conditions : Free fall onto firm meadowland from a height of 4.5m (15ft). Weapons in dropping containers must fall in such a way that each time at least one container receives its impact on its base, on each side and on one longitudinal and one transversal edge. After this test a functioning test is to be carried out, after visual inspection and noting of damage. A report on handling and functioning safety should be produced.

2.15.3.3 Dropping of Weapon from a Vehicle

a. Drop one weapon onto a concrete surface from 1.5m, replacing any broken parts after each stage of the test. At the manufacturer's recommendation, certain positions may be omitted, but this fact must be clearly recorded.

a. Positions of the Weapon:
  Vertical, butt down
  Vertical, muzzle down
  Horizontal, on right side
  Horizontal, on left side
  Horizontal, top up
  Horizontal, bottom up

c. State of Weapon : Cocked, full magazine charged with ammunition with live primer / cap, but with propellant removed, in position, safety catch released and change lever in each position. The weight of the magazine should equal that of one filled with live ammunition. The first cartridge in the magazine must be a blank cartridge. Before and after each fall carry out inspection of the weapon and optical verification of parallelism between the axis of the bore and the line of sight. Accuracy firings should be carried out before and after the test. The time and ease of replacement of damaged parts / components should be checked (replacing magazine etc.). A report on handling and functioning safety should be produced.

2.16 SPECIAL EFFECTS

2.16.1 Quality of Surface Protection

2.16.1.1 Object Examination of resistance to wear and shocks; examination of the reflection due to illumination by visible or infra-red light

2.16.1.2 Method

a. Measurements in the Visual Sector :

(1) The weapon should be mounted on a round table, rotatable through 360 degrees.
(2) For the simulation of sunshine a searchlight BSW 301 (with a halogen lamp) should be used, at a distance of 40m from the weapon. Measurement is to be made of the reflected emission from the weapon, using a Pritchard-Photometer;
(3) Measurement of the overall emission from the weapon with a larger aperture and appropriate distance. Weapon components giving particularly strong reflection are to be measured with a smaller aperture and a lesser distance;
(4) Photographic procedures should be used to identify weapon components giving particularly strong reflections and to give a visual record of the reflected conditions.

b. Measurement in the Infra-Red Sector :

(1) The principles used above should be used, but with the searchlight set to infra-red operation
(2) Measurements of emission should be made using a measuring apparatus employing an S-1 cathode. Photographs should be obtained using an infra-red night sight.

2.16.1.3 Results to be Recorded

a. Results are to be presented separately for the visual and infra-red sectors, giving:

(1) Overall reflection in cd/cm^2
(2) Reflection of weapon components giving particularly strong reflection in cd/cm^2
(3) Photographs for 1 and 2 above.

2.16.2 Chemical and Nuclear Effects on Weapons

2.16.2.1 Object To determine the effects of Chemical and Nuclear warfare on the weapons, including any decontamination problems.

2.16.2.2 Method The appropriate NATO Group AC/225(LG/3-SG/1) should be made responsible for this testing.

Detailed testing of thermal effects and nuclear / chemical contamination (particularly absorbtion and later desorbtion of chemical agents from non-metallic parts) requires specialised laboratory facilities. However, a simple, subjective evaluation of the ease of decontamination can be conducted at a Test Centre, using a simulant for the tests. An example of a simple decontamination test, used during the 1977 -79 NATO trials, is described below.

2.16.2.3 Results to be Recorded

It must be left to the experts carrying out this test to decide on their report format. However, it is likely that the report would include information on;

a. Thermal effects
b. Nuclear contamination
c. Chemical contamination
d. Absorbtion and desorbtion from non-metallic parts
e. Decontamination, including : subjective assessment, simple testing and detailed laboratory testing

2.16.2.4 Simple Decontamination Test (as used in the 1977 - 79 NATO Trials)

a. Summary For the purpose of evaluating the ease with which weapons can be decontaminated after an attack by chemical agents a method was developed to simulate such an attack. Prior to contamination the weapon was thoroughly cleaned. A mixture of paraffin and gun oil was then sprayed onto the weapons. Decontamination of the weapons was performed by napkins. On parts of the weapons where decontamination was incomplete the contaminant, even in small quantities, was seen as a fluorescence under ultraviolet light. The amount of fluorescence remaining after decontamination gives an indication (using the chosen method of decontamination) of the least suitable weapon, from the point of view of decontamination.

(1) Preparation of the Weapons All weapons are to be cleaned, oil wiped off and then checked under ultraviolet light prior to spraying with the simulated contaminant.

(2) Contamination of the Weapons A mixture of one part gun oil and two parts paraffin gives a viscosity similar to that of persistent nerve agent and mustard. A spray gun (minimum 1 litre capacity) should be filled with this solution. A spray pressure of 4.5 atm. Should be used to perform the “attack”. Weapons should be suspended horizontally and are to be sprayed moving the nozzle horizontally 200cm over a period of 5 seconds. 30 seconds should be allowed to allow the “contaminant” to settle – see Fig 2.12

(3) Decontamination Decontamination should start immediately after the contamination process is complete. Napkins (Finess Nasdukar) should be used. No more than two minutes and a maximum of three napkins should be allowed for the decontamination process, which should be carried out using NBC gloves.

(4) Control of Decontamination Immediately after decontamination the weapons should be brought to a blackened room equipped with an ultraviolet light source. Contamination not removed by the napkins will show up beneath the ultraviolet light.

(5) Ease of Decontamination An assessment should then be made of the ease of decontamination, firstly in the Subjective Evaluation and then in the Decontamination Test, as : easy / average / difficult.

Figure 2.12 Contamination Effects

2.17 COMPATIBILITY WITH SOLVENTS, LIQUIDS AND LUBRICANTS

2.17.1 Object To investigate the chemical compatibility of the weapons with the various cleaning products, liquids, lubricants and insecticides in use. For current regulations see AC/301 AECTP 300 Method 314 for current reference list of Solvents, Liquids and Lubricants.

2.17.2 Method to Determine the Chemical Compatibility of Metallic Materials in Small Arms Weapons

a. All test weapons, equipped with a fully loaded magazine or belt (possibly containing inert ammunition) are to be cleaned, but should not be lubricated. One weapon is then to be immersed, if possible, in one of the products shown in the table below. (If immersion is impossible, the product is to be smeared over the weapon.) This procedure should be carried out once daily, for four consecutive days. The weapon is then to be stored in the following atmospheric conditions :
temperature 21±10 ^{o}C ; relative humidity 50±30 % ;
atmospheric pressure 724 +50 / - 115 mm mercury.

b. Each weapon should be inspected daily before being re-immersed (or smeared). During inspections particular attention should be devoted to the metallic parts of the weapon. Examples of products used in the 1977 -79 NATO trials are given in Table 2.20 below. Others can be added or substituted, as appropriate.

Table 2.20 LIST OF SOLVENTS AND LUBRICANTS

Item N°	Type	Identification
1	Cleaning compound, solvent	)
2	Drying cleaning solvent	)
3	The equivelent of Trichloroethane	)
4	Lubricant, semi-fluid, auto, wpns (a)	)
5	Lubricating oil, general purpose (a)	)
6	Lubricant, cleaner and preservative (a)	)
7	Gasoline, automotive combat (b)	)
8	Turbine fuel (b)	)
9	Fuel oil, diesel (b)	)See AECTP-300 method 314
10	Turbine fuel (b)	)For reference
11	Insect repellent	)
12	Hydraulic fluid	)
13	Anti-freeze, ethylene glycol	)
14	Carbon-removing compound	)
15	Water, deionised and distilled	)
16	Simulated sea water	)
17	Decontaminating agent DS2	)
18	Decontaminating agent STB	)
19	Lubricating oil, weapons	)
20	Lubricating oil, internal comb	)
21	Hydraulic fluid, petroleum base	)
22	Hydraulic fluid, fire resistant	)

[a] ASTM D471, Table 1
[b] ASTM D471, Table 2

2.17.3 Method to Determine Chemical Compatibility of Non-Metallic Materials in Small Arms Weapons

a. Prepare each of the non-metallic (plastic) samples for chemical compatibility tests(dependent upon the sample population) as a standard tensile property specimen (in accordance with ASTM D638), or thin sheeting (in accordance with ASTM D882). Determine the tensile strength of the plastic by testing a portion of the samples in accordance with ASTM D638 and follow the procedures in paragraph (c), below.

If standard tensile property specimens cannot be prepared samples should be prepared as follows and hardness measures, as detailed in paragraph b), below.

(1) Use test specimens at least 2.5 cm square and as thick as the component, if cut from a component part or material sample.

(2) Smooth cut edges of specimens by sharp cutting, machining or by finishing with fine sandpaper or emery cloth.

b. To measure hardness place the specimen on a hard, horizontal surface. Hold the durometer in a vertical position with the point of the indentor at least 12mm (0.5in) from any edge of the specimen, unless identical results can be obtained when measurements are made with the indentor at a lessor distance. Apply the presser foot to the specimen as rapidly as possible, without shock, keeping the foot parallel to the surface of the specimen. Apply just sufficient pressure to obtain firm contact between the presser foot and the specimen (see ASTM D2240).

(1) Unless otherwise specified, read the scale within one second of the presser foot coming into firm contact with the specimen. If the durometer has a maximum indicator, the maximum reading should be taken. After a time interval (where specified), hold the presser foot in contact with the specimen, without change in position or pressure and read the scale after the specified period.

(2) Measure hardness at three different positions on the specimen, at least 6mm (0.25in) apart and determine the median value, or the arithmetic mean.

c. Measure lengths of all major axes of the test specimens and weigh all specimens before immersion.

d. Place specimens in containers appropriate to the chemical solution being used (see Table 2.21 Conditioning Chemicals). Condition the specimens for a minimum of 8 hours in the standard laboratory atmosphere, depending upon the chemical and the test item. Total conditioning time will depend upon the operational requirement, the solutions used and other judgmental factors. The maximum time should not, normally, exceed 168 hours.

Table 2.21 LIST OF CONDITIONING CHEMICALS

Serial	[a] German Nomenclature [b] American Nomenclature	NATO Code No.	NATO Stock No.	National Specification [a] GE, [b] US, [c] (UK), [d] Other	Use
1	2	3	4	5	6
1	[a] Kraftstoff, Otto [b] Gasoline, Automotive	F-46	9130-12-154-7096	[a] VTL 9130-009 [c] DEF 2401 (Combat Gasoline)	For use with petrol engines, with the exception of aircraft engines
2	[a] Petroleum [b] Kerosene	F-58	9140-12-154-7101	[a] VTL 9140-005 [b] VV-K-211 [c]DEF 2403 (Grade B)	For lighting, cooking and heating and, in appropriate equipment, for cleaning
3	[a] Kraftstoff, Diesel [b] Diesel, Fuel	F-54	9140-12-154-7099	[a] TL 9140-001	For use in high revolution diesel motors, particularly vehicle diesel motors and others which place similar demands on fuel
4	[a] Kraftstoff, Turbinen, Luftfarzeug [b] Turbine-Fuel, Aviation	F-40	9130-12-154-7094	[a] TL 9130-006 [b] MIL-T-5624 (JP4) [c] D.Eng.R.D.2454	For jet engines in aircraft. Petrol based
5	[a] Benzin, Spezial [b] Dry Cleaning Solvent	S-752	6180-12-124-9217	[a] VTL 6810-012 [b] P-D680 (Type 1) [c] BS-245 [d]DCEA-202	For washing, dilution and cleaning purposes
6	[a] Schmierol, halbflussing [b] Lubricating Oil, semi-fluid	O-158	9150-12-137-5709	[b] MIL-L-46000	Synthetic lubricating oil for automatic weapons, where high pressure is experienced
7	[a] Schmierol, Weapons [b] Lubricating Oil, Weapons	O-157	9150-12-133-9601	[b] MIL-L-14107	Synthetic oil, rust inhibiting. For aircraft weapons at low temperature
8	[a] Schmierol, Allgemein [b] Lubricating Oil, General Purpose	O-190	9150-12-129-8106	[a] VTL-9150-027 [b] VV-L-800 [c] CS-3118	For general lubrication. Suitable for light weapons
9	[a] Korrosionsschutzmittel [b] Corrosion Preventing Compound	None	8030-12-131-6219	[a] VTL 830-004 [b] MIL-C-16173	A protection for interior surfaces of machines and other equipment during storage in covered rooms, or appropriate packaging. Water repellent. Equivalent to the preservative K3
10	[a] Insektenschutzmittel "Bonomol" [b] Insect Repellant "Bonomol"	None	6840-12-137-4306		
11	[a] Laufreiniger [b] Bore Cleaner	None	-	[b] MIL-L-372 B	

e. After conditioning for the specified time period remove each specimen individually from the test solution. Wash and immediately weigh the specimen in a weighing bottle. Re-measure specimen dimensions and hardness and look for changes in surface texture.

(1) With running water, wash specimens removed from acid, alkali or other aqueous solutions. Wipe them dry with a cloth or tissue and weigh immediately.

(2) Hygroscopic (moisture absorbing) solutions, such as concentrated sulphuric acid may remain absorbed on the surface of the specimen, even after rinsing. Immediate special handling is required to avoid moisture pick-up before and during weighing.

(3) Specimens removed from non-volatile, non-water-soluble organic liquids should be washed with a non-aggressive, but volatile, solvent, such as ligroin, before wiping dry.

(4) Specimens removed from volatile solvents, such as acetone, alcohol, etc. need no rinsing before wiping dry.

2.17.4 Data Required

For each sample tested record the following data:

a. Type of material tested;
b. Type of chemical(s) in which the item was conditioned;
c. Sources from which material is obtained;
d. Number of samples tested;
e. Weight and tensile strength, or hardness, as appropriate;
f. Evidence of loss of gloss, developed texture, decomposition, discolouration, swelling, clouding, tackiness, rubberiness, bubblings, crackings and solubility, etc;
g. Conditioning time (hours);
h. Air temperature and relative humidity;

2.17.5 After performing the test on grenade launchers, the weapon is to be disassembled, cleaned and inspected. Particular attention should be given to plastic, rubber and organic components and all finishes. After replacing any damaged components, the weapon is to be lubricated, reassembled and fired. Five rounds are to be fired in each firing mode.

2.18 INTERCHANGEABILITY

2.18.1 Introduction Interchangeability is a condition which exists when two, or more, items possess such functional and physical characteristics as to be equivalent in performance and durability and are capable of being exchanged, one for the other, without alteration of the items themselves, or of adjoining items, except for adjustment, without selection for fit or performance. Should there be no requirement for interchangeability for specific weapons (sniper rifles, etc.), then a full interchangeability test will not be carried out, but a clear record of this will be made in the test report. Sighting systems will not be expected to be interchangeable without zeroing or adjustment; they will, therefore, be tested for interchangeability only as far as the mechanical interface sight / weapon is concerned.

2.18.2 Object To ensure that the sub-assemblies which constitute the weapon, the major components of the mechanism (for example: the bolt and the slide) and those parts that are replaced during the life span of the weapon are interchangeable.

2.18.3 Method

a. Use the same weapons as for the endurance test.

b. Note which parts must be checked for interchangeability.

c. Strip each weapon down into these parts, ensuring that they are marked so that they can be identified easily as to their original weapon.

d. The parts thus obtained are to be selected according to a permutation formula to reassemble the same number of weapons, which must function satisfactorily upon reassembly.

e. The normal operation of these reconstituted weapons is to be confirmed for each firing mode (5 rounds single shot, 5 controlled bursts and one burst of 25 rounds), the rate of fire being noted.

f. The test is to be carried out at two stages in the life of the weapon :

(1) New Weapon This test is to be performed with the weapons selected for the endurance test, after the high pressure firing has been carried out (paragraph 2.1.4.2). The rates of fire should be noted before each test begins. After the interchangeability test has been performed the interchanged weapons are to undergo the endurance test.

(2) Worn Weapon This test is to be performed with the same weapons as used for the "New Weapon" test (1 - above), but at the end of the endurance test (2.5), or after a specified number of cycles of that test.

2.18.4 Test Details - Example: US M16A2

Rifles shall be tested for interchange of parts by disassembly and reassembly of parts, using parts from a prearranged system. Interchange of parts shall be accomplished by dividing the parts of each of the initial configured weapons into 10 groups of non-mating parts. The 10 groups used for the M16A2 rifle are shown in the Table 2.22. The groups are distributed into 10 different trays, until each tray contains parts for a complete rifle. Groups of parts from rifle 1 shall be taken in order and placed in trays 1 to 10: groups of parts from rifle number 2 shall be taken in order and placed in trays 2 to 10 and 1: groups of parts from rifle number 3 shall be taken in order and placed in trays 3 through10 to 2, etc. The rifles are to be reassembled using only those parts which are in the same tray. The reassembled rifles are to be tested for headspace, firing pin indent, trigger pull, function firing (including cyclic rate of fire) and accuracy tests. These weapons should remain in the interchanged configuration for the remainder of all testing.

Table 2.22 INTERCHANGEABILITY TEST DETAILS - M16A2

Group 1	Takedown Pin Detent (2), Receiver, Upper, Rear Sight Spring Pin, Magazine Catch Spring, Trigger Subassembly, Front Sight Post, Lock Washer, Buttcap Spacer
Group 2	Lower Receiver, Barrel and Front Sight Assembly, Permanent Assembly of : *Barrel, Barrel Extension, Barrel Indexing Pin, Front Sight, Taper Pin, Handguard Cap, Tubular Rivet, Sling Swivel, Nut Barrel.* Extractor Pin, Butt Cap Screw, Ejection Port Cover Assembly
Group 3	Receiver Extension, Bolt w/Bolt Rings (3), Ejection Port Cover Pin & Snap Ring, Trigger Guard Pivot Pin, Trigger Spring, Takedown Pin, Magazine Release Button, Spring Pin, Pin
Group 4	Key & Bolt Carrier Assembly, Takedown Detent Spring, Handguard Slip Ring, Ejector and Safety Detent Spring, Retainer Buffer, Trigger and Hammer Pin, Front Sight Detent Spring, Buttplate Assembly
Group 5	Buffer Retainer Spring, Buttstock, Ejection Port Cover Spring, Ejector Pin, Magazine Catch, Semi Disconnect, Plunger Assembly, Rear Sight Base, Pistol Grip Screw, Burst Cam, Handguard Spring Assembly
Group 6	Rear Sight, Bolt Cam Pin, Bolt Catch, Pistol Grip, Buffer Assy, Pawl Spring Pin, Index Spring, Handguard Retaining Ring, Elevation Spring, Swivel
Group 7	Ejector, Rear Sight Spring, Gas Tube Assy, Hammer & Hammer Pin Retainer Assy, Compensator, Firing Pin Retaining Pin, Bolt Catch Plunger, Pawl, Hinge, Index Screw
Group 8	Pivot Pin, Firing Pin, Rear Sight Windage Screw, Gas Tube Pin, Handguard Assy, Bolt Catch Spring, Automatic Sear Pin, Compensator Spacer or Compensator Spacer & Compensator Shim, Pawl Detent, Elevation Index, Burst Disconnect
Group 9	Rear Sight Windage Knob, Charging Handle Assy, Bolt Catch Pin, Hammer Spring, Fire Control Selector, Bolt Spring, Elevation Knob, Front Sight Detent, Door Assy
Group 10	Extractor w/Spring Assy, Trigger Guard Assy, Handguard Assy (Bottom Section), Automatic Sear Assy, Action Spring, Fire Control Selector Detent, Plunger Spring, Rear Sight Ball, Clutch Spring, Swivel Screw

2.18.5 Results to be Recorded

Any difficulties encountered when reassembling or firing the weapons is to be noted, also any adjustments made. Rates of fire are also to be recorded.

Notes : Each weapon is to be identified by its original body (receiver) reference number.

An example of a component interchange plan is at Table 2.23. In the "worn" condition it may be advisable to use new spare parts only.

Table 2.23 INTERCHANGEABILITY PLAN FOR A WEAPON SYSTEM - AS USED IN THE 1977 - 79 NATO TESTS

(Weapon Nos. 8, 9, 10 being tested)

Part		**Phase 1**			**Phase 2**	
Main body with barrel	8	9	10	8	9	10
Breech System	9	10	8	10	8	9
Handguard	10	8	9	9	10	8
Trigger Mechanism	9	10	8	10	8	9
Butt, with Buffer	10	8	9	9	10	8
Main Spring, with Guide	9	10	8	10	8	9
Gas Plug	10	8	9	9	10	8
Gas Piston	9	10	8	10	8	9
Gas Cylinder	10	8	9	9	10	8
Rod, with Spring	9	10	8	10	9	9
Part		**Phase 3**			**Phase 4**	
Weapon, except Breech	8	9	10	8	9	10
Bolt Head	9	10	8	10	8	9
Extractor	10	8	9	9	10	8
Ejector	8	9	10	8	9	10
Cam Pin	8	9	10	8	9	10
Firing Pin, with Spring	8	9	10	8	9	10
Bolt Carrier	10	8	9	9	10	8
Cocking Knob	8	9	10	8	9	10

2.19 GRENADE LAUNCHING CAPABILITY

2.19.1 For individual combat weapons (ICWs) only, a test will be made of any grenade launch capability, either submitted with the weapon for test, or stated in the requirements. If it is a new grenade or launch system, full testing as in Section 5 will be required.

2.19.2 However, where the individual weapon system simply projects an existing, known, rifle grenade, or can take an existing, known, attached grenade launcher (e.g. US M203 type), it will suffice to test safety, compatibility and range and accuracy effectiveness during firing with the individual weapon system being tested. All the tests in Section 5, which purely concern the area target ammunition, as such, may be omitted.

2.19.3 The details of the test must be dependent upon the particular characteristics of the individual weapons and grenades concerned. However, the measurements and results requirements should include:

a. Measurements:

- Verification of the zero of the weapon before, in between and after firing the grenade
- Measurement of the muzzle velocity of the grenades
- Measurement of the velocity at 25m for the Ball firings
- Position of the points of impact
- Recording of any incident or anomaly
- Inspection of the weapons between each firing
- Measurement of the recoil force

b. Results:

The test report should give the following details :

- Velocity and accuracy results, with statistical analysis (means and standard deviations)
- Incidents during firing and anomalies, with remarks on the firing and photographs necessary for explanation and future analysis.

2.20 ATTITUDES

2.20.1 **Object** This test is designed to determine the functioning performance of test launchers when fired in various orientations and attitudes.

2.20.2 Crew Served Launchers

(a) If the launcher is fired from a mount and is to be employed in various orientations and attitudes that may adversely affect its performance, it will be necessary to conduct an attitudes test, using three test weapons with the launcher assembled in a gimbals type mount. The test should be fired in four stages :

STAGE (1) launcher topside up
(2) launcher right side up
(3) launcher left side up
(4) launcher upside down

(b) For each stage, fire 20-round cycles with 10-round belts (or equivalent magazine) in the sequence shown in Table 2.24. When testing weapons with dual modes of fire, fire 10-round belts, alternately employing both modes. If the test weapon has capability for more than two modes, fire additional 10-round serials for each additional mode.

Table 2.24 **TEST SEQUENCE FOR ATTITUDES TEST**

Elevation	Burst Length	Feed
0 degrees 0 degrees	Semi-Automatic Continuous Burst	When designed for left and right hand feeding, entire sequence is to be fired from each feed.
Max Depression (-85 to -90 degrees *)	Semi-Automatic	
Max Depression	Continuous Burst	
Max Elevation (+85 to +90 degrees *)	Semi-Automatic	
Max Elevation	Continuous Burst	

* Test Sponsor may have required min and max. elevations and depressions other than those shown

2.20.3 **Individual or Rifle Grenades** If the launcher is of a design whose performance may be adversely affected by firing in various orientations and attitudes, it will be necessary to conduct an attitudes test, using three test weapons. Fire 20 rounds from the launcher under each of the conditions shown in Table 2.25.

Table 2.25 **WEAPON ORIENTATIONS**

Condition	Position of Weapons (Hand Held)	Elevation
1 2 3 4	Prone Supported Hand Held without support * Right side up Left side up	Horizontal Horizontal ** Horizontal Horizontal
5 6	Prone Supported Hand Held without support *	80 degrees elevation **
7 8	Prone Supported Hand Held without support *	80 degrees depression **

* **WARNING : When firing Hand Held without support fire with caution**

** Test Sponsor may have required min and max. elevations and depressions other than those shown

SECTION 3

COMMON TESTS FOR MUNITIONS

3.1 GENERAL FORWARD ON PROCEDURES

3.1.1 General

3.1.1.1 The tests in this section are intended to cover point and area target ammunitions. However, it is possible that new types of ammunition may emerge in future and the tests will then have to be revised as appropriate to cover such particular new types of ammunition.

3.1.1.2 NATO AC/225(LG/3-SG/1) is responsible for the interchangeability of NATO small arms ammunition currently in service. Their expert advice should be sought when planning the testing of any new type of ammunition.

3.1.1.3 The SG/1 tests are largely quality control tests and it may be necessary to modify them when writing the test detail to cover particular new requirement or development aspects.

3.1.1.4 For any particular program, the tests appropriate to the requirements and the stage of development of ammunition and/or weapon should be selected and the necessary specific test detail should then be drafted for approval.

3.1.2 Test Detail When the test program and then the test detail is drafted, the following considerations must be taken into account as appropriate:

a. Need to ensure homogeneity of ammunition being tested.

b. Need to test, if possible, all natures of the ammunitions concerned (ball, tracer (including the particular ball/tracer mixes envisaged), armour piercing, incendiary, training practice, flare, smoke, illuminant, etc.), as applicable. In certain instances, particularly with non-operational training ammunition, the tests given would not be realistic or appropriate. The relevant tests should then be performed suitably amended or, where obviously inappropriate, should be omitted altogether for those particular natures.

c. Control ammunition to be used includes NATO reference ammunition to check equipment accuracy and provide "corrected" figures if required.

d. Test barrels to be used, including:

(1) numbers needed/available (normally minimum of three);

(2) mounting to be used;

(3) advisability of: common barrels for different ammunition (giving better comparative baseline) or different barrels (being more representative of weapons concerned and less likely to wear out during testing);

e. Need to consider facilities available or obtainable at chosen Test Centre, in particular local SAFETY regulations.

f. Requirement to test ammunition twice if fired from two different weapons being tested.

g. Reporting formats and workload (possibility of using joint French/English headings).

h. Different ammunition packaging philosophies and different actual packaging even when the philosophy is the same.

i. Agreement on measuring techniques and equipment to be used at an early stage in planning - also on "climatic box to loading" procedures and timings.

j. Analysts or group of experts to advise on data format requirements particularly for Accuracy/Dispersion firings, before test detail is drafted.

k. The need for testing of compatibility of similar, but slightly different, ammunition and weapons may have to be considered such as the firing of ammunition from weapons of the same calibre but with different barrel twist.

3.1.3 Ammunition Malfunctions

3.1.3.1 In the detailed test instructions a procedure must be specified for the recording and subsequent assessment and analysis of all the defects in the functioning of the ammunition.

3.1.3.2 A procedure, based on the experience of the 1977-79 NATO Tests, is outlined in Annex C.

3.1.4 Other Matters

3.1.4.1 The tests in the Section make no attempt to impose acceptance or rejection criteria although in certain instances suggested standards, based on current experience, have been quoted purely for the purposes of guidance and information. This also applies where reference has been made to the Manuals of Proof and Inspection Procedures for NATO 5.56 mm Ammunition AC/225(LG/3-SG/1)D/8.

3.1.4.2 Throughout the tests in this Section the expression "series of 20 rounds" implies the following sequence: 3 warming rounds - series of 20 rounds - air-cooling (if more than one series is to be fired).

3.1.5 Suggested Sample Sizes for Area Target Ammunition

a. Table 3.1 lists recommended sample sizes for each area target ammunition test. Actual sample sizes will vary with reason for test, type of munition being tested, and quantity of rounds per container. Specific tests and sample sizes for all potential types of area target munitions are not included, but tests and sample sizes shown for a similar item can be used as a guide.

b. The tests preceded by an "*" are considered the minimum criteria tests which must be conducted in the preliminary evaluation of an area target munition. The tests preceded by an "(*)" are recommended as follow-on tests to the minimum criteria tests. The remainder of tests are to be selected as appropriate to the stage of development of the test munition and the specific type of munition.

Table 3.1 SUGGESTED TEST SAMPLES FOR AREA TARGET AMMUNITION

	TEST	HE/HEDP			TP/Smoke/Illum		
		RG	CG	CSWCG	RG	CG	CSWCG
*	Initial Inspection	24	24	24	24	24	24
*	Projectile Torque	N/A	8	8	N/A	8	8
*	Bullet Extraction	N/A	8	8	N/A	8	8
	Mercurous Nitrate	-	-	-	-	-	-
	Extreme Temp Store/Func	20	80	80	20	80	80
	Temp Effect/Propellant	40	40	40	40	40	40
	Temp-Humidity (10 day)	20	80	80	20	80	80
*	Exposed Desert	20	80	80	20	80	80
	Continuous heating	-	-	-	-	-	-
*	Arctic Storage	20	80	80	20	80	80
	Temperature Shock	10	10	10	10	10	10
	Salt Fog - Fuze Only	10	10	10	10	10	10
	- Full Round	5	5	5	5	5	5
	Waterproofness	10	10	10	10	10	10
	Vacuum Steam Pressure	6	6	6	6	6	6
	Fungus	6	6	6	6	6	6
*	12 Meter Drop	10	36	48	10	36	48
*	Seq. Rough Handling	96	144	480	96	144	480
*	Secured Cargo Vibration	48	72	192	48	72	192
	Air Delivery	10	36	48	10	36	48
*	Fuze Arming Safety	20	20	20	20P	20P	20P
(*)	Impact-Safe Distance	25	25	25	-	-	25P
*	Out-of-line Detonator	5	5	5	-	-	-
*	Jolt	3	3	3	3	3	3
*	Jumble	3	3	3	3	3	3
*	Fuze Sensitivity	50	72	144	25P	72P	144P
(*)	Bullet Impact	5	5	5	-	-	-
(*)	Sympathetic Det'n	10	36	48	N/A	N/A	48P
(*)	Fast Cook-Off	1	1	1	-	-	-
(*)	Slow Cook-Off	1	1	1	-	-	-
*	Noise/Blast Pressure	20	20	20	20	20	20
	Flash and Smoke	10	-	-	-	-	-
*	Inpulse/Recoil	10	10	10	10	10	10
	Function and Casualty	10	36	192	5	18	96
*	Fragmentation	10	10	10	N/A	N/A	N/A
*	Penetration	20	56	92	N/A	N/A	N/A
	Velocity	5	30	30	5	30	30
	Pressure	N/A	30	30	N/A	30	30
	Action Time	N/A	N/A	30	N/A	N/A	30
(*)	Precision	10	20	40	10P	20P	40P
(*)	Firing Table	20	40	120	20	40	120
	Weapon Compatibility	-	-	-	50P	-	-
	Out-of-Battery/Hangfire	N/A	-	6	N/A	-	3
	De-bulleting	N/A	4	4	N/A	-	4
	Missing Prop. Retainer	N/A	4	8	N/A	4	8
	Wrong Launch Ctg f/ RG	-	N/A	N/A	-	N/A	N/A
	Burst vs. SS RG Launch	-	N/A	N/A	-	N/A	N/A
	Human Factors Eng'rg (incl. Safety/Health)	N/A	N/A	N/A	N/A	N/A	N/A
	Logistic Supportability	N/A	N/A	N/A	N/A	N/A	N/A
	Self-Destruct	-	-	-	N/A	N/A	-
	Tracer	-	-	-	N/A	N/A	-
	(1) TOTAL	593	1166	2062	526	1005	1849

Notes (Ref. Table 3.1):

HE = High Explosive
HEDP = High Explosive Dual Purpose
TP = Training Practice

(1) Totals as shown assume minimal combination of tests, and do not include number of control or reference rounds. Samples will vary w/ confidence and reliability levels required.

"P" = Training Practice rds only.

"RG" = Rifle Grenade - An area target munition with no integral propulsion unit (e.g., no ctg case). It is attached to a rifle and launched by a bullet fired from that rifle. Applies to both "bullet-trap" and "bullet-through" grenades.

"CG" = Cartridge Grenade - A weapon launched, area target munition consisting of a warhead body assembled to a cartridge case. A separate bullet is not required for launch (e.g. 40 mm M433 HEDP).

"CSWCG" = Crew Served Weapon Cartridge Grenade - Same as CG above, but usually in linked configuration and fired in bursts from a crew served automatic grenade launcher (e.g. 40 mm US M430 HEDP).

3.2 REQUIREMENTS DATA

All requirements documents and performance data pertaining to the ammunition shall be obtained prior to the commencement of any testing. This information will be used for comparison to actual test results and shall include, but not be limited to, the following:

a. weapon system characteristics (weight, length, rate-of-fire, twist rate, family of ammunition, etc.), its applications, and fielding status;

b. peak pressure, pressure-time curve, action time, muzzle velocity, spin rate, range, accuracy and dispersion;

c. terminal effect capabilities (penetration, casualty radius, pyrotechnic effects);

d. overall dimensions and physical characteristics of individual item and its packaged configuration;

e. technical drawings and specifications of end item and major components, including packaging details;

f. fuze type, safety mechanisms, and arming distances (if applicable);

g. list of all energetic material types, weights, full specification giving chemical composition and thermo-chemical data, together with appropriate hazard and compatibility information;

h. Values of temperature coefficient of the propellant, and details of ballistic stability;

i. range safety distances;

j. firing table(s);

k. range clearing procedures (Dud Recovery).

Note: The technical characteristics supplied by the manufacturer must, as far as possible, have been determined by the test methods defined in this document. If this is not possible then full notes will be provided covering details of the equipments and methods used.

3.3 INSPECTION

3.3.1 Initial Inspection of Point Target Ammunition

3.3.1.1 Object

To establish the exact dimensions of the ammunition - also its appearance both to ensure it is in good order at the start of testing and to act as a baseline for comparison of any change occurring after particular tests.

3.3.1.2 Method

To be based on the Manual of Proof and Inspection Procedures for NATO 5.56 mm Ammunition AC/225(LG/3-SG/1)D/8.

3.3.1.3 Results to be Recorded

(a) Defects noted on visual inspection of sample 100 ctgs:

(1) Corrosion.

(2) Case:

(a) Round Head
(b) Dent
(c) Split
(d) Perforations
(e) Scratches
(f) Bevelled Underside of Head
(g) Case Mouth Crimping
(h) Scaly Metal
(j) Other Apparent Defects.

(3) Bullet:

(a) Split Jacket
(b) Loose Bullet
(c) Scaly Metal.

(4) Primer:

(a) No Primer
(b) Cocked Primer
(c) Inverted Primer
(d) Loose Primer
(e) Other Apparent Defects.

(b) Gauging and measuring of 50 cartridges from the original sample of 100 for:

(1) Weight
(2) Overall Length
(3) Diameter of Bullet at Base
(4) Diameter of Cartridge Case
(5) Length to Shoulder from Base
(6) Height of Primer in Relation to Base.

Note:Manufacturers are to supply detailed drawings and all special gauges necessary.

(c) Data from weighing 20 disassembled cartridges (from the 50 cartridges at (b) above):

(1) Weight of Projectile
(2) Weight of Case
(3) Weight of Propellant
(4) Length of Case
(5) External Diameter of the Neck
(6) Well Thickness of the Case at the Neck.

(d) For caseless ammunition the following will apply:

(a)(3)(a) , (a)(3)(b) , (a)(3)(c) , (a)(4)(a) , (a)(4)(b) ,
(a)(4)(c) , (a)(4)(d) , (a)(4)(e) , (b)(1) , (b)(2) , (b)(3).
(c)(1) , (c)(3) - Special rounds (caseless) may have to be broken down under laboratory conditions.

Also results from visual inspection of the body (propellant), regarding:

- Chipping
- Scratching
- Incomplete Cover of Resin
- Cracking or Splitting at Joint.

3.3.2 Initial Inspection of Area Target Ammunition

3.3.2.1 Preliminary Visual Inspection

As part of the initial inspection, a sample of test ammunitions (see Table 3.1) shall be visually examined to determine if it has been assembled, marked, lot numbered, linked (if applicable), and packaged in accordance with the applicable technical requirements.

3.3.2.2 Physical Measurements

(a) Object To determine that the grenade ammunition to be tested meets all physical and dimensional requirements.

(b) Method

(1) The samples to be inspected shall first be radiographically inspected to insure that the grenade fuzes are in the non-armed position and that all fuze safeties are present and intact.

(2) Since it is not feasible to check all measurements of a complete round of grenade ammunition particularly if it is a fuzed HE round, engineering

judgement must be used to select critical areas to be checked. These, as a minimum, should include :

(a) Complete grenade/cartridge.
(1) Weight.
(2) Centre of gravity.
(3) Length.
(4) Profile.
(5) Projectile diameter at bourrelet or rotating band.

(b) Components (cartridge grenade must be disassembled).
(1) Grenade Projectile: weight, length and moments of inertia.
(2) Propellant: weight, type and general appearance.

(3) Critical components (based on engineering judgement) are compared with drawings. A complete set of cartridge and component drawings is required prior to test initiation. Sampling from the rounds furnished is on a random basis and must be sufficient to provide, as a minimum, statements at the lower 90 percent confidence limit.

3.3.2.3 Projectile Torque

(a) Object

The purpose of this test is to determine the force required to rotate the projectile in an assembled cartridge grenade.

(b) Method

(1) When a projectile is assembled into a cartridge case, it is retained in assembly by crimping (indenting) the case into an annular recess in the projectile body. This prevents movement along the longitudinal axis of the projectile so that during feeding into the weapon the projectile will not separate from the case. This crimping may also maintain a seal against moisture penetration. It is recommended that a sample of test cartridges (see table 3-1) be tested for the required rotational resistance, if any, prior to commencing any firing tests.

(2) To determine whether the cartridge meets its minimum torque requirement (if it has such a requirement), the cartridge case is held firmly and a calibrated torque wrench (with adaptors) is used to attempt to cause rotation of the projectile. The load is gradually applied until the prescribed minimum is reached and is maintained for 1 minute. Because of the potential hazards associated with this test, particularly when HE-fuzed rounds are being evaluated, all personnel will be behind barricades and the test accomplished remotely.

(c) Results to be Recorded Force required to rotate the projectile for each round giving average, standard deviation, minimum and maximum force.

3.3.2.4 Bullet Extraction (Bullet Pull) See Section 3.16. It is recommended that a sample of test cartridges be subjected to this test prior to commencement of any firing tests.

3.3.3 Chemical Analysis of Propellant

3.3.3.1 Object To establish the exact chemical composition of the propellant in the ammunition.

3.3.3.2 Method A complete chemical analysis will be performed in a nationally agreed laboratory. Each manufacturer will supply the Test Centre with the formulation of the propellant. A nationally agreed method of laboratory chemical analysis will be used on the propellant from a sample of cartridges of each type. See MOPI AC/225(LG/3-SG/1)D/8 for reference.

3.3.3.3 Results to be Recorded

(a) Detailed chemical composition.

(b) Methods used to determine percentages of constituents.

3.3.4 Chemical Analysis of Primer Explosive

3.3.4.1 Object To establish the exact chemical composition of the primer explosive used in the ammunition.

3.3.4.2 Method A nationally agreed method of laboratory chemical analysis will be used on the primer composition from 100 primers from a sample of 100 cartridges of each type. **It is imperative that:** each manufacturer supplies the Test Centre with a list of constituents in each of their primers. Percentages of each constituent are not vital but would be useful. Consideration will be given on toxic substance. See MOPI AC/225(LG/3-SG/1)D/8 for reference.

3.3.4.3 Results to be Recorded

(a) Detailed chemical composition.

(b) Methods used to determine percentages of constituents.

3.4 SENSITIVITY OF PRIMERS

3.4.1 **Object** To determine the energy required to cause firing of the primers used in the ammunition.

3.4.2 **Method** To be based on Section 17 of NATO Manual AC/225(LG/3-SG/1)D/8.

3.4.3 **Results to be Recorded**

a. Full details of the numbers firing and the failing to fire at each drop height.

b. If not applicable use an appropriate method.

3.5 DETERMINATION OF VELOCITIES

3.5.1 Object To determine mean observed velocity at a specific point along the trajectory.

3.5.2 Method

a. The preferred method for measuring velocity is by use of a Doppler Radar Velocimeter.

b. The other method is based on the EPVAT section of NATO Manual AC/225(LG/3-SG/1)D/8.

c. The handling, loading and firing of the cartridges are described in the appropriate EPVAT section.

d. To determine the contribution of variables when single-shot testing ammunition for velocity levels, reference ammunitions and a like number of test cartridges are fired alternately throughout the test. The reference lot will have been extensively tested to establish the velocity (also pressure) under conditions of 21°C in a test barrel. The reference ammunition is always fired after being conditioned to 21°C, and the amount that the tested velocity misses the assessed value is used to correct the test cartridge velocity. The rate of fire during the test should not exceed one round per half-minute interval, and the barrel should be cooled to ambient temperature following each sequence of firing.

3.5.3 Results to be Recorded

(a) For each barrel and overall, also of the reference ammunition, full details of :

(1) Mean velocities

(2) Greatest Difference (Extreme Spread)

(3) Standard Deviation

(b) Values are reported as corrected velocity along with the "as tested" (uncorrected) velocity.

3.6 ACTION TIME AND PRESSURE MEASUREMENTS

3.6.1 Object

a. The purpose of the action time test is to determine the time interval between the application of initiating energy to the primer and the projectile passing the gas port or emerging from the barrel. This information is useful for determining ammunition compatibility with weapons that are capable of high rates of fire, or are externally powered. Too rapid action time can result in an out-of- battery, and too long action time can result in a hangfire (which can lead to the hazardous condition of possible ejection of the cartridge during ignition).

b. Pressure measurement test is conducted to establish the mean peak pressure, standard deviation and pressure-time characteristics of the test munition. Pressure measurements for area target munitions are taken at the chamber.

3.6.2 Method

Firings are conducted single shot from a test barrel. The firing mechanism is fitted with a device which reliably transmits an electrical signal to initiate timing on a chronograph at the instant of primer initiation.

a. Chronograph stop pulse could be provided by the port pressure transducer (to be based on Section 23 of NATO Manual AC/225(LG/3-SG/1)D/8).

b. Chronograph stop pulse could be provided by a device (such as an electrostatic collector at the muzzle, infrared detector or other approved NATO system) which transmits an electrical signal at the instant of bullet exit from the muzzle. An infrared detector will not record reliably with some projectiles due to discarding sabots or other debris, gas escapage, etc. In these instances lumiline screens are placed in front of the weapon muzzle to determine when the projectile passes a given point (chronograph stop time) and to provide data for calculating the velocity of the projectile. The time for each projectile to travel from the muzzle to the first screen is computed using previously obtained ballistic data and the recorded velocity observed for each round. This time is subtracted from the total time observed to obtain the action time.

c. Time-pressure histories could be recorded using piezoelectric pressure transducers (to be based on Section 23 of NATO Manual AC/225(LG/3-SG/1)D/8) rather than copper crusher gauges.

d. For temperature test, the ammunition must be conditioned according to the MOPI, as a guide prior to firing at high or low temperature. Ammunition shall be fired at +52°C, +21°C and -54 °C.

e. The handling, loading and firing of the cartridges will be as near as possible to that prescribed for the appropriate EPVAT Test and will be uniform from shot to shot.

f. Reference rounds and a like number of test cartridges are fired from one barrel alternately throughout the test.

g. The rate of fire during the test will not be greater than about one shot per half-minute interval. This rate will be slowed if necessary to keep the temperature of the outside of the barrel below 65°C.

3.6.3 Results to be Recorded

a. The results will be given uncorrected and corrected using the correction factor obtained by firing reference rounds on the same day.

b. The mean action time, standard deviation and extreme variation of test and reference cartridges.

c. The mean peak pressure, standard deviation and extreme variation of test and reference cartridges.

d. The mean velocity, standard deviation and extreme variation as a cross-check against velocities obtained in Section 3.5.

e. Copies of the photographs of the Pressure/Time Curve (four photographs of each series).

3.7 FIRING TABLE

3.7.1 **Object** This test is conducted to determine the exterior ballistic characteristics of the test munition. Exterior ballistic data are required to prepare/verify firing tables, to give beaten zone and to determine the degree of ballistic similitude between the various munitions that will be fired from the same weapon system. A high degree of ballistic similitude requiring neither a firing table correction, nor a separate table, is confirmation that the rounds are ballistically matched.

3.7.2 **Method** See ITOP 4-2-805 to be used as a reference for Bursting Munitions and AC/225(LG/3-SG/1)MOPI for Point Target ammunition.

a. A sample of the test ammunition and control ammunition will be fired single shot from a service weapon placed in a rigid mount and set at a predetermined quadrant elevation varying from minimum to maximum combat ranges.

b. The rounds will be fired alternately under conditions of little or no wind (below 1.5 m/sec).

c. At least ten (10) rounds at each range of interest are recommended. It is further recommended that a minimum of four ranges be tested roughly equal to each 25% increment to maximum range. Range increments to be tested depend on the munition being tested. For grenade munitions, both direct and indirect (high angle elevations) firing modes should be tested. If a firing table has not been prepared, the same test shall also be conducted from a test barrel.

3.7.3 **Results to be Recorded** Meteorological data, quadrant elevation, projectile velocity, range, dispersion (horizontal), functioning and other pertinent information will be recorded for each round fired. A comparison of ballistic characteristics of the test and control ammunition (and the firing table, if prepared) will be made using the data obtained.

3.8 PRECISION

3.8.1 Obiect To determine the precision of the test ammunition, as compared with reference ammunition (if available), which establishes its contribution to the overall accuracy of the weapon system.

3.8.2 Method

a. The initial firings are conducted using test barrels from a fixed rest to determine the single-shot dispersion and accuracy of the test ammunition over the tactical ranges. Unless specified otherwise, four groups of 10-round targets are fired with realignment of the barrel on an aiming point before each round . A boresight is used for this purpose. Prior to firing for record purposes, three fouling rounds are fired. The impact target should be large enough to contain all rounds fired. If the dispersion of the group is expected to be 1.2 m^2, the target should be 2.4 m by 2.4 m which allows a 100% factor both vertical and horizontal. All firings should be conducted under low wind conditions to minimize projectile drift due to weather factors at the time of the test. The suggested wind limits relative to target distances are:

(1) Area Target Ammunition : ranges less than or equal to 200 m, wind velocity not to exceed 4.5 m/s; ranges more than 200 m, wind velocity not to exceed 2.25 m/s.

(2) Point Target Ammunition: wind velocity not to exceed 3.9 m/s.

b. The X and Y co-ordinates of all rounds are measured, or printed with an automatic target scorer.

c. This test can also be conducted from a rigidly mounted service weapon.

3.8.3 Results to be Recorded

a. Full details of the test barrels including:

(1) Barrel length
(2) Weight of barrel
(3) Gauging
(4) Firing pin protrusion
(5) Headspace
(6) Barrel mounting details

b. Hit co-ordinates to establish:

(1) EHS - Extreme Horizontal Spread (maximum horizontal distance).
(2) ES - Extreme Spread (maximum distance between all possible pairs of impacts).
(3) EVS - Extreme Vertical Spread (maximum vertical distance).
(4) MPI - Mean Point of Impact
(5) HCI - Horizontal Centre of Impact.
(6) HSD - Horizontal Standard Deviation (dispersion).
(7) VCI - Vertical Centre of Impact.
(8) VSD - Vertical Standard Deviation (dispersion).

c. Details of the methods used in measuring co-ordinates.

d. Full details of:

(1) Weather conditions
(2) Case Casualties
(3) Misfires

3.9 BARREL EROSION TEST

3.9.1 **Object** To determine the effects of barrel erosion during prolonged firing.

3.9.2 **Method**

a. To be based on section 10 of NATO Manual AC/225(LG/3-SG/1)D/8.

b. But with appropriate arrangements to cover the effects of different rates of fire with different weapon systems.

3.9.3 **Results to be Recorded**

a. Determination of Erosion Performance:
- Inspect for visual damage
- Velocity in new barrel
- Velocity after the number of rounds specified in MOPI
- Velocity loss in the number of rounds specified in MOPI
- Rounds before 20% "keyholing"
- 15° or greater Yaw
- Total rounds fired per barrel
- Bore gauge measurements

b. Horizontal and vertical spread at suitable intervals.

c. Comparison to reference ammunition (if applicable) of:
- Noise)
- Muzzle flash) (1)
- Smoke from weapon)
- Toxicity of smoke)
- Fouling and, if applicable, coppering characteristics
- Bore wear
- Erosion performance

Note: (1) Gradings of:
- "Appreciably less"
- "Appreciably more"
- "Comparable"

3.10 PENETRATION

3.10.1 Object To evaluate the ability of the basic point target round (normally the “ball” round) to incapacitate the human target, including the penetration of protection. This may be achieved by determining the maximum penetration capability of point-fire projectiles between 100m and the maximum operational range against the "dismounted personnel" targets defined in STANAG 4512 and representative Unarmoured Vehicle, Helicopter and Field Fortification targets defined in STANAG 4498. For the determination of the vulnerability of personnel to small arms fire, see Section 4.1.

3.10.2 Method All point-fire testing will be conducted beginning at an intermediate range and reducing or increasing the range, dependent upon the results obtained. A test weapon will be employed and firing will be continued on each target until ten hits are obtained. If hit probability is low, it is recommended to use the LANGLIE method R50 (reference AOP-20, US MIL-STD-331, Test D2 and Langlie, H.J., "A Reliability Test Method for One-Shot Items". Aeronautic Division, Ford Motor Company, Publication No. U-1792, August 1962), as described in Section 6.4.1.2.

The range at which perforation is achieved on 50% of all occasions will be investigated, where appropriate. The details of the targets and the test conditions are to be specified in the test report.

Notes:

(1) Because of the relationship with the incapacitation effect behind the protection, the details of this test will often be considered together with Section 4.1 and by the same group of experts on Terminal Ballistics.

(2) The use of witness plates or packs behind the protection, including STANAG representative targets, will have to be considered.

(3) The use of firings at increasing or decreasing firing distances to establish the "50% penetration range" will be required.

(4) Details of the firings and actual materials used for this test in the 1977-79 NATO Tests (STANAG 4512) are given on Table 3.2. Different firing distances would be required for testing other weapons and target types, including STANAG representative targets.

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Table 3.2 PENETRATION TEST CONDITIONS

Serial No	Material	Specification	Angle of Strike	Firing Distance (Range)	Measurements Required	No. of Hits per Angle	No. of Hits per Range
1.1 Individual Weapons Only	Steel Helmet Plate	BWB TL 8415-061 (Edition dated 3.10.76)	0^{O} 30^{O}	Begin at 600m with 0^{O}	a. See Note (1) b. Witness plate (0.5mm Al, F40) 300mm behind the target	10	20
1.2 Individual Weapons Only	Aramid Helmet fitted with Polycarbonate Visor	STANAG 4512 Annex D (Helmet) STANAG 4512 Annex E (Visor)	Not over 10^{O}	STANAG 2920	STANAG 2920		10 valid hits
2 Individual Weapons Only	Body Armour	STANAG 4512 Annex F	0^{O}	STANAG 2920	STANAG 2920	10	10
3 Support Weapons Only	Representative Target - Medium Truck - Door Skin	STANAG 4498 Annex A	0^{O} 30^{O} 60^{O}(2)	Begin at 100m, 0^{O}		10	20 (30)
4 Support Weapons Only	Representative Target - Medium Truck - Door Skin	STANAG 4498 Annex B	0^{O}	Begin at 300m		10	10
5 Support Weapons Only	Representative Target - Assault Helicopter - Lower Door	STANAG 4498 Annex C	30^{O}	Begin at 300m		10	10
6	Sand	Quartz sand washed and hot air dried. Composition 50% of grains 0.2 to 1mm and 50% 0.1 to 0.4mm	0^{O}	100m and 300m	Establish Penetration Depth	5	5

Notes :

(1) measurement of projectile velocity 10m in front of the target and 10m in front of the muzzle

(2) To be decided when results

3.10.3 Results to be Recorded

a. STANAG representative targets and their material characteristics data.
b. Firing records with projectile velocity (at muzzle and target) and penetration.
c. Statistical analysis giving 50% penetration ranges, where required.
d. Additional photographic records

3.10.4 Penetration (Bursting Munitions) There are two types of penetration tests for bursting munitions, static and dynamic. They can both be designed and conducted to establish the depth and the diameter of penetration achieved by anti-armour (or dual-purpose) grenades in relation to the amount of stand-off (distance of burst).

3.10.4.1 Static Penetration

3.10.4.1.1 Object The static penetration test is a more controlled armour penetration test which eliminates yaw, angle of impact, vectored velocity and impact effects inherent in the dynamic penetration test.

3.10.4.1.2 Method

(a) Between three and five projectiles are to be fired statically at armour plates placed side by side (rolled homogeneous plates, as defined in STANAG 4089, Edition No. 2 [Classified]) at, as a minimum, five different distances of burst. The exact distances of burst are to be chosen to enable the maximum amount of information to be obtained on the relationship between the penetration and the distance of burst (the shortest could correspond to the length of the nose, or twice the diameter of the hollow charge). The plates should be large enough to avoid all risk of fracture and the alignment should consist of a sufficient number of plates to cover the full area of impact.

(b) To permit a direct comparison of the static and dynamic tests, it is desirable that, for tests at distances other than the length of the nose, a thin plate (6 or 10mm), constituting a replica of the burster plate required for the dynamic tests, should be placed at the appropriate distance of burst.

(c) The total depth of penetration and the diameter of the penetration are to be recorded in millim. This diameter should be measured along the hole at distances of 1 cm and may be ascertained by any suitable means: liquid displacement, gauges or x-ray photography).

(d) The above tests are to be carried out using static charges (with rotation of the charge, if necessary, with the spin rate being noted in the report). Mobile charges have, in some instances, a lower performance (because of their angle of impact) or a higher performance (because of their considerable kinetic energy)

(e) In the former case, an adjustment can be made during the detailed evaluation calculations. In the latter case the results can be confirmed only by experience ; when it is considered that the performance would be higher under dynamic conditions, the tests described in 1) above can be carried out dynamically.

(f) Four projectiles should also be fired at a distance of burst of twice the diameter of the charge at the triple standard target mentioned in STANAG 4089, Edition No. 2 [Classified]. For two of these firings a 40mm mild steel plate should be placed against the back of the third target plate and the depth of the residual penetration of this plate is to be measured. For the two remaining firings, mild steel standard plates are to be placed 30cm behind and parallel to the target plates; the quantity and distribution of the fragments penetrating each of these plates is to be ascertained.

3.10.4.2 Dynamic Penetration

3.10.4.2.1 Object The dynamic penetration test is conducted to assess the penetration performance of the test munition under realistic firing conditions. The effects of yaw, impact angle, resultant velocity and spin vector and target impact interaction on the munition’s penetration capability are inherent in this test.

3.10.4.2.2 Method

(a) Using a sample larger than that used in the static penetration test, the area target munition should be fired from the service weapon to a vertical armour target, against which it should achieve 100% perforation (complete penetration of the target with 100%% reliability of giving a high order detonation). The target should be located a short distance beyond the all arm distance, so that the trajectory is relatively flat. Type of functioning (high or low) and confirmation of perforation should be recorded. The target plate may be sectioned to allow x-ray of any partial penetrations to determine the actual penetration depth. As a minimum, the test should be conducted at zero burst distance (the built-in stand-off condition).

(b) To determine whether there is any line of sight degradation in penetration capability of the munition, the test may be repeated against a thinner steel plate target placed at 60 degrees obliquity (top of plate away from weapon). The same procedure and information recording as for the 0 degree obliquity tests should be employed. Only built-in stand-off is tested.

(c) Penetration data can be used to assess P(k) given a hit, to assess overall munition effectiveness against various threat armoured targets.

3.11 CLIMATIC TESTS

3.11.1 Exposed Desert Conditions

3.11.1.1 Object To determine the effects on both the point target ammunition and the area target ammunition of the combination of very low humidity and high temperature (world-wide) typical of exposed desert conditions and to ascertain that the munition is safe to fire and function reliably after storage under such conditions. For cartridge grenades, this test will also determine whether drying of propellants through evaporation of volatiles will occur and its effects on performance.

3.11.1.2 Methods To be based on Section 12 of NATO Manual AC/225(LG/3-SG/1)D/8. For the grenade munition, for informational purposes only, reference STANAG 4370 and AECTP-300, from which the following procedure is excerpted:

(a) The test grenade(s) shall be placed into the test chamber, and conditioned at 49°C without humidity control for 24 hours;

(b) The internal chamber temperature is then to be gradually decreased to 35°C and 10% relative humidity (R.H.) for 2 hours;

(c) The test item(s) are then to be exposed to internal chamber conditions as indicated in Table 3.3 for seven (7) cycles (168 hours);

(d) At the completion of the last cycle, maintain the internal chamber conditions at 35°C and 10% R.H.; then perform the following:

(1) Inspect the test items (including radiographically, if applicable), and record evidence of material deterioration or drying out.

(2) Fire and record the pressure, velocity, action time and functioning performance of the ammunition using pre-test data for comparison.

Table 3.3 **HOT-DRY CYCLE**

Hour	Temperature °C	Relative Humidity (%)
1	35	10
2	34	10
3	34	10
4	33	10
5	33	10
6	33	10
7	36	10
8	40	5
9	44	5
10	51	5
11	56	5
12	63	5
13	69	<5
14	70	<5
15	71	<5
16	70	<5
17	67	<5
18	63	5
19	55	5
20	48	5
21	41	10
22	39	10
23	37	10
24	35	10

3.11.1.3 Results to be Recorded

(a) Velocity
(b) Pressure
(c) Hangfire
(d) Trace (if applicable)
(e) Waterproofness

3.11.2 Continuous Heating

3.11.2.1 Object To determine the effects on both the point target ammunition and the area target ammunition of storage under conditions of continuous heating.

3.11.2.2 Method To be based on Section 12 of NATO Manual AC/225(LG/3-SG/1)D/8.

3.11.2.3 Results to be Recorded

(a) Velocity
(b) Pressure
(c) Hangfire
(d) Trace (if applicable)
(e) Waterproofness

3.11.3 Continuous Arctic Conditions

3.11.3.1 Object To determine the effects on both the point target ammunition and the area target ammunition of storage under continuous arctic conditions and to ascertain that the munition is safe to fire and will function reliably after exposure to such conditions.

3.11.3.2 Method To be based on Section 12 of NATO Manual AC/225(LG/3-SG/1)D/8.

3.11.3.5 Results to be Recorded

(a) Velocity
(b) Pressure
(c) Hangfire
(d) Trace (if applicable)
(e) Waterproofness

3.11.4 Temperature Shock

3.11.4.1 Object

3.11.4.1.1 To determine if the ammunition can withstand sudden changes in the temperature of the surrounding atmosphere without experiencing physical damage or deterioration in safety and performance reliability. (It does not assess effect on performance from lengthy exposure to extreme environments).

3.11.4.1.2 The variations of this test, which can be conducted in accordance with standard methods, are identified by the simulated deployment scenarios in which exposure to rapid temperature change is expected:

(a) Ascent from a desert airfield to a high altitude with the item in an unheated aircraft compartment or externally stored.

(b) Air delivery/drop from high altitude to a desert environment.

(c) Ground transfer or air delivery of the item to and from heated areas within a cold environment.

3.11.4.2 Methods See STANAG 4370 and AECTP-300 Method 304 and reference US MIL-STD-810E, Method 503.3.

3.12 EXTREME TEMPERATURE CONDITIONING AND SUBSEQUENT FUNCTIONING

3.12.1 Object

a. To insure safe and proper functioning of the ammunition from the service weapon after temporary storage at extreme temperature (with diurnal cycling);

b. To determine the effect of exposure to extreme temperature on the propellant as measured by changes in pressure and/or muzzle velocity (and /or pressure) of the test ammunition (in addition, for the area target ammunition only, a lesser exposure test is required).

3.12.2 Methods To be based on Section 19 of NATO Manual AC/225(LG/3-SG/1)D/8. But test method extended to include temporary storage of different samples of ammunition for time periods in accordance with MOPI and at the following temperatures:

52°C	-10°C
40°C	-20°C
30°C	-30°C
21°C	-40°C
10°C	-50°C
0°C	-54°C

Note: This full range of temperature enables a full temperature/pressure and temperature/velocity coefficient scale to be compiled.

Reference STANAG 2895(Climatic Categories), STANAG 4370, and AECTP 300. A minimum sample of 10 rounds of the test ammunition will be conditioned to a temperature in accordance with the above limits.

3.12.3 Results to be Recorded

(a) Temperature details.

(b)Velocities with their means, standard deviations and extreme values at each specified temperature.

(c) Pressures with their means, standard deviations and extreme values at each specified temperature.

(d) Results of Function and Casualty test at each specified temperature.

Note: As a guide only, the mean values recorded shall be within the following brackets in relation to the results obtained at 21°C:
Pressure: +10% to -30% Velocity: +5% to - 9%

(e) For the area target ammunition only: impact functioning results will be observed for additional information.

3.13 FIRING IN EXTREME COLD

3.13.1 **Object** Because of changes in bullet stability when fired in very cold conditions, there is a need to discover the extent of degradation in the performance of the point target ammunition under such conditions.

3.13.2 Method

a. Firing will be carried out in a climatic chamber.

b. Firing will be from weapons on a fixed mount at the following temperature levels:

21°C	-18°C
-37°C	-54°C

c. Weapons and ammunition will be conditioned in the climatic chamber for at least 12 hours before firing.

d. Number of rounds to be fired at each temperature level per ammunition type/weapon system:

- Dispersion test - 3 bursts each of 10 rounds;
- Velocity tests - 10 rounds (can be combined with Dispersion test);
- Yaw tests - 15 rounds.

e. For the yaw tests, yaw cards will be set up so as to allow determination of the first maximum yaw of the bullet.

f. The layout used for the 1977-79 NATO tests is shown in Figure 3.1.

3.13.3 Results to be Recorded

a. Test arrangements including photographs.

b. Temperatures record.

c. Co-ordinates at each Dispersion shot.

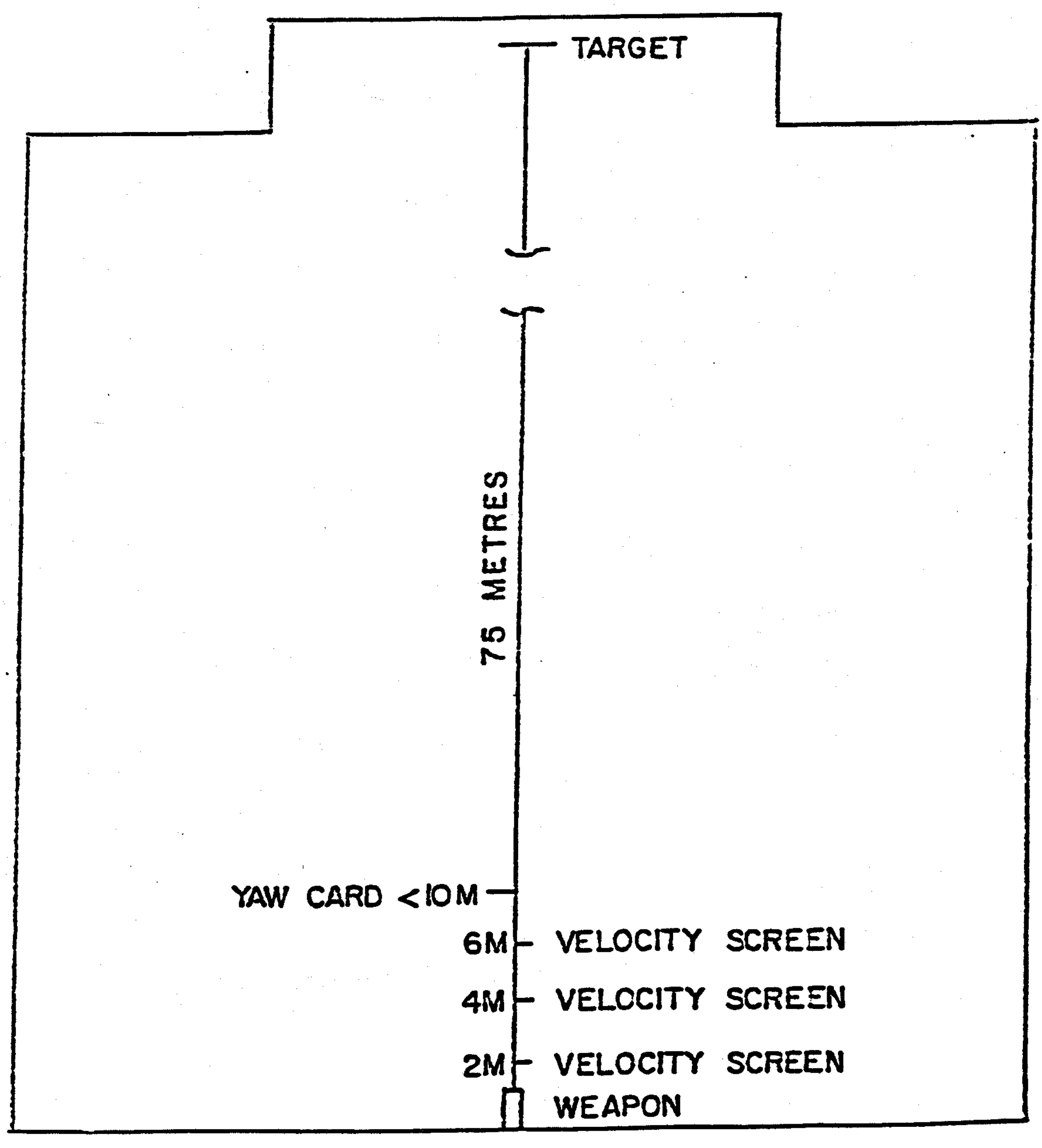
d. Linear standard deviation in horizontal and vertical plane, giving the mean quadratic dispersion.

e. Muzzle velocity.

f. First maximum yaw (the size of the hole in the yaw card being measured and converted through bullet geometry to yaw size).

g. Stability factor estimates.

Fig 3.1 TEST DETAIL - ENVIRONMENTAL DISPERSION EFFECTS



3.14 RESIDUAL STRESS TEST (NORMALLY BRASS CASE ONLY)

3.14.1 Object To determine the effects on the ammunition of contact with Mercurous Nitrate or Ammoniacal Copper Sulphate, this giving an indication of the long-term effects on the ammunition of inherent cracks or stresses in the cartridge case.

3.14.2 Method To be based on Section 15 of NATO Manual AC/225(LG/3-SG/1)D/8.

3.14.3 Results to be Recorded Any cracks or splits after testing.

3.15 FUNCTION AND CASUALTY TEST

3.15.1 Object To determine the effects of firing the ammunition with weapons, including those with maximum manufacturing tolerances and those with minimum manufacturing tolerances.

3.15.2 Method

a. To be based on Section 13 of NATO Manual AC/225(LG/3-SG/1)D/8.

b. The test weapons shall be from normal production but the following shall be added:

(1) MAX weapon (MAX permissable bore, MAX cartridge headspace, MIN firing pin protrusion);

(2) MIN weapon (MIN permissable bore, MIN cartridge headspace, MAX firing pin protrusion).

c. Function and Casualty firing should be carried out at High to Low temperature, with at least 100 rounds being fired from each of these weapons.

3.15.3 Results to be Recorded

(a) Weapon details

(b) All incidents of malfunction

(c) Any unusual conditions associated with weapon functioning, test ammunition, appearance of fired cases.

(Note: Normally no functioning failure due to the ammunition, no breaking away and no piercing of the primer are acceptable).

3.16 BULLET EXTRACTION TEST

3.16.1 Object To determine the force required to extract the bullet from the cartridge case.

3.16.2 Method To be based on Section 11 of NATO Manual AC/225(LG/3-SG/1)D/8 but arranged to cater to the ammunition under test.

3.16.3 Results to be Recorded

a. Test apparatus/method of mounting ammunition

b. Rate of loading

c. Rate of travel of loading head

d. Any calibration error

e. Extraction force for each round (giving average, minimum and maximum force)

3.17 SALT SPRAY TEST ON COMPLETE ROUND

3.17.1 Object To establish the effects on the ammunition of being subjected to a salt laiden environment as in amphibious operations or weapons systems used on naval vessels.

3.17.2 Method

(a) To be based on STANAG 4370 and AETCP-300, Method 309. Additional guidance is provided at Section 22 of NATO Manual AC/225(LG/3-SG/1)D/8, or appropriate MOPI. Both ammunition and weapons are treated as a system.

(b) At the conclusion of this test, there will be a firing to check velocity, providing the ammunition does not show signs of serious degradation.

3.17.3 Results to be Recorded

a. Any cracks or splits after testing

b. Results of firings

3.18 WATERPROOFNESS

3.18.1 Area Target Ammunition

a. Object To determine the ability of the ammunition to withstand the ingress of moisture.

b. Method

(1) To be based on Section 22 of NATO Manual AC/225(LG/3-SG/1)D/17. See also STANAG 4370 and AECTP-300 Method 307.

(2) A sample of the test ammunition of adequate size will be immersed to a depth of 30 cm in a solution of sodium fluoresceinate (113 g in 23 litres) maintained at a temperature of + 21°C ± 5 °C for a period of 24 hours. The ammunition and solution will be maintained at this temperature for four hours prior to immersion. The ammunition will be placed horizontally under the liquid and the depth adjusted so that the level is at least 30 cm over the uppermost part of the ammunition. All fuze elements shall be present in the fuze during the test.

(3) Following the 24 hour period of temperature conditioning, the ammunition will be removed from the liquid and half the sample dissasembled and inspected under the ultra-violet light to determine if any liquid entered any part of the ammunition. The remaining rounds will be fired within one hour after removal from the liquid. Effects on performance (velocity and impact functioning) will be determined by firing a like number of grenades that have not been subjected to the waterproofness test and comparing performance with respect to velocity levels and impact functioning. The control rounds should be fired alternately with the conditioned rounds.

3.18.2 Point Target Ammunition

a. Object To determine both the watertightness and airtightness of the ammunition, also the effects of any water getting into the round.

b. Method To be based on Section 21 of NATO Manual AC/225(LG/3-SG/1)D/8. See also STANAG 4370 and AECTP-300 Method 307.

3. 18.3 Results to be Recorded Details of leaks classified into:

a. No leak.
b. Slow leak.
c. Fast leak.

3.19 ROUGH HANDLING

Reference: To be based on STANAG's 4370 and 4375, AECTP- 400 Method 406, and ITOP 4-2-601.

A - Point Target Ammunition

Note: This testing is as much testing of the packaging as of the ammunition itself. If both new and in-service versions of the same ammunition are tested using existing in-service packaging, then directly comparable results can be obtained. However, new designs of ammunition tested using different packaging cannot provide directly comparable results with in-service ammunition and packaging: they can only give an indication of the ability of the new design of ammunition in its different packaging to withstand Rough Handling.

3.19.1 Rough Handling During Transport

a. Object To determine the effect on packaged ammunition of rough handling during the whole life of the ammunition.

b. Method The ammunition will be packaged in transport boxes and each box will be subjected in turn to the sinusoidal vibration, jolting and bouncing tests described in 2.15.2.1 (a), (b), and (c). Ammunition in belts and magazines in its combat packing can only be subjected to the bouncing test. The vibration and jolting tests are, in fact, designed for rigid equipment: they could be carried out on ammunition in belts or magazines in position on the corresponding weapons, the weapons being excited as described in 2.15.2. At the end of the tests, as for the weapons, the functioning of the ammunition will be tested including functioning of 20 rounds after a visual inspection has been carried out. An assessment of the handling and operating safety will also be made.

c. Results to be Recorded

(1) Exact test conditions

(2) Ammunition and packaging used

(3) Visual inspection of ammunition, also photographs

(4) Functioning of ammunition, including: velocity at specific point on trajectory maximum and minimum pressure hangfire watertightness trace (if applicable), also assessment of handling and functioning safety.

3.19.2 Dropping (Free-fall and with Parachute)

a. Object To determine the effect on ammunition of being dropped when packed in an appropriate container, either free-fall from a low-flying aircraft or with a parachute.

b. Method (See Section 2.15.3.2) Ammunition is to be packed in transport boxes (5 in number). Ammunition in belts and magazines in its combat packing (5 combat packs for each). The transport boxes and combat packs must fall in such a way that each time at least one box receives the impact on its base, on each side and on one longitudinal and one transversal edge. After this test, a functioning test is carried out, after visual inspection, on at least 20 rounds. The visual inspection covers the unscrewing of components and the noting of damage for all the ammunition.

c. Results to be Recorded

(1) Exact test conditions
(2) Ammunition and packaging/containers used
(3) Visual inspection of ammunition - also photographs
(4) Damage (including internal) of ammunition
(5) Functioning of ammunition, including:
- velocity at specific point of trajectory
- maximum and minimum pressure
- hangfire
- watertightness
- trace (if applicable)
- assessment of handling and functioning safety

3.19.3 Dropping from a Vehicle

a. Object To determine the effect on packaged ammunition of being dropped from a vehicle.

b. Method (See Section 2.15.3.3) Ammunition in belts and magazines in combat packing and unpacked (5 combat packs, 5 belts, 5 magazines). After this test, functioning test, preceded by a visual inspection, on at least 20 rounds from each. The visual inspection covers the noting of damage to the ammunition, the belts or the chargers, for all ammunition.

c. Results to be Recorded

(1) Exact test conditions
(2) Ammunition and packaging used
(3) Visual inspection of ammunition - also photographs
(4) Functioning of ammunition, including:
- velocity at specific point of trajectory
- maximum and minimum pressure
- hangfire
- watertightness
- trace (if applicable)
- assessment of handling and functioning safety

B - AREA TARGET

3.19.4 Sequential Rough Handling

a. Object

(1) This test is conducted to evaluate the capability of packaged and loose rounds of ammunition to withstand the shocks and vibrations that could be encountered as a consequence of transport or employment on the battlefield. Various phases of the test (as described in ITOP 4-2-602, Rough Handling Tests) represent: accidental drops of crated ammunition during ship loading (12 meter drop); intentional or accidental drops of crated ammunition from trucks, hovering helicopters, or forklifts (2.1 meter drop); transport of unpackaged ammunition (either in ammunition boxes or in belts) loosely placed on the cargo bed of a truck or trailer (loose cargo test); and drop of uncrated ammunition during man-handling (1.5 meter drop test).

(2) Except for the 12 meter drop test, all other rough handling tests are conducted at both high and low temperatures.

b. Method

(1) (Reference ITOP 4-2-602). The sequence begins by conditioning the packaged ammunition (half the total sample allotted for rough handling (e.g., 5 out of 10 standard packages)) for 6 hours at -51 °C. All the standard packages are dropped 2.1 m once in each of three orientations: bottom, left side and right side.

(2) One package is removed, the contents inspected, and then fired for muzzle impact safety (see Section 6.4.2.1).

(3) The remainder of the packages are subjected to the loose cargo test (30 minutes duration, multiple orientations) at the same temperature (see Section 3.19.5).

(4) 3/4 of the rounds from each orientation of the loose cargo test are then inspected and fired for muzzle impact safety (see Section 6.4.2.1).

(5) The remaining 1/4 are unpackaged and dropped 1.5 m at the same temperature against heavy steel plates. See Section 3.19.6. All are inspected and fired for muzzle impact safety (see Section 6.4.2.1).

3.19.5 Loose Cargo

a. Object To simulate the effects of transport of unpackaged ammunition (either in ammunition boxes or in belts) loosely placed on the cargo bed of a truck or trailer.

b. Method

(1) (Reference ITOP 4-2-602). Loose, temperature conditioned grenades are placed either in a standard container, or in belted configuration (as applicable) directly on the vibration surface, and vibrated for 30 minutes duration.

(2) After vibration is completed, grenades are visually inspected for any damage and then remotely fired from the standard launcher. Velocity measurements and functioning reliability are to be recorded, or rounds can be fired for muzzle impact safety only in accordance with Section 6.4.2.1.

3.19.6 1.5 Meter Drop (Unpackaged) - Point and Area Ammuntion

a. Object To determine point/area target ammunition serviceability after a 1.5 m drop using individual unpackaged rounds/grenades.

b. Method

(1) Reference STANAG 4375 and STANAG 4370, AECTP 400 Method 403.

(2) (Reference ITOP 4-2-602, or US MIL-STD-331, Test A4). This test consists of a series of 5 impact orientations with a number of individual, unpackaged rounds/grenades dropped singly for each impact orientation.

(3) A drop for an individual round/grenade is defined as a free-fall into a steel plate having a minimum thickness of 7.6 cm. The impact orientations of the round/grenade are:

(a) nose down;
(b) base down;
(c) horizontal;
(d) axis 45 degrees from vertical with nose down;
(e) axis 45 degrees from vertical with base down.

(4) A new round/grenade will be used for each separate drop.

(5) After being dropped, each round shall be fired from the standard service weapon and observed for proper functioning against a target plate of the same material and minimum thickness as used in the fuze sensitivity test (see Section 6.4.6, or for muzzle impact safety (see Section 6.4.2.1).

3.19.7 12 Meter Drop (Packaged) - Point and Area Ammunition

a. Object To determine if ammunition as normally packed does not deteriorate and is safe for disposal after a drop of 12 m.

b. Method

(1) Reference STANAG 4375 and STANAG 4370, AECTP 400 Method 403.

(2) (Reference ITOP 4-2-601 and US MIL-STD-331 Test A3)). This test consists of a series of 2 impact orientations:

(a) nose down;
(b) base down.

(3) A new package containing new ammunition will be used for each impact orientation. For each drop the package will contain a percentage of the number of rounds/grenades usually contained in a package. Fillers will be used to simulate weight and packing conditions of a full package of ammunition.

(4) Following the drop, the grenade ammunition shall not deflagrate and shall be safe to dispose of; there is no firing or performance test requirement.

3.20 EFFECT OF LIQUIDS ON AMMUNITION

3.20.1 Object To investigate the chemical compatibility of the ammunition with various cleaning products, liquids, lubricants or insecticides in use. Reference STANAG 4370 and AECTP-300 Method 314.

3.20.2 Method Immerse 100 rounds of ammunition and its clips for 5 minutes in the liquids and under the conditions specified in Section 2.17, noting their characteristics. After the last period of immersion, allow excess fluid to drain for 15 minutes before firing at ambient temperature (subject to precautions, and to the ammunition not showing signs of serious degradation).

3.20.3 Results to be Recorded

a. Exact test conditions
b. Details of liquids used
c. Any changes noted to the ammunition or its components
d. Results of firing, velocities
e. Assessment of handling and functioning safety

3.21 CHEMICAL AND NUCLEAR EFFECTS ON AMMUNITION

a. Object To determine the effects of Chemical and Nuclear warfare on the ammunition and its packaging, including any decontamination problems.

b. Method and Results

(1) The problems of these effects on the ammunition should be referred, usually as part of the overall weapon system, to the appropriate NATO group as required in Section 2.16.

(2) The problems of the effects on ammunition must also be considered.

(3) Results should include, as appropriate, those shown at 2.16.2 with the addition of consideration of ammunition packaging.

3.22 SAFETY AND SERVICEABILITY OF AMMUNITION IN STORAGE

3.22.1 Safety and Serviceability in Storage of all Ammunition

3.22.1.1 Resistance to Impact of a Projectile

a. Object To determine the effects on point target packaged ammunition of a hit by a projectile - including the effects on the ammunition in a magazine.

b. Method (Reference STANAG 4241)

(1) An adequate number of rounds of NATO 7.62mm ammunition (ball, armour piercing and tracer) will be fired against each type of test ammunition packaging; a magazine will be considered as a type of packaging.

(2) Firing will be continued until 5 hits on the propellant section of the ammunition and 5 hits on the primer have been registered.

(3) The various results obtained will be recorded and the same test will be carried out on packaging or on a magazine containing NATO 7.62 ammunition if it is considered that this is essential for the interpretation of the results.

c. Results to be Recorded

(1) Exact test arrangements
(2) Test ammunition and packaging
(3) Details of ammunition fired
(4) Results obtained from firing
(5) Full photographs

3.22.1.2 Resistance of a Stored Round to Premature Detonation

3.22.1.2.1 Object To determine the effects on packaged ammunition of one round being subjected to premature detonation.

3.22.1.2.2 Method (Reference STANAG 4396)

(a) The primer of a rounded located in the center of a package of ammunition be activated; a magazine will be considered as a type of packaging. This activation might perhaps be achieved by perforating the packaging just enough to insert a percussion pin or ignition electrodes. The detonation of the cartridge in question will be obtained either by dropping weight on the percussion pin or by energizing the electrodes.

(b) The various results will be recorded and the same test will be carried out on packaging or on a magazine containing NATO 7.62 mm ammunition if it is considered that this is necessary for the interpretation of the results.

3.22.1.2.3 Results to be Recorded

(a) Exact test arrangements

(b) Test ammunition and packaging

(c) Results obtained from ignition of a primer of the one round

(d) Full photographs

3.22.1.3 Resistance to Iinflammation

3.22.1.3.1 Object To ensure that the ammunition does not easily ignite, at atmospheric pressure, as a result of impact by a projectile and that flames do not rapidly spread from one round to another.

3.22.1.3.2 Method The methods used for this test will be as for those employed in the United States in the flame spreading test carried out with a heated wire) and in the match test. These tests are specified in NATO document AC/225(Panel III)WP/43. (Reference STANAG 4240).

3.22.1.3.3 Results to be recorded

(a) Exact test arrangements

(b) Test ammunition and packaging

(c) Result obtained from:

- flame spread test
- match test

(d) Full photographs

3.22.2 Safety and Serviceability in Storage of Ammunition Without Metal Cartridge Case

3.22.2.1 Ageing

3.22.2.1.1 Objective To establish the effects on the ammunition of successive temperature cycling representing the "ageing" effects experienced over the whole life of the round.

3.22.2.1.2 Method Forty rounds of ammunition will be subjected to an accelerated ageing test using a suitable climatic chamber. They will undergo 12 successive cycles of an appropriate ageing test. After this test, the ammunition will be checked visually and measured and, if there is no serious deterioration, it will be subjected to the high +52°C and low -54°C temperature tests described in Section 19 of AC/225(LG/3-SG/1)D/8.

3.22.2.1.3 Results to be Recorded

(a) Exact test arrangements

(b) Visual inspection after cycling

(c) Results as recorded in Section 19 AC/225(LG/3-SG/1)D/8.

3.22.2.2 Resistance of Micro-Organisms

3.22.2.2.1 Object To determine the resistance of the ammunition in particular to micro-organisms (fungi).

3.22.2.2.2 Method (Reference STANAG 4370, AECTP 300 Method 308).

(a) Forty rounds of ammunition will be placed in an air- tight enclosure and exposed to selected micro-organisms. See ISO 846.

(b) After this test, the ammunition will be checked visually and measured and, if there is no serious deteriorating, it will be subjected to the high 52 °C and low -54°C temperature tests described in Section 19 AC/225(LG/3-SG/1)D/8.

(c) As a guide, the method used in the 1977-79 NATO Test is given below.

1. Preparation

a. Sample of 40 rounds of each ammunition to be sent from the Test Centre to a Microbiology Laboratory)

b. Mould cultures of the type listed below are to be prepared within 14-28 days before the tests.

Table 3.4 **MICRO-ORGANISMS**

No	Name	Typical Strain culture for guidance	Nature
1	Aspergillus niger	V Tieghem ATCC 6275	Grows profusely on many materials and is resistant to copper salts
2	Aspergillus terreus	Thom PQMD 82j	Attacks plastic materials
3	Aercobasidium pullulans	(De Barry) Arnaud ATCC 9348	Attacks paints & lacquers
4	Paccilomyces varioti	Bainier IAM 5001	Attacks plastics and leather
5	Penicillium funicolosum		Attacks many materials especially textile
6	Penicillium ochro-chloron	Biourge ITCC 9112	Resistant to Copper salts & attacks plastics and textiles
7	Scopulariopsis brevicaulis	(Sacc.)Bain Var.Glabra Thom IAM 5146	Attacks Rubber
8	Trichoderma viride	Pers.Ex.Fr. IAM 5061	Attacks cellulose textiles & plastics

c. Mould suspensions are to be prepared as follows:

(1) The suspension shall be prepared in distilled water to which has been added 0.05% of a non-fungicidal wetting agent. An agent based on N-methyl tauride or on dioctyl sodium sulphosuccinate has been found to be suitable.

(2) 10 ml of the water containing wetting agent is addedgently to each phial or tube. A platinum or a nichrome wire is sterilised by heating to red heat in a flame and allowing to cool. This wire is then used to scrape gently the surface of the culture to liberate spores. The liquid is slightly agitated to disperse the spores without detaching mycelial fragments, and the mould suspension gently decanted into a flask.

(3) All eight of the dispersion are shaken vigorously together in the flask to mix thoroughly and to break up any clumps of spores.

(4) The suspension must be used on the same day in which it is prepared, and must not be stored for future use.

d. A viability control test is to be carried out by allowing the spores to attack control strips of pure white filter paper soaked in a solution made up of the following nutrient salts dissolved in one liter of distilled water. The strips shall be freshly prepared on the same day in which they will be used for the test and a fresh solution of nutrient salts shall be used for preparing each batch of control strips.

Modified Czapek-Dox solution containing sucrose

Potassium dihydrogen orthophosphate (KH2HPO4)	0.7g
Potassium monohydrogen orthophosphate (K2HPO4)	0.3g
Magnesium sulphate (MgS047H20)	0.5g
Sodium nitrate (NaN03)	2.0g
Potassium chloride (KC20)	0.5g
Ferrous sulphate (FeS047H20)	0.01g
Sucrose	30 g

2. Equipment

a. An incubator shall be used for testing which shall have an operating temperature range of 28-32 C. Any periodic cycling of the temperature due to action of the thermostat shall not exceed 1 C per hour.

b. Each group of test ammunition and control strips shall be contained within one or more glass or plastic containers with close fitting lids.

The container shall have free distilled water exposed at all times in the base to maintain a relative humidity greater than 90 %. Specimens shall not rest in, or be splashed by this water.

The container lid will be opened for 10 seconds each 7 days to ensure a regular supply of fresh oxygen to the growing moulds.

3. Testing

a. Ammunition for testing and three control strips are to be sprayed with the mixed spore suspension in water. The spray shall be generated by a nozzle large enough not to be blocked by fragments of mycelium, such as an artist's spray gun, and shall impinge on all surface of the ammunition and control strips.

b. The ammunition control strips are to be placed in their containers within 15 mins of spraying and shall not be disturbed, except for opening container lids, for 28 days.

c. The test shall be considered void and recommenced if no mould growth is found on control strips within 7 days.

4. Examination

a. Immediately on removal from the container test ammunition will be photographed in color.

b. After photographing the ammunition will be examined under a microscope.

3.22.2.2.3 - Results to be Recorded

(a) Exact test arrangements

(b) Colour photographs on removal from container

(c) Results of microscopic examination

3.22.2.3 Resistance to Termites

3.22.2.3.1 Object To ensure that the ammunition, caseless ammunition in particular, is resistant to attack by termites.

3.22.2.3.2 Method

(a) The test will be carried out in accordance with an appropriate national standard – see ASTM D3345 and ASTM D1413.

(b) The manufactures of ammunition submitted to this test will confirm whether or not the ammunition has received protective treatment against termites.

(c) As a guide, the method used in the 1977-79 NATO Tests is given below:

1. Preparation

a. A sample of 10 rounds of the ammunition will be sent from the Test Centre to the Laboratory.

b. The laboratory will prepare test chambers of 250-400 ml capacity an fill two-thirds full with Vermiculite of 2-3mm grain diameter. A suitable rest will be placed in the vermiculite to support the sample during the test. The vermiculite will be moistened by distilled water.

The quantity of water to be used is to be 3 (Three) times the weight of Vermiculite.

c. 250 Termites of the species RETICULITERMES SANTONENSIS (de Feytaud) will be collected, care being taken to ensure that none are moulting or wounded. A number of soldiers and pupae must be added corresponding to the proportion found in the colony from which they are selected.

d. The Termites are to be placed in the test chamber and the chamber covered with a lid allowing air circulation.

2. Testing

a. The ammunition sample under test will be placed on the support in the test chamber and the lid replaced.

b. The test chamber is to be placed in a conditioning chamber with temperature maintained at +27 °C ±1 °C and a relative humidity of 75% ±5%.

c. Control samples of wood, size and type would be left to the discretion of the laboratory, are to be placed in the test chamber to assess the virulence of the termites collected for the test.

d. Testing is to take place for 8 weeks.

e. During the test the moisture of the Vermiculite is to be maintained by small daily additions of distilled water.

3.22.2.3.3 Results to be Recorded The laboratory will report on each test in accordance with their normal practice. In particular the activities of the termites during the test and the condition of the ammunition should be supported by color photographs.

3.23 FUNGUS RESISTANCE

3.23.1 Object This test is conducted to determine whether fungus, streptomycetes, or bacteria to which the test ammunition will be exposed under tactical situations will degrade its performance.

3.23.2 Method

a. If all components are certified for fungus resistance, the fungus test is not necessary; otherwise, samples of the test ammunition are subjected to the applicable portions of the fungus resistance test (as outlined in MIL-STD-810 E Method 508.4. (Also reference US MIL-STD-331, C5).

b. Following the fungus exposure, the cartridges are wiped clean and examined for any damage; the rounds are then fired from the service weapon and functioning observed. Fuzed ammunition is fired to impact against a target determined to reliably function the fuze as established under Fuze Sensitivity, Section 6.4.6. Tracer ammunition is fired for daylight trace observation as described in Section 3.25. For cartridge grenades, cartridge cases are examined following the firing test to determine any firing defects resulting from the exposure.

3.24 EFFECT OF CROSS WIND ON TRAJECTORY

3.24.1 The effect of cross wind on trajectory becomes more significant as the trend develops towards lighter, higher velocity ammunition. Owing to the difficulty of obtaining reliable mean wind data over the full extent of the range, experience has shown that cross wind deflection can be more reliably assessed by calculation than by measurement.

3.24 2 Object To compare the effect of cross wind on the trajectory of projectiles from the test weapon system, and from a nominated control weapon system.

3.24.3 Method The formula shown below will be used to derive the predicted values of cross wind deflection (based on the retardation effect of air upon the bullet). This requires the determination of muzzle velocities and time-of-flight measurement as covered in paragraphs 3.24.4.1 to 3.24.4.5.

Formula for Derivation of Cross Wind Deflection of Projectiles

$$W_D = W_C\left(t - \frac{x}{v}\right)$$

where: W_D = cross wind deflection, m

W_C = cross wind component, m/s

t = time of flight, s

x = range, m

v = muzzle velocity, m/s

In order to obtain true comparative data one “warmer” and then a minimum of 10 rounds (the total depending on the statistical validity of the results achieved) will be fired from each of the test and control weapons, at the same location and date, from which mean comparative values of cross wind deflection will be obtained. The results will give representative predicted cross wind deflection values with a cross wind component of four m/s and at the agreed maximum operational range. (The cross wind deflection is, of course, directly proportional to cross wind component and time.)

3.24.4 Time-of-Flight Measurement

3.24.4.1 Facilities Firings will be conducted (on a sheltered range) under "still" conditions such that the line of fire component of the wind vector does not exceed 1.5 m/s and may therefore be ignored. To determine this component a suitable anemometer and anemoscope will be used. The sensing elements should be mounted about 3 m from the ground and within 20 m from the gun.

3.24.4.2 Equipment Two photo-electric or optical initiators will be positioned at suitable short distances from the weapon muzzle to obtain "observed" velocity results. A photo-electric or optical initiator will be placed at a distance of 400 m from the muzzle. (Gun to initiator and inter-initiator distance will be carefully measured.) As an alternative a time-of-flight screen of suitable size consisting possibly of two conducting layers separated by an insulating layer may be used at the 400 m position. Short circuiting of the conducting layers terminates the time-of-flight count. Two counter chronographs will be used, one to record the bullet's time of passage between the photo-electric initiators and the second to measure the time interval of the bullet's flight between the first photo-electric initiator and the time-of-flight screen. As an alternative, a doppler velocimeter may be used to obtain these measurements.

3.24.4.3 Results to be Recorded

Tables will be produced for each weapon showing:

- the muzzle velocity of each round;
- the time of flight to 400 m of each round;
- the line of fire component of wind vector at the time when each round as fired;
- mean values of muzzle velocity and time of flight to 400 m;
- derived values of predicted cross wind deflection based upon the above mean values and with an assumed cross wind component of four m/s.

3.25 TRACER FUNCTION TESTS

3.25.1 Object This test is conducted to determine the visibility and performance (length and time of trace) of the tracer element in the ammunition. The test is conducted under both night and day conditions; at night to determine the physical characteristics of the trace out to trace burn out range the length of trace and delayed ignition and the quality of trace; and in daytime to determine the visibility during hours of light.

3.25.2 Method

(a) To be based on Section 20 of NATO MOPI AC/225(LG/3-SG/1)D/8. Consideration should be given to a repeat test, after accelerated ageing, during environmental tests.

(b) But with additional detail, using appropriate distance, based on the Test Detail of the 1977-79 NATO Tests, which was as follows:

(c) Firings are normally conducted from the weapon in a single-shot mode of fire. For the night phase, reference lights are positioned along the line of fire at predetermined distances and a camera(s) is positioned perpendicular to this line. The camera is placed so that the reference lights are within the field of view; in some instances it is necessary to use more than one camera. The camera shutter remains open during the firing of each cartridge so that each tracer appears as a line across the exposed film. Multiple exposures may be recorded on the same plate or film by tilting the camera in small uniform increments. The time of trace from tracer ignition to burnout is recorded manually with stopwatches.

(d) Daylight firings are similarly conducted except that only the time of trace is recorded. The observers (timers) are behind the weapon and positioned to allow complete view of the trajectory. The same personnel employed for timing under night conditions should be used so that reaction time for the stopwatches will be comparable.

(e) The following terminology is used in reporting by actual count the defects occurring during the tracer evaluation:

1. Blind: No trace during any part of the trajectory;
2. Short: Tracer did not reach required length, but no defects;
3. Short igniter: Only igniter burned;

4. Early: Bright trace starts too soon and ends before reaching the required distance;

5. Delayed: Bright trace starts late and traces the required distance;

6. Long: Bright trace starts too soon and traces the required distance;

7. Partial: Bright trace starts too late and does not trace the required distance;

8. Bursting Bullet: Projectile explodes with loud report and does not continue in normal flight;

9. Igniter Muzzle Flash: Particles of burning igniter and tracer composition are blown from the projectile.

10. Tracer Muzzle Flash: Tracer composition is blown from the projectile and the projectile continues in flight. It traces not over 25 m.

(f) Tracer evaluation testing is generally accomplished at the range ambient temperature; it may be of interest, however, to condition some test cartridges to high and low temperatures to determine whether there is any temperature effect on performance.

Part 1 - Length of Trace and Delayed Ignition

Note: All trace ammunition will be tested at sufficiently long range to establish the tracer burn out range.

1 Equipment

(a) Weapon system suitable for each type of Test and Control Ammunition.
(b) Suitable mount.
(c) Light sensitive Electrical Sensors (Optional: If possible utilise observers)
(d) Image Intensifier (I^2)

2 Preparation

The weapon and other equipment will be set up and tested. The layout of the range will be on the following lines:

(a) Gun position - at an appropriate distance from the stop butt.

(b) Light sensors will be established at appropriate distances from the Gun position.

(c) In addition to the light sensors human observers will be positioned to observe the trace at appropriate distances from the gun position.

(d) These observers will be approximately at right angles to the line of fire and a minimum of 50 m from the line of fire. Their fields of view will be restricted to the area, which they are required to observe.

3. Method

(a) The Trace Test will be fired in daylight but in dull overcast conditions avoiding bright sunshine and by night.

(b) At least three (3) unrecorded cartridges of the type of ammunition under test will be fired to sight, warm and foul the barrel before commencement of the Test.

(c) One hundred (100) unconditioned test cartridges will be fired with sufficient interval between cartridges to allow the trace of each shot to be observed and recorded by each observer.

(d) After firing fifty (50) shots the barrel will be air cooled to ambient temperature.

(e) Paragraph 3(c) and (d) will be repeated with 300 rounds to test ammunition which has been subjected to Climatic Storage Conditioning as follows:

(1) 100 rounds as for Test 3.11.1.
(2) 100 rounds as for Test 3.11.2.
(3) 100 rounds as for Test 3.11.3.
(4) 100 rounds as for Test 3.11.4.

(f) The trace characteristics of each shot fired will be recorded as it passes each observation point. After the test is completed, the observers will check their observation shot-by-shot with the test conducting officer to determine the type of defect, if any, attributed to each individual shot of the test.

(g) The dim tracer shall be tested as above with the following exceptions:

(1) The dim tracer shall be tested at night only.

(2) When viewed at night from behind and above or to one side of the gunner, the bullet of the tracer cartridge shall exhibit a detectable trace, when viewed with the aid of an Image Intensifier, from the muzzle of the weapon to a point not less than that specified in the appropriate Manual of Proof and Inspection (MOPI). The trace shall be also at a very low level of luminosity and preferably invisible when viewed with the unaided eye.

4. Reporting

(a) All defects will be reported by actual count using the definition described in the NATO Manual of Proof and Inspection (MOPI) AC/225(LG/3-SG/1)D/8, Section 20.

(b) The results from the electrical sensors will be shown in parallel with the human observations.

Part 2 - Quality of Trace

Note: There is a requirement to assess the quality of trace - particularly to indicate flight of projectiles and for target indication purposes - under different light conditions and against different backgrounds. As the assessment of quality of trace must be subjective, it is probably best done by actual soldiers during the course of the Military Tests. During the 1977-79 NATO Tests the quality of trace was assessed by “experts” at a Technical Test Center, but it was found that "expert" opinions varied considerably and that the use of soldiers under field conditions would have been better. The Test Detail used is given below as an indication of how such testing might be done:

1. Equipment and Personnel

(a) A panel of expert observers drawn from the staff of the test center.

(b) Weapons for each type of ammunition to be fired.

(c) Suitable mounts for the weapons.

2. Preparation

(a) The ammunition will be fired at an appropriate range from the stop butt.

(b) The observers will be positioned to the side of, and approximately level with, the firing position.

(c) The test will be conducted on three separate occasions in various weather/visibility conditions, e.g.:

(1) Bright sunshine.

(2) Dull, overcast.

(3) In darkness.

3. Method

(a) For each of the three test occasions the panel will observe each type of tracer ammunitions:
(1) 10 x 7.62 mm tracer control will be fired first;
(2) 10 x 5.56 mm tracer control will be fired second.

(b) Ten unconditioned rounds of each of the contender ammunitions, followed by 3 x 10 rounds which have been conditioned as described in Part 1, paragraph 3(e) of this test will then be fired in an order decided by drawing lots. The Panel will not know the order of firing.

4. Reporting

(a) The report will show each panel member's opinion on each round fired for the following characteristics:

(1) Trace colour.

(2) Trace visibility using terms such as:

Clearly visible for full distance
Not visible
Dimly visible

(3) Was the trace satisfactory (YES/NO).

(b) The panel members will be required to show their opinion on which series (in numerical order) was the "best" tracer ammunition and which was the worst. (They may give a complete order of merit if they feel that this is possible).

(c) The type of ammunition to which the numerical order applies will be added into the Report by the test conducting officer at a later stage.

3.25.3 Results to be Recorded As given in paragraph 4, "Reporting" for both Parts 1 and 2.

TEST 3.25 - TRACE TEST
Part 2 - QUALITY OF TRACE

SHEET: 1

Key (Column 4)
CV = Clearly visible for Full Distance
DV = Dimly visible
DV$^1/_2$ = Dimly visible for half distance
NV -Not visible etc.

PANEL MEMBERS:
NAME:
DATE OF TEST:
WEATHER (VISIBILITY) CONDITIONS:

Type of Ammunition (Computed) Later by Test Conducting	2 ROUND NUMBER . .	3 TRACE COLOR RED, GREEN, ORANGE, ETC. .	4 TRACE VISIBILITY (See Key) .	5 SATISFACTORY TRACE (Yes/No) .	6 FURTHER OBSERVATIONS AND REMARKS .
	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				
	1				
	2				
	3				
	4				
	5				
	6				
	7				
	8				
	9				
	10				

3.26 LOGISTIC SUPPORTABILITY

3.26.1 Object An overall assessment of the logistic supportability of the ammunition, based on information gained throughout the evaluation test series.

3.26.2 Method Test data that will be collected during the initial inspection and all other tests, as appropriate, to evaluate the logistic supportability of the ammunition shall consist of the following elements:

(a) Design for maintainability
(b) Ease of transport and handling
(c) Effectiveness of packaging
(d) Special or system unique tools
(e) Personnel and training factors

SECTION 4

SPECIFIC TESTS FOR KINETIC MUNITION

4.1. PERSONNEL VULNERABILITY TO SMALL ARMS FIRE

4.1.1 Introduction

a. In the past terminal (wound) ballistics have concentrated largely on the incapacitation effect on an unprotected man of a random hit by a fragment from an explosive ammunition. As far as small arms were concerned, the weapon systems generally had no difficulty in incapacitating an unprotected man out to the maximum range of the weapon. Now, however, there is a requirement both to defeat the lightly protected man (that is a man wearing steel helmet and/or body armour) at a particular range and also to make weapon and ammunition as light and as handy as possible compatible with this incapacitation. As a result, weapon systems may now be designed to achieve just the minimum incapacitation of the lightly protected man (when wearing his helmet in particular) out to the "essential" range. Accurate testing, analysis and assessment is then necessary to establish exactly that the incapacitation requirement has been met.

b. Terminal (wound) ballistics tests, largely due to the difficulty in achieving a "good hit" on the target array at full range, tend to be time-consuming and thus costly. It is therefore necessary to concentrate effort on the essential incapacitation requirement, with extrapolation a limited supplementary testing giving further information regarding effects behind other types of protection and at other ranges. Maximum use must be made of firings at "simulated ranges" (short range firings to give same effects as a at longer "real ranges" required), but with some real firings at longer ranges to confirm effectiveness of "simulated range" firings representing that range.

4.1.2 Object To evaluate the ability of the weapon system firing its basic point target round (normally the "ball" round) to incapacitate a human target as required in the agreed specification. Normally "the lightly protected man" (namely a man wearing a steel helmet and/or body armour). Firings must be carried out at the "essential" ranges. Firings at the "desirable" ranges may be advisable. (Reference STANAG 4512)

4.1.3 Method and Measurements Required

4.1.3.1 Method

(a) The main part of the test will take the form of firings against gelatine blocks at both actual and simulated ranges.

(b) For the firings at simulated ranges certain external ballistic data (velocity, yaw) have to be obtained based on actual range firings with the weapon and normal rounds.

(c) In addition certain personnel vulnerability data will be obtained during Section. 3.10 (Penetration). Details are given in STANAG 4512.

(d) Indoor ranges will be used as much as possible.

(e) Ball ammunition will be used in the first instance. For "simulated range" firings, reduced charge rounds will be put together by the Test Centre using components provided by the manufacturer.

(f) All ammunition will be conditioned at +21^{o}C $\underline{+}2^{O}$C for at least 12 hours before each firing and kept at that temperature up to the moment of firing each round.

(g) Details of the gelatine block are given on Figure 4.1.

(h) An example of the use of "simulated" and "actual" firing distances (that used on the 1977-79 NATO tests) is given on Figure 4.2.

(i) Examples of test lay-outs used are given in Figures as follows:

Test lay-out	**Figure**		
Simulated Ranges	4.3	(and notes)	4.3.1
Actual Ranges	4.4		
High Speed Camera	4.5		
X-ray Tubes	4.6		

4.1.3.2 Measurements Required

(a) Retardation of the bullet in the gelatine ;block will be recorded using high-speed camera techniques. Film records of the cavity changes inside the gelatine; block will also be made. Full details of all gelatine block measurements are given on Figure 4.7.

(b) For all firings against the gelatine block there will be recorded:

(1) firings at actual distances: velocity at 10m from the weapon and 10m in front of the block, and yaw as near as possible to the block.

(2) firings at simulated distances: velocity and yaw as near as possible to the block.

4.1.3.3 Results to be Recorded

(a) Firing conditions, temperature.

(b) Weapon, ammunition, mounting.

(c) Velocities and yaw.

(d) Firing distance.

(e) Gelatine block details (e.g. storage time).

(f) Measuring instrumentation details.

(g) Number of rounds fired/"good hits".

(h) Retardation of bullet in gelatine block.

(i) Cavity volume in gelatine block (film)

(j) Effects on witness material

4.1.3.4 Analysis The data from the real and simulated range firings against the gelatine block will be analysed at the Test Centre in order to arrive at the P(I/H) factor (the Probability of Incapacitation given a Hit). The film (or relevant parts of the film) showing cavity changes will be used for specialist analysis of this phenomenon.

Note: The US EKE method is the recommended method to be used. Individual nations have to establish appropriate agreements to access this model from the host nation. This can be accomplished through the national delegates of AC/225(LG/3-SG/1).

4.1.3.5 Assessment

(a) After analysis the test results will be referred to a Panel of Experts on Terminal Ballistics for a final analysis and assessment. The Panel of Experts will also have to consider terminal ballistic results from other Tests - in particular Section 3.10.

(b) First priority must be given to establishing the weapon systems ability to meet the "essential" incapacitation requirement, see Section 4.1.2. However, a full analysis and assessment of effectiveness with other forms of protection and at other ranges should also be considered.

(c) For the basic human target (the lightly protected man) analysis may include inputs from other Sections, both in the technical and military tests on the chance of hit on particular sections of the body (head, protected by steel helmet - torso, protected by body armour - and limbs, unprotected). These data, when combined with the relative chance of incapacitation for that section of the body may then indicate the total overall chance of incapacitation for the weapon system.

(d) After analysis and assessment, the weapon systems under test (including "controls") should be listed according to their ability to incapacitate the basic target (the lightly protected man) at the "essential" range. From the further test results (see 4.1.3.1) and from extrapolation from the basic test results, relative incapacitation behind other protection and at other ranges should also be established.

Figure 4.1 Personnel Vulnerability to Small Arms Fire Gelatine Block

Size:	A stationary gelatine block 30cm (along line of fire) x 15cm x 15cm.
Gelatine powder:	Photo gelatine of the firm Koepff & Söhne, quality controlled in a laboratory.
Composition:	20% by weight. For example, 6,000g of dry gelatine powder are mixed with 24,400g of water at 25^{o}C. 0.01% Thymol will be added as a preservative against mould.
Mixture:	Let the mixture soak for 45 minutes without stirring. After swelling, the mixture is gelatinous and opaque. Then, without being stirred, it is heated up to a temperature of 50^{o}C to get a clear, easy-flowing liquid. Then skim off carefully foam and bubbles from the surface.
Pouring:	Pour the liquid into stainless steel moulds of a 15 x 20 x 30cm size. (The final height of the block has to be 14 to 16acm). Again skim off the foam.
Cooling:	Cool the mixture while in the mould to a temperature of 20^{o}C.
Block:	Gelatine block may be removed from the mould by dipping into hot water and turning it over on a flat surface. Surface ridges that are optically objectionable may be smoothed out by placing a flat pane of glass on the surface, pouring hot water over the glass and honing the glass against the surface until satisfactory. Store in refrigerator at 10$^{o}\pm$ 2^{o}C for several hours until the temperature in the block has stabilised.
Store and use;	Store at 10$^{o}\pm$ 2^{o}C either with 65% RH (or sealed in a plastic bag with no humidity specification) up to 4 days. During the firing the gelatine block will have a temperature of 10$^{o}\pm$ 2^{o}C.

Figure 4.2 **Personnel Vulnerability to Small Arms Fire Example of Firing Against Gelatine Block**

Firing Serial No.(1)	Individual Weapon (IW) and Light Support Weapon (LSW)	Weapon or Accuracy Barrel	Actual Firing Distance (m)	Real distance or velocity and yaw giving the known conditions at the simulated distance (m)	Minimum number of "good hits"
1.	IW and LSW (2)	Accuracy barrel	10 ± 1 (3)	100	10 (4)
2.	IW and LSW (2)	Accuracy barrel	10 ± 1 (3)	300 (5)	10 (4)
3.	IW and LSW	Weapon (6)	300	Real distance (5)	5 or 6
4.	IW	Accuracy barrel	10 ± 3	500	10 (4)
5.	LSW (7)	Accuracy barrel	10 ± 3	600	10 (4)
6.	LSW (7)	Accuracy barrel	10 ± 3	800	10 (4)

NOTES:

(1) The serials may be fired in any order.

(2) When the ammunition is common to the IW and LSW only one firing is necessary. It will be made under the conditions for the IW for Serials 1 and 2 and at 600m under the conditions for the LSW for serials 4 and 5.

(3) "± 1m" allows a correct yaw to be obtained.

(4) Or more if necessary to obtain a correct yaw distribution.

(5) Permits a direct comparison of results.

(6) Weapon on buffered mount as for Test 2.19 or hand held as determined by the Test Conducting Officer. Single Shot Firing

Figure 4.3 **Simulated Ranges**

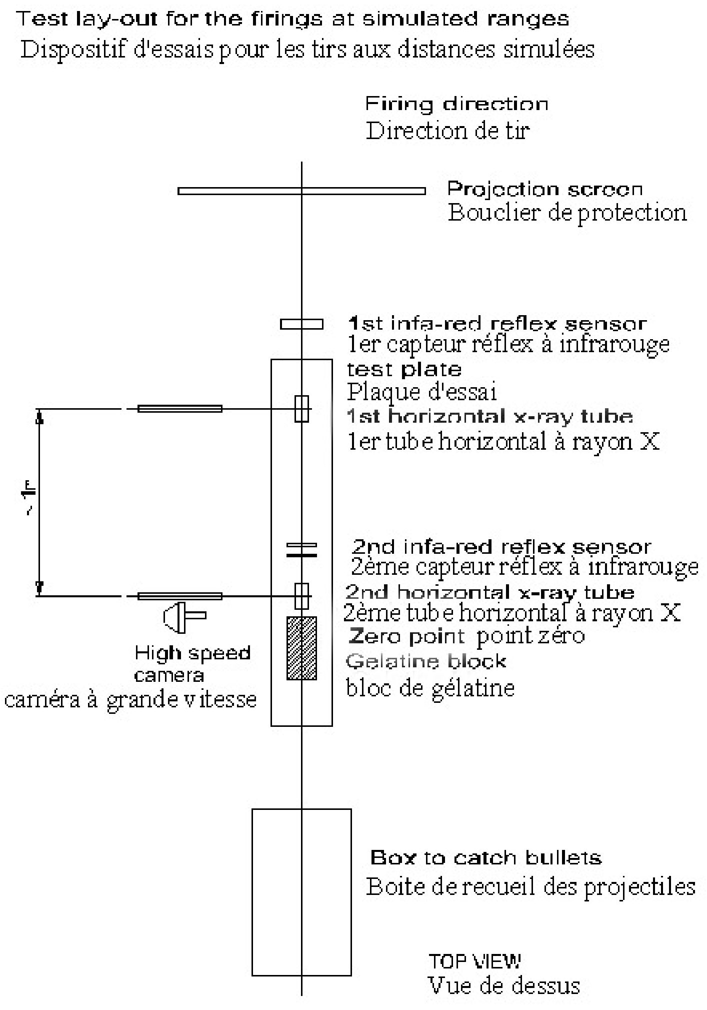


FIGURE 4.3

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Figure 4.3.1 **Test Layout for Firings at Simulated Ranges**

NOTES:

(1) The real distances of 100 to 800m were simulated at a range of 10m.

(2) The accuracy or pressure barrels were fixed in a mount. The muzzle and centre of the gelatine block were at the same height.

(3) In front of the test apparatus a protective plate was positioned which had a 9cm diameter round hole for shots to pass through.

(4) The projectile velocity was measured approximately 50cm in front of the gelatine block by the use of x-ray flash photography and a counter.

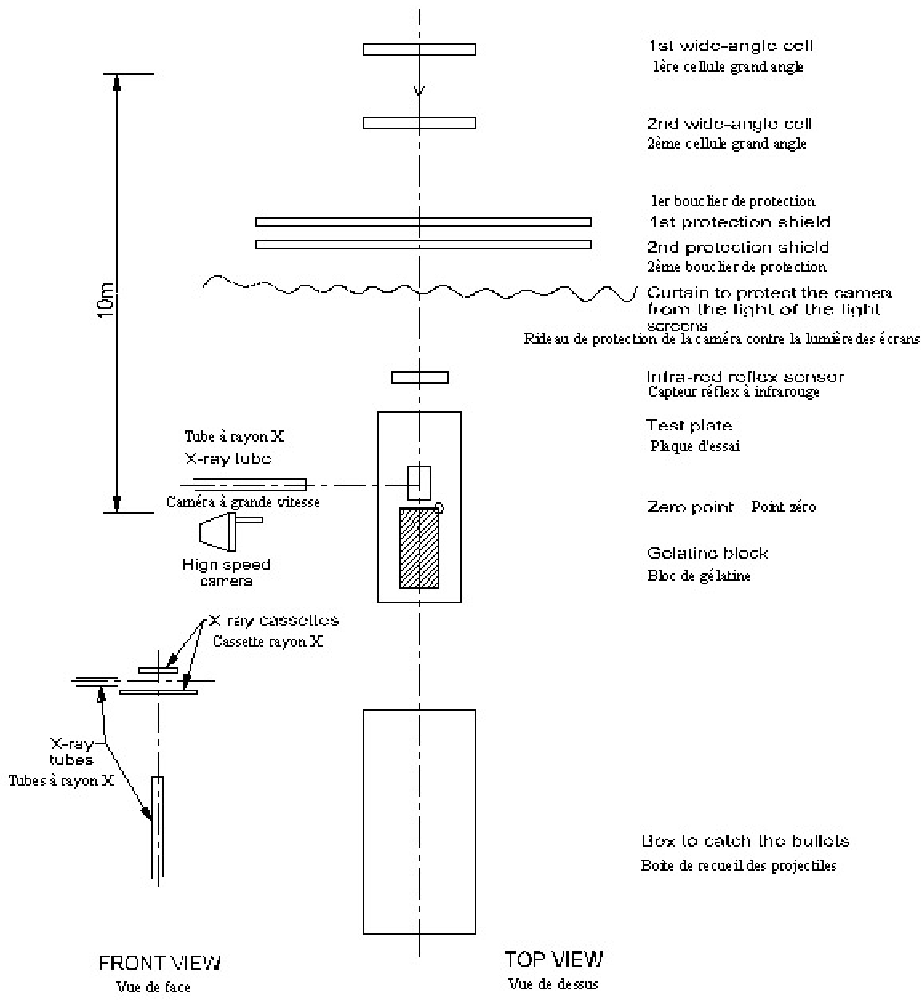
(5) The yaw was measured firstly about 1m and secondly a few cm in front of the gelatine block by the use of x-ray measuring points.

(6) In contrast to the testing at real distances a different test base-plate was used, as two x-ray points had to be accommodated.

(7) The penetration of the projectile into the gelatine block was measured as for the testing at real distance.

(8) The test plate and the measuring equipment were surveyed in relation to the line of fire.

Figure 4.4 **Actual Ranges**

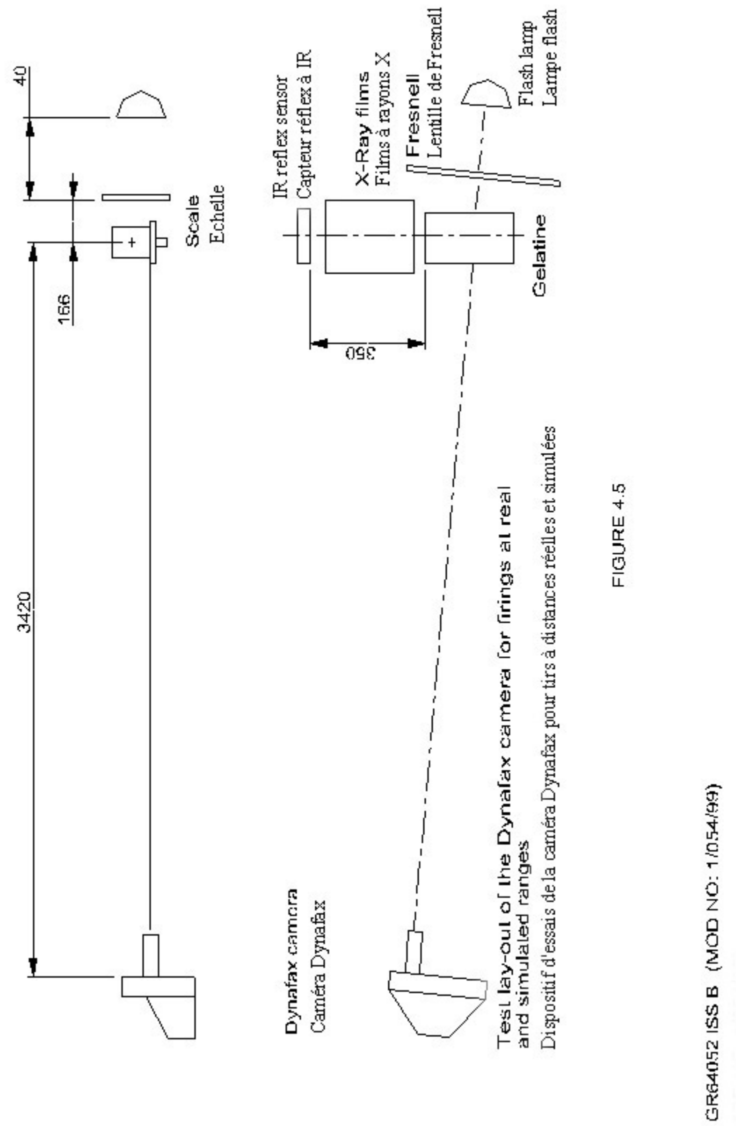


Test lay-out for the firings at real ranges
Dispositif d'essai pour les tirs aux distances réelles

FIGURE 4.4

GR64193 ISS B (MOD NO: 1/1054/99)

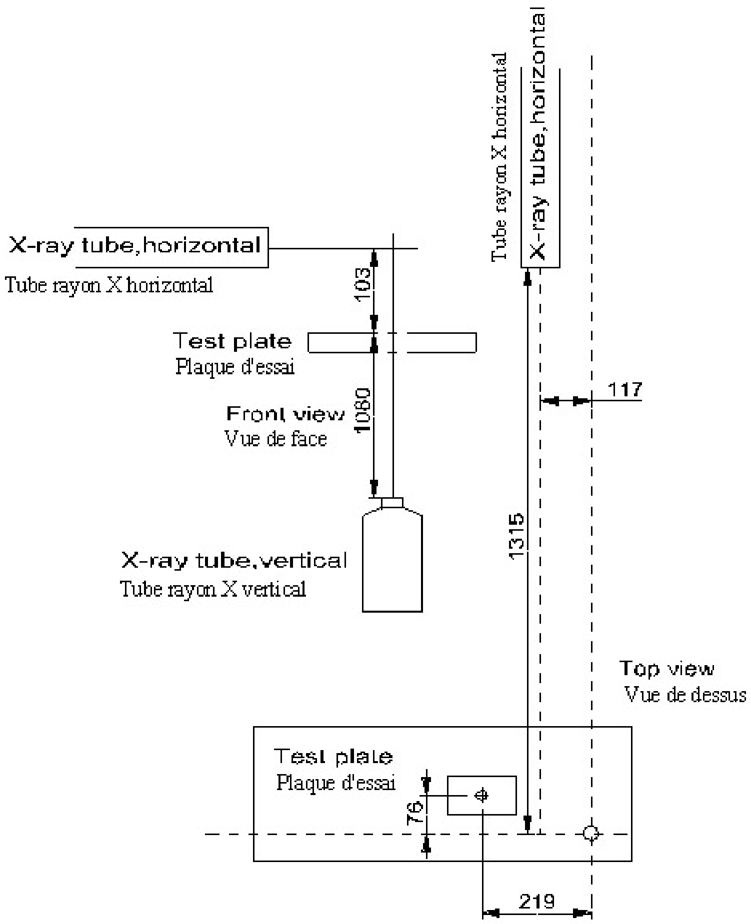
Figure 4.5 **High Speed Camera**



Test lay-out of the Dynafax camera for firings at real and simulated ranges
Dispositif d'essais de la caméra Dynafax pour tirs à distances réelles et simulées

FIGURE 4.5

Figure 4.6 **X-Ray Tubes**



Test lay-out of the x-ray tubes for firings at real ranges

Dispositif des tubes à rayons X pour les tirs à distances réelles

FIGURE 4.6

GR64191 ISS B (MOD NO: 1/054/99)

Figure 4.7
Personnel Vulnerability to Small Arms Fire Measurements in Gelatine Block

1. The dimensions of the gelatine blocks used must be 15 x 15 x 30cm as given on page

For the firings the blocks will be placed on a flat surface, one of the long sides acting as the base.

2. Two high-speed cameras (Dynafax Model 350 - or equivalent - with a frame speed of 35,000 frames/second) will be used in order to determine the projectiles/energy loss in the gelatine blocks. One camera will be used to determine the development of the temporary cavity in the gelatine block in the direction of the trajectory; the second to determine this development in the direction vertical to the trajectory. This second camera will have to have a frame speed inferior to that of the first. Set second camera could be eliminated if the data on the cavities can be obtained with the first camera alone.

The films obtained by the above process will be sent for cavity analysis.

3. The data on the function penetration/time concerning the development of the temporary cavity in the direction of the trajectory will be established by the Test Centre and subsequently analysed by means of an analysis programme on a computer. The results will then be made available.

4. The data on external ballistics will be established during preliminary testing (at least that which has not been established already during ammunition Technical Testing. On this subject the necessary velocities for the simulations and the yaws (angle between projectile axis and trajectory) must be measured as given in Figure 4.3.1. For these measurements a shadow graph photographic system will be used.

5. The yaws of the projectiles at the moment of impact on the gelatine blocks will be recorded by shadow graph radiography.

4.2. EFFECT OF LIGHT BRUSH ON TRAJECTORY

4.2.1 **Introduction** The deflection of small arms projectiles by brush becomes of increasing importance as the weight of the projectile decrease. The possibility of accurate aimed fire decreases as the firer's field of view is obscured by increasing brush depth and/or density. There will obviously be many occasions, however, when it is necessary to search with fire certain areas which are hidden from view by brush. A few brush deflection test have been devised using both natural and simulated brush. The simulated brush generally consisted of wooden doweling (circular rods) of various thickness up to 12.5mm, and often only single pieces of doweling have been fired at from short ranges. In order to provide a valid and reproducible test it is considered necessary to use a suitable piece of lattice of wooden rods. (Should it be considered desirable, for the purposes of information, tests may be considered which could be conducted in a manner similar to that which follows but using natural media, such as light brushwood, standing corn or wheat, etc., in addition to the lattice of rods.) This is an area for further investigation to arrive at an improved test technique.

4.2.2 **Object** To compare the effects of simulated brush on the trajectory of projectiles from the test weapons and from a nominated control weapon.

4.2.3 **Method**

a. Simulated Brush. This will be seen in the form of a "brush screen" as illustrated in Figure 4.8, which will comprise a 91cm square screen containing a lattice of 6.35mm thick doweling placed at 6.35mm intervals both across the screen and in depth, as illustrated. This will give a ratio of 3:2 , upright to horizontal rods, and will ensure that all projectiles strike at least one rod. An attempt will be made to overcome any random strike effect by firing a sufficiently large number of rounds from each weapon. A suitable frame will be required which will allow easy removal of the rods for inspection, and replacement of all damaged rods as necessary, after each round is fired. It may be necessary to build a form of springing into the frame, in order to simulate the non-rigid nature of natural brushwood. The rods should be made from beechwood, free of knots, splits, shakes and other defects and with a moisture content of between 12% and 14%.

Note: The above test concept may be revised after the 1977-79 tests in the light of improved technical methods of brush simulation.

b. Witness screen. These will be of a material suitable for giving a clear strike "signature" for yaw measurement and suitably gridded. They will be accurately positioned 30cm in front of and 10m behind the brush screen in such a manner that the angle of deflection of each round fired may be calculated from the shift in strike obtained. An aiming mark on the front witness screen will be positioned in line with the centre of the brush screen. The rear witness screen will be of sufficient size to gather the strike of all deflected rounds.

c. Firing Procedure. Twenty rounds of each type of operational ammunition will be fired from each of the test and control weapons through the approximate centre of the brush screen at arrange of 100 and 200 m. The weapons will be mounted on suitable mounts and fired semi-automatically. After each shot:

(1) the brush screen will be inspected and all damaged rods replaced;

(2) the position of the projectile strike on both witness screens will be noted;

(3) strikes on witness screens will be examined for tippers; the occurrence and degree of tipping will be noted;

(4) witness screens will be repaired (patched) as necessary.

4.2.4 Results to be Recorded The following are required:

a. observed velocities of all rounds (in front of screens) ;

b. residual velocities of all rounds after penetration of brush screen (this may not be possible but as many velocities as possible should be obtained);

c. linear displacement (shift in strike) of all rounds;

d. deflection angle of all rounds (by calculation)

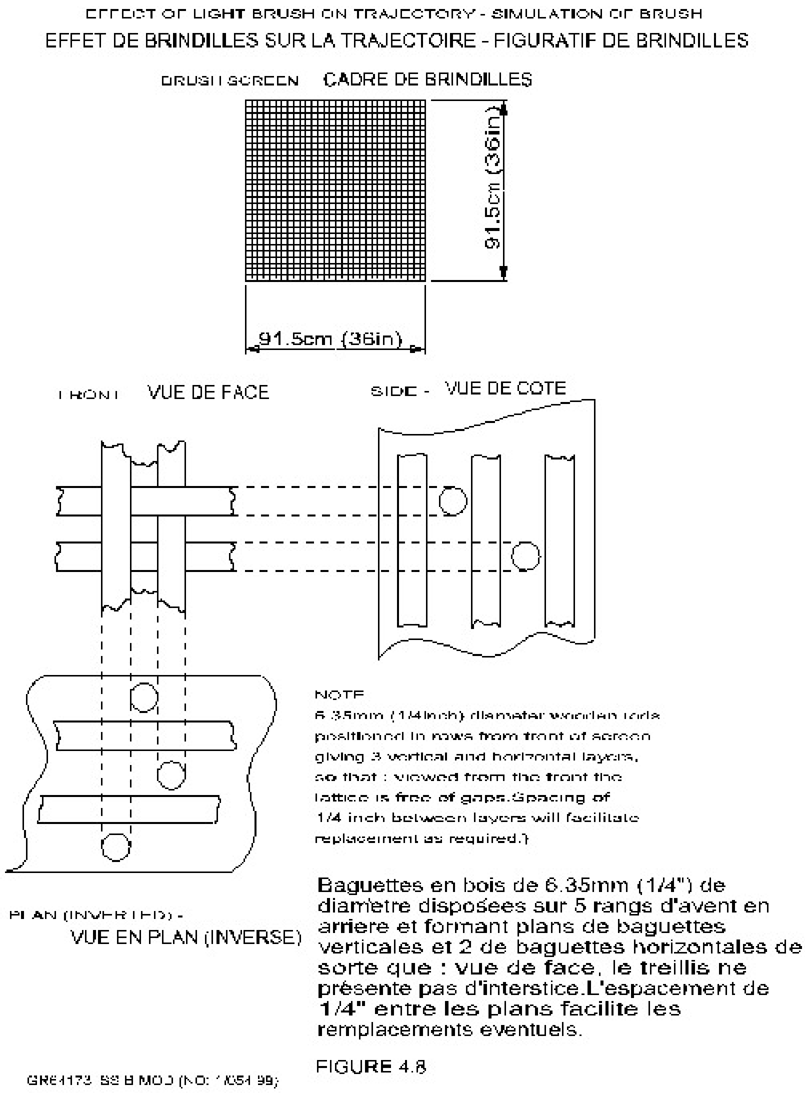
e. horizontal and vertical spread of all 20 round groups;

f. linear displacement and deflection angle of the mean points of impact of all 20 round groups;

g. incidence and degree of “tippers” on both witness screens.

4.2.5 Assessment Mean results and standard deviations will be derived as appropriate. Analysis will enable comparison of the test and control weapons and, when possible, allow tentative comments on the likely subsequent trajectories beyond the rear witness screen.

Figure 4.8 EFFECT OF LIGHT BRUSH ON TRAJECTORY



4.3. RICOCHET CHARACTERISTICS

4.3.1 Introduction This is important for establishing danger areas for Technical and Military testing. The development of small calibre and unconventionally-shaped projectiles has prompted the requirement for a test to establish ricochet characteristics of future weapon/ammunition systems. It should be borne in mind that the casualties to be expected from ricocheting small arms projectiles will be very low and that the difference between ricochet characteristics of various projectiles is therefore not great significance. A test of these characteristics must be comparatively complicated and it remains a matter for further discussion whether such a test is required. A suggested test procedure follows.

4.3.2 Object To investigate the flight characteristics of projectiles and to assess their penetrative ability, after ricochet, from various typical kinds of terrain.

4.3.3 Method

4.3.3.1 General Arrangements

(a) The weapon or test barrel will be mounted on a suitable rest, capable of elevation and depression, 100 m from the point at which ricochet is to occur. (If the position of zero yaw can be established beforehand the distance should be adjusted accordingly.)

(b) The point of aim will be the centre of a horizontal trough at least 2 m x 2 m x 0.3 m which will be filled to represent meadow land, rocky and sandy terrain respectively with:

(1) earth-covered with well-knit turf which have been rolled and kept cut;

(2) tamped hogging (sifted gravel) covered with at least 8 cm of weathered concrete;

(3) sea-washed sand free of pebbles;

(c) Two witness screens, 3.7 m^2, of suitable material to give satisfactory perforation signatures will be erected perpendicular to the “line of fire” necessary to give the angles of incidence required by paragraph 4.3.3.2 below. They will be placed at 4.6 m and 9.1 m respectively beyond the point of impact. A screen of 2.5 cm boards of suitable size to intercept all ricochets will be similarly erected 6.1 m behind the second witness screen.

4.3.3.2 Firing and Recording The weapon will be laid along a line of fire perpendicular to the screens and depressed to give an angle of incidence representative of angles of descent at fighting ranges for the weapon. Propellant charges will be adjusted to give strike velocities equal to the residual velocities at the appropriate fighting range. If charge weights are varied to give these reduced velocities, the possibility exists of instability of the projectile. Safety issues will then have to be considered when conducting the test. A series of 20 rounds for each type of terrain (and fighting range if necessary) will be fired and the following recorded:

(a) type of terrain and simulated fighting range;

(b) angle of incidence;

(c) co-ordinates of terrain strike relative to point of aim;

(d) co-ordinates of strikes on first and second witness screens relative to datum point on screen;

(e) description of projectiles signature on both screens (maximum diameter and its orientation to the vertical);

(f) velocities of projectiles, if possible, during the ricocheting phase;

(g) co-ordinates of strike on deal screen and depth of penetration;

(h) description of bullets recovered.

Note: If ricochets occur at all simulated fighting ranges the weapon will be depressed to give greater angles of incidence until the position at which no ricochet occurs. Increasing the safety template will need to be considered when conducting the test.

4.3.4 Assessment It will not be possible to undertake any quantitative analysis, only a general picture of the comparative ricochet behaviour of the projectiles being obtainable, e.g.:

a. The approximate degree of tumbling which occurs during ricochet;

b. The typical deflection in azimuth and elevation;

c. The typical penetrative power based on the penetration of boards;

d. The limiting angle of incidence at which ricochet occurs;

e. The safety area template required for open ranges.

4.4 BULLET TEST

4.4.1 Object To determine the effects on the bullet itself and of the resulting yaw conditions when fired through barrels of minimum and maximum internal bore limits.

4.4.2 Method

a. This test is carried out with the following weapons:

- A weapon whose barrel wear conditions are to the maximum limits as stated by the manufacturer.
- A weapon which has completed the Endurance Test firing (Section 2.5).
- A normal weapon with bore at minimum allowed in manufacture.

b. The weapon is fired at a cardboard target 25m from the muzzle; two series of 25 rounds are fired, in single shots, with each weapon.

c. Rounds are to be fired into a recovery box packed with cotton waste or similar material. The point of aim should be altered slightly after each shot and recovery should be carried out at five round intervals.

4.4.3 Results to be Recorded

a. Weapon Barrel Wear Conditions

b. Yaw conditions - these should not exceed the criteria laid down for the Barrel Erosion (Section 3.9)

c. Any bullet deformation or loss of parts

SECTION 5

SPECIFIC TESTS FOR BURSTING MUNITIONS

5.1 BULLET IMPACT

5.1.1 Object To determine if firing small arms ammunition into the exposed grenade munitions (as possible tactical situation) can result in detonation of the grenade.

5.1.2 Method

a. Reference US TOP 4-2-016, ISO 2859-1 or ANSI/ASQC Z1.4 and STANAG 4241.

b. One to three rounds of each type of small calibre ammunition (5.56mm, 7.62mm, and 12.7mm) are fired single shot, from a minimum distance of 15 m, against an exposed grenade in various orientations: head-on into fuse, perpendicular to the major axis of the fuse, perpendicular to the HE filled body, and, if applicable, transversely into the propellant area, and directly into the primer.

c. Test sample size should be sufficient that this evaluation can be made with a high degree of confidence.

d. Video recording of the test event may be taken for reference.

5.2 SYMPATHETIC DETONATION

5.2.1 Object The purpose of this test is to determine whether the test ammunition is susceptible to sympathetic detonation. The definition is as follows: Explosion caused by the transmission of a detonation wave through the air from another explosion. Passing criteria is the acceptor munitions will not detonate as a result of the donor detonation.

5.2.2 Method (Reference US TOP 4-2-016, US MIL-STD-2105B and STANAG 4396). A standard container of ammunition is prepared so that the centre most cartridge can be initiated externally. The container is closed and the specially prepared round is initiated. This can be accomplished with an electrically fired detonator in the propellant of a non-fused round; in an HE round, the detonator would be in the HE-filled projectile. After a waiting period, as imposed by local safety regulation, the container is examined to determine the extent of damage and the number of rounds that have functioned other than the specially prepared round. Multiple-explosions must be anticipated when HE (fuzed) ammunition is subject to this test; all induced detonations must therefore be conducted with test personnel under adequate cover.

5.3 COOK-OFF

5.3.1 Both fast and slow cook-off are required to insure that a munition item will have no reaction more severe than burning when subjected to an extreme thermal environment outside the weapon.

(1) Note: This is in contrast to the weapon system cook-off test which is essentially a test to see if a weapon can become hot enough during firing to fire or detonate a chambered cartridge, or lodged projectile. The hot gun cook-off test applies to area munitions rapid fired from an automatic weapon. Detailed procedures on how to perform this test are found in Section 2.14. (Number of rounds will vary with system being tested).

5.3.2 Both test methods detailed in Sections 5.3.3 and 5.3.4 below were extracted from US MIL-STD-2105B, Hazard Assessment Tests for non-nuclear ordnance.

5.3.3 Fast Cook-Off (Liquid fuel fire)

a. Object The fast cook-off test consists of engulfing the test item in the flame envelope of a liquid fuel fire and recording its reaction as a function of time. Passing criteria is no reaction more severe than burning.

b. Method

(1) (Reference US MIL-STD-2105B and STANAG 4240). The test shall be conducted in an area large enough to ensure the item is completely engulfed of the item by the fire for the duration of the test. This can be accomplished if the test area is at least 3 m larger in all directions than the dimensions of the munition. The burning area must also be at least $36m^2$ to ensure a full intensity fire.

(2) The item shall be tested in the configuration in the logistic phase being duplicated by the test. Items with an integral propulsive unit shall be restrained to avoid launching due to heat induced propulsive reaction. The restraining method shall not interfere with heating of the item.

(3) The test item shall be positioned so that its horizontal centre line is 1 m above the surface of the fuel or in the attitude most probable in the weapon's life cycle environment. Item shall be supported so as to prevent it from falling into and being quenched by the fuel.

(4) Four thermocouples with time constants of 0.1s or less shall be located 10-20 cm outside the ordnance skin for each item tested. The thermocouples shall be positioned on each end and side of the ordnance skin in a horizontal plane through the ordnance centre line. Thermocouple readings shall be made and recorded at least once every second through the duration of the fire.

(5) Sufficient hydrocarbon fuel (JP-4, JP-5, JP-8, or JET A-1) shall be used to insure that the item reacts while engulfed in the fire. The quantity of fuel required shall be based on the size of the test site and the characteristics of munition being tested.

(6) The time (rise rate) until flame temperature, as measured by any two of the thermocouples, reaches 550^{o}C shall be recorded. An average flame temperature of at least 870^{o}C as measured by all valid thermocouples at the test item without contribution of the burning ordnance will be considered a valid test. This temperature is determined by averaging the temperature from the time the flame reaches 550^{o}C until all ordnance reactions are completed.

(7) Measurement of the fire flame temperature as a function of time is required. Internal munition temperatures may be required. The test shall be recorded using video or motion picture cameras with sound.

5.3.4 Slow Cook-Off

a. Object The slow cook-off test is used to determine the reaction temperature and to measure the overall response of major munition subsystems to a gradually increasing thermal environment. The passing criteria is no reaction more severe than burning.

b. Method

(1) (Reference US MIL-STD-2105B and STANAG 4382). The test consists of subjecting the test item to a gradually increasing temperature at a rate of 3.5^{o}C per hour until reaction occurs. To conserve time, the test may begin with the test item pre-conditioned to 55^{o}C below the predicted reaction temperature. Temperatures and elapsed test time shall be observed and measured continuously.

(2) Test equipment shall be capable of providing a controlled thermal environment over a 40 to 345^{o}C range and increasing the temperature of the item at the rate of 3.3°C per hour throughout the temperature operating range. Its design shall be such as to minimize hot spots and to ensure by circulation

(or other means) a uniform thermal environment to the item under test. Occurrence of secondary reactions (such as those caused by exudate contacting the heating devices) shall invalidate the test. A means of relief shall be provided for the increased air pressure that will be generated by the test due to heating.

(3) Temperature recording devices (permanent record type) shall be used to monitor temperatures. The temperature of the external case and oven air temperature shall be monitored at the positions and sampling frequency identified in a specific test plan for the item. (The measurement of temperature of the explosive inside the item is optional).

(4) Steel witness plates positioned beneath the test item shall be used to provide evidence of the test item reaction. Still photographs shall be used to record the condition of the test item and test site prior to and after the test. Video coverage of the cook-off event is suggested.

5.4 FRAGMENTATION

5.4.1 Object The fragmentation test serves to determine the spatial distribution, masses and velocities of the fragments dispersed from the test projectile. The data thus gained may ultimately be used to determine the effectiveness (lethality) of the fragments against personnel (using Computer Models); to compare one explosive, casing, design or set of environmental conditions with another; and to determine safe distances or protective equipment needed for friendly personnel.

5.4.2 Method

a. From static-test data the performance of dynamic projectiles can be predicted mathematically, no one test procedure is suitable for all projectiles; procedures may vary greatly, depending upon the information desired and the size and characteristics of the item under test. Owing to the complex nature of these tests, the country undertaking development may provide fragmentation data or figures for lethal areas, in accordance with their national procedure and policies.

b. A test programme is considered complete only after the data are properly assessed. For this purpose it is necessary, in many fragmentation tests, especially those involving lethal area computations, to utilise specialist in data analyses and reduction. Familiarity with the problems confronting the data analyst is helpful in designing and efficient and complete test set up.

c. To assure proper evaluation and to permit fair comparison with projectiles developed in the future, a full description of each test item must be available. This description should include the nomenclature of the projectile, the fuse, and the type of explosive. A cross-sectional sketch and a photograph of the items are desirable.

d. The weights of the individual components of the projectile, especially the metal components, must be determined to the nearest one-tenth of one percent or a minimum of 0.065g. These weights will include the total test weight of the item; the weight of the empty explosive casing; the weight of the fuse; its metal parts, and any booster components; and the weights of the fins etc.

e. All projectiles should be X-rayed by the test agency before being considered for detonation in order to ensure that the explosive is sound and devoid of cavities and fissures.

f. The procedure recommended by NATO for conducting the static detonation fragmentation tests is described in the document No 5 E-GRE-002 dated 21 February 1992, see Annex L.

g. The procedure recommended by NATO to determine effectiveness of projectile is to use Computer Man (US) or MIC (Fr) with targets described in the STANAG 4512. A description of these two models is joined in Annex 2 of CRISAT Technology Area 2: Terminal Effects (AC/225-Panel III-D/342 Volume 2).

Notes:

1. Individual nations have to established appropriate agreements to access these models from the host nations. This can be accomplished through the national delegates of AC/225(LG/3-SG/1).

2. There is an alternative procedure used in the UK and elsewhere using TTCP Witness Pack for the assessment of fragment lethality. This is described in Annex P.

5.5 IMPROPER USE/SIMULATED MALFUNCTION TESTS

5.5.1 General The general purpose of this section is to pre-test the area target munition with its weapon system for the specific purpose of evaluating the hazards to the user associated with improper use, or ammunition malfunctions within the weapon system. Actual incidents should be watched for during function and casualty tests and any other ammunition test conducted from the service weapon. These tests can also be performed as part of Section 4 testing. Specific tests are to be chosen as applicable to the type of area target weapon system (5.5.2 - 5.5.5 are intended for crew served grenade launchers; 5.5.6 and 5.5.7 are intended for rifle launched grenades).

5.5.2 Out of Battery/Hangfire

a. Object To determine if a hazard exists from an out-of-battery or hangfire such as rupturing of the cartridge case or lodging of projectile.

b. Method

(1) Out-of-battery: The service weapon is altered as required to cause the munition to be fired before it is in the fully chambered position. Witness panels are placed around and under the weapon which is rigidly mounted. Weapon is remotely fired. Video recording for future reference can be made. Test should be repeated at least twice for higher confidence level.

(2) Hangfire: This condition is likely to be very difficult to simulate, but should be conducted in similar manner as the out-of-battery test. Note: Results from out-of-battery test may be sufficiently similar so that this test can be eliminated.

5.5.3 De-bulleting

a. Object To determine if a hazard exists as a result of a projectile de-bulleting from its cartridge case during firing.

b. Method A sample of cartridge grenades shall be intentionally crimped below the required bullet pull force of the particular munition and supplied for this test. Witness panels are placed around and under the weapon, which is rigidly mounted. Weapon is remotely fired. Video recording of the test event can be made for future reference. Test should be repeated at least twice for higher confidence level.

5.5.4 Missing Propellant Retainer

a. Object If applicable, to determine if a hazard (such as a lodged projectile) can result from firing a cartridge that was assembled without its required propellant retainer (e.g., missing closure cup).

b. Method A sample of cartridges must be assembled without the required propellant retainer and fired from the standard weapon. Rounds should be subjected to some form of vibration (e.g., loose or secured cargo prior to firing, so as to check worst case condition. Velocity readings can be taken and/or rounds should be observed for location of vertical target impact and functioning. If a lodged projectile occurs, note position in barrel. Repeat at least twice for higher confidence in results.

5.5.5 Lodged Projectile Impact

a. Object To determine if a hazard (such as low order detonation exists from firing a projectile into another projectile that is lodged in the bore as a result of a prior malfunction.

b. Method This is a probable destructive test, at least to the weapon barrel. It requires that one projectile be lodged in a weapon's barrel, either by simulation of a malfunction or by being pressed into place. Witness panels are placed around and under the weapon which is rigidly mounted. Another projectile shall be cycled through the weapon and remotely fired into the lodged projectile. Video recording of the test event can be made for future reference. Test should be repeated with the projectile lodged at three different locations in the barrel (breech end, middle, and muzzle end), two tests per location, to insure a high confidence level.

5.5.6 Use of Wrong Launching Cartridge

a. Object To determine if a hazard results from launching a rifle grenade with the wrong cartridge.

b. Method See Section 2.3.7

5.5.7 Burst vs. Single Shot Launch

a. Object To determine results of launching a rifle grenade in burst fire mode rather than single shot.

b. Method See Section 2.3.7

SECTION 6

SPECIFIC TESTS FOR FUZES

6.1 TEMPERATURE-HUMIDITY CYCLING (10 DAYS)

6.1.1 Object The purpose of this test is to determine the ability of the grenade's fuze (assembled to the projectile) to withstand the adverse climatic conditions of temperature and humidity.

6.1.2 Method

a. Samples of the test ammunition are subjected to a ten (10) day temperature cycling and humidity test to simulate "warm-wet" climatic conditions. Reference STANAG 2895, STANAG 4370 and AECTP-300 Method 306.

b. The ammunition is first conditioned at 49°C with no humidity control for 24 hours to ensure the items are dry before the start of the humidity testing. The ammunition is then exposed to the 24 hours schedule shown below in Table 6.1 for a period of 10 days. (This schedule conforms to the High Humidity-Temperature cycle of ITOP 4-2-820). Reference US MIL-STD-810E, Method 507.3.

Table 6.1 Storage Schedule for Humidity Test (24 Hours)

No. of Hours		Temperature (°C)		Relative Humidity %
2	increase	to...............41	..................and	90
16	maintain	at................41	..................and	90
2	decrease	...............41 to 21	..............incr	to......................95
4	maintain	at................21	...................and	95

c. Following the storage period the grenades are fired from the service weapon along with a like number of control grenades that have not been subjected to storage. Grenades are observed for functioning reliability, and velocities are recorded and are compared (conditioned to unconditioned) to determine the effect of the storage under high humidity conditions on the performance of the test cartridge. Any weapon malfunctions, such as failure to fire or failure to extract or eject, that might be attributable to storage of the cartridge under high humidity conditions are recorded.

6.2 SALT SPRAY/FOG

6.2.1 Object The purpose of this test is to ascertain the ability of a munition's fuze to resist the effects of a moist, salt-laden environment, as in amphibious operations or weapon systems used on naval vessels.

6.2.2 Methods

a. Reference STANAG 4370 and AECTP 300, Method 309. The fuzes shall be exposed to a salt spray atmosphere (the concentration by weight of salt being at least 5% of distilled water weight) continuously for 48 hours to check operability and 96 hours to check safety. All fuze explosive elements shall be present in the fuze during the test. The test reports shall specify the apparatus used and diameter of nozzle. When the ammunition is assembled in such a way that the fuze is partly sealed by being fitted on the projectile, the test will be conducted with fuzes fitted on inert projectiles.

b. The fuzes shall not contact each other or any material capable of acting as a wick. Each fuze shall be placed so as to permit free settling of fog on all fuzes being tested. Salt spray shall not be permitted to drip on the test specimen.

c. The air temperature in the chamber shall be controlled between 33°C and +36 °C. The air shall contain sufficient water vapour to be in equilibrium with the atmosphere in the chamber which has an 84% humidity at a temperature of +35 °C.

d. At least one wet fuze and one dried fuze shall be examined, broken down and/or tested within a 48 hour period after removal from the test chamber.

e. Reference Section 3.17 for salt spray test procedures for a whole munition (as opposed to just the fuze).

6.3 VACUUM STEAM PRESSURE (TROPICAL CLIMATE)

6.3.1 Object To determine the ability of the fuze to withstand tropical climates. (If the fuze cannot be separated from its ammunition, the test will only be carried out if there is no risk involved for the operator and the installation.)

6.3.2 Method

a. (Reference US MIL-STD-331, Test C2). This test consists in subjecting each sample fuze to 1,000 15 min consecutive cycles in a vacuum-steam pressure chamber. The basic 15-min cycle consists of temperature cycling superimposed on pressure cycling in a test chamber. Variations of temperature are from 52°C to 68°C with a mean of 61°C. Pressure variation is from 71 cm of mercury below atmospheric pressure to a pressure of 172 kPa (gauge). All fuze explosive elements shall be present in the fuze during the test. When the ammunition is assembled in such a way that the fuze is partly sealed by being fitted on the projectile, the test will be conducted with fuzes fitted on inert projectiles.

b. Following this test the fuze is assembled to a complete round and fired for functioning reliability.

c. A representative cycle consists of first evacuating the test chamber to the low pressure. At the end of this operation, which takes about 6 min, the temperature within the test chamber is approximately 52°C. Steam at 100°C is then allowed to enter the evacuated vacuum chamber for about 1.5 min until the temperature within the chamber is 62°C. 172 kPa air pressure is then applied which raises the chamber temperature to approximately 68°C which drives the condensed vapour into any cavities in the fuze under test. The pressure is held for 4 min, after which the chamber is vented, the moisture is allowed to drain off and the chamber to return to atmospheric pressure. The cycle is then repeated. During the test, sodium fluoride is dissolved and dispersed within the chamber at a rate of 40 g per 1,000 cycles. The fuze should be safe and operable following this test.

6.4 SAFETY

6.4.1. Fuze Arming Safety (Non-arm/All arm)

6.4.1.1 Object

a. To determine/verify the arming and non-arming distance of fuzed area target ammunition.

b. This test is essential for verifying that the grenade ammunition is safe (e.g., not armed) for a prescribed distance forward of the muzzle. This assures inadvertent "close-in" impacts, against targets to which the fuze is sensitive, will not cause the fuze to function and expel fragments in close proximity to the weapon. The fuze shall be assessed against the requirements of STANAG 4187.

6.4.1.2 Method Reference AOP-20, US MIL-STD-331, Test D2 and Langlie, H.J., "A Reliability Test Method for One-Shot Items". Aeronautic Division, Ford Motor Company, Publication No. U-1792, August 1962 and US TOP 4-2-016.

a. To protect equipment from high-velocity fragments, the rounds/grenades may be inert loaded or may contain a spotting charge to indicate functioning.

b. Minimum (non-armed) and maximum (all-armed) arming distance requirements are established in the appropriate requirements documents. These distances are verified by firing a statistically adequate sample of the test cartridges single shot from the service weapon to impact on a vertical target of sufficient density to assure detonation by fuze action only. The target material shall be thick enough to cause the fuze to function reliably (ref. Section 6.4.6.(b)(2), Plate Sensitivity), but not so thick as to cause deflagration of the explosive filler in the grenade projectile. (If a plate sensitivity test has not been conducted or no guidance on sensitivity is provided in the requirements document, a 1 mm thick aluminium plate is used for a functioning target. For rifle grenades, a 5 mm thick mild-steel plate is recommended. This is based on past tests in which no deflagration of the explosive filler occurred due to the low rifle grenade velocity of about 70 m/s.

c. Statistical evaluation of the data will result in the plotting of a sigmoid (s-shaped) curve, showing an estimated 0% and 100% arming distance (with a confidence level dependent upon number of distances fired and sample size fired).

d. The target is placed initially at the minimum prescribed distance, then the firing test is repeated at the maximum distance. Firing of 45 rounds at each distance is often prescribed. If no arming, as evidenced by no functioning, occurs at the minimum distance, it may be said that there is a probability of .95, with 90% confidence, that the fuze will not be armed at that distance. Forty-five arming (functioning’s) at the maximum distance would give the same probability of arming. other sample sizes will provide other probabilities (Reference: TOP 3-1-002). At least ten (10) RG's at each distance is recommended.

e. If the arming distances stated in the requirements document are not met or no parameters on the minimum and maximum distances are provided, they may be established using one or both of the following procedures:

(1) When the number of available rounds is Small, or for obtaining preliminary information, the Langlie method is suitable. This procedure requires that the gun-to-target distance be adjusted round by round based on an analysis of the results of preceding rounds fired. For the Langlie method:

(a) An upper limit of distance and lower limit of distance are selected: the upper limit being a distance at which it would be expected that all fuzes would be armed, the lower limit at one at which no fuze would be armed. (It is better to select this interval too large than too small.)

(b) The target is placed at a distance midway between the upper and lower limits (the estimated 50% functioning distanced), and the first round is fired.

(c) If the first round functions, the target for the second round is placed halfway between the distance for the first round and the lower limit. If the first round does not function, the target distanced for the second round is halfway between the distance for the first round and the upper limit.

(d) If the first two rounds result in a reversal (one function and one non-function), the distance for the third round is halfway between the distances for the first and second rounds. If the first two rounds function, the distance for the third round is halfway between the second-round distance and the lower limit. If the first two rounds produce non-function, the distance for the third round is halfway between the second-round distance and the upper limit.

(e) If the first three rounds fired in the sequence produce all functions or all non-functions, selection of new limits is advisable and the sequence started anew.

(f) Succeeding rounds are fired using the following rules:

- If the preceding pair of rounds resulted in a reversal, the next-round distance is halfway between the distance for the two rounds of the pair.

- If the preceding pair of rounds did not produce a reversal, the last four rounds are examined. If the number of functions and non-functions is equal. the next-round distance is halfway between the distances for the first and last round of that group. If the last four rounds did not have an equal number of functions and non-functions, the last six, eight, etc., are examined, until the number of functions and non-functions is equal. The distance used is always halfway between the distances for the first and last round of the group examined.

- If the above conditions cannot be satisfied and the last round resulted in a function, the distance for the next round is halfway between the distance for the last round and the lower limit; otherwise (last round was a non-function), halfway between the distance for the last round and the upper limit.

- The above procedure is followed until the rounds allocated are expended.

- The data are plotted and the maximum likelihood estimates for the mean and standard deviation for the arming distance are calculated.

(2) When a large number of rounds are available, a more efficient method of determining arming distance (the target is moved after a group of rounds is fired rather that after each round) is as follows:

(a) Based on engineering judgement and experience from the testing of similar items, a point halfway between the estimated minimum and maximum arming distance is selected. A functioning target is located at this point and a 10-round sample size is fired. Based the results of this firing the functioning target is moved to bracket the distances. The procedure is repeated until the minimum, maximum, and 50 per cent arming distances have been located.

(b) The data are used for calculating of maximum likelihood estimates of the mean and standard deviation of arming distance, as with the Langlie method above.

(3) Additional firings may be conducted with ammunition conditioned to high $+52^{o}C$ and low $-54^{o}C$ temperatures to determine the effect on the arming and non-arming distances established at ambient temperature.

6.4.2 Impact - Safe Distance The test described in this section consists of two sub-tests, muzzle impact and safe separation distance, some portions of which may be performed in combination, and both of which are modifications to the standard test of US MIL-STD-331, Test D2).

6.4.2.1 Muzzle Impact

6.4.2.1.1 Object The purpose of this test is to both verify that the area target munition is bore-safe, and whether with an unarmed fuze, it is liable to function on impact against an obstacle which offers resistance.

6.4.2.1.2 Method

(a) A vertical target, against which the test item's fuze will be function sensitive, is placed 1 metre in front of the weapon muzzle (or 1 metre in front of the nose of an RG). The round is then fired into the target to determine whether it is in functioning condition as it exits the bore of the weapon. A bore-safe" fuze will not function under these conditions.

(b) The area target ammunition is next fired against a vertical, highly resistant target (thick armour plate or concrete wall). This target is placed at several distances, starting at 1 metre from the muzzle (or 1 metre from the nose of an RG), and not past the maximum arming distance of the fuze (as determined in 6.4.1). A total of five distances about the estimated 50% arming distance (e.g., 0, 20, 40, 60, and 80% of arming distance) should provide sufficient data, and will allow determination of the distance at which the unarmed fuze is liable to function on impact with a solid, or immovable object. This test may be performed in combination with the Safe Separation Distance sub-test (see 6.4.2.2(b)(2)).

6.4.2.2 Safe Separation Distance

6.4.2.2.1 Object To determine if the fuze arming distance provides sufficient separation between the gun position (gunner/gun crew) and a grenade functioning, from either intentional or unintentional impact, between its no-arm and all-arm distances. The grenade is considered to have safe separation distance if, in the event of such an incident, no injury to the gunner/gun crew will result from rearward fragmentation.

6.4.2.2.2 Method

(a) For high order detonations, the necessary safe separation distance is usually obtained from the analytical results computed from the fragmentation test (Section 5.4).

(b) For deflagrations, resulting from solid obstacle impact by an unarmed grenade (Section 6.4.2.1.2.(b)), witness panels can be set-up in front of the weapon (approximately even with the muzzle) to catch rearward projected fragments/debris during the muzzle impact test (See Section 6.4.2.1.2(b)). Relative fragment energy can be estimated from weight of recovered fragments/debris and depth of penetration in witness panels. Potential worst case rearward travel distance can be estimated from velocity and shape factor of recovered debris. (No known standardised procedure exists for this analytical determination).

(c) For low order detonations, resulting from improper functioning of a grenade with an armed fuze, a separate firing test will have to be conducted with a sufficient sample of grenades fired, or modified in such a way to attain a statistically significant sample of low order functioning's. Measurement of velocity of rearward projected fragments by available means is recommended. As with deflagrations, worst case rearward travel distance can be estimated. (No known standardised procedure exists for this analytical determination).

(d) In the event that any or all of the potential types of grenade functioning's result in unsafe separation distance(s), (either within or beyond the arming distance) the probability of this event occurring must then be factored in to determine safety of combat and training use of the grenade munition. The collective information is then used to generate a system safety risk assessment (See Section 2.3.4) which includes: minimum safe combat and training engagement ranges, operational safety precautions (such as protective equipment or firing posture) range safety zones, etc.

6.4.3 Out-of-Line Detonator

6.4.3.1 Object The object of this test is to check the safety of the fuze design when the detonator(s) and/or any other elements containing an explosive more sensitive than standard lead-charge explosive are fired in an unarmed fuze.

6.4.3.2 Method

(a) The basic procedures for this test are described in US MIL-STD-331, Test D1. The test consists of firing one or more of the explosive components in sample fuzes, checking the effectiveness of the explosive train interrupter (safety mechanisms), and determining whether or not there is ejection of parts, deformation, or shattering that might result in unsafe conditions.

(b) There is no set of standard equipment for this test because the fixtures must be designed to hold in place the parts of the particular fuze being evaluated. Modification to the test fuze is usually necessary. In the case of a percussion-fired fuze, a hole might be drilled through the side of the fuze and a special firing pin inserted for initiating the sensitive explosives in their unarmed position. With an electrically initiated fuze, special holes may be drilled to insert an initiator for the detonator.

(c) For all types of fuzed projectiles. the test, starting with a fuze in the unarmed position, is conducted as a systematic investigation of the effects of firing sequentially or simultaneously all explosive components of the high explosive train. The order and manner of firing should be designed to expose any possibility of defeating the purpose of the fuze safety mechanisms.

6.4.4 Jolt

6.4.4.1 Object To check the safety and ruggedness of the fuze design. The fuze is not required to be operable during or after the test, but must remain safe to store, transport, and handle. No explosive elements shall be initiated. If assembled to a munition, it must also be safe to fire (launch and flight safe).

6.4.4.2 Method

(a) (Reference US MIL-STD-331, Test A1, and STANAG 4370, AECTP 400, Method 403). This test consists of shocking the fuze 1,750 times in each of three orientations:

(1) major axis horizontal;
(2) major axis vertical, nose up;
(3) major axis vertical, nose down.

(b) Three (3) bare, unpackaged live fuzes containing all their explosive elements are assembled to the mounting fixtures of the shock machine (either a commercial shock machine, or as detailed in MIL-STD-331), one in each orientation. The fuzes will be simultaneously tested on one jolt arm. (If less than three fuzes are tested, dummy loads equivalent in weight to the test fuze and fixture are to be assembled to the unused jolt arm).

(c) The height of each drop arm shall be set to 10 cm ± 0.5 cm. The machine shall be operated through 1,750 ± 10 turns (drops) at the rate of 35 ± 5 drops/min. Fuzes shall remain rigidly attached; if a fuze becomes loose, the test shall be declared a "no test". Remove the fuzes and inspect without disassembly.

(d) Repeat the above steps twice, with the same fuzes in different orientations, so that at completion of entire test each fuze will have been jolted once in each orientation.

(e) Determine compliance with object of test (through breakdown and inspection of fuze if required).

(f) To check for independence of fuze safeties, this test can be repeated with each one of the fuzes' safeties successively subverted (e.g., the setback pin removed, etc.).

6.4.5 Jumble

6.4.5.1 Object To check the safety and ruggedness of the fuze design. The fuze is not required to remain operable during or after test but must remain safe to handle, transport, store. No explosive shall be initiated, nor shall parts be broken or come apart. If assembled to the grenade munition, it must be safe to fire (launch and flight safe).

6.4.5.2 Method

(a) (Reference US MIL-STD-331, Test A2, and STANAG 4370, AECTP 400). A sample of the test fuzes will be subjected to tumbling through 3,600 revolutions in a jumble testing machine one at a time. The machine consists of a wood-lined steel box 15 cm deep. 30 cm wide, 38 cm long, which is rotated about two diagonal corners of the bottom at a speed of 30 rpm. Evaluation and examination requirements will be identical to those in the jolt test. All fuze explosive elements are present during this test.

(b) To check for independence of fuze safeties, this test can be repeated with each one of the fuzes' safeties successively subverted (e.g., the setback pin removed, etc.).

6.4.6 Fuze Sensitivity and Reliability

6.4.6.1 Object To determine the ability of the test area target ammunition to function satisfactorily against various impact media at various angles of impact.

6.4.6.2 Method A sample size sufficient to meet stated specifications of the test area target ammunition will be fired from a weapon placed on a rigid mount and elevated to give impacts at ranges varying from minimum to maximum tactical requirements. Impact media will be varied to represent a soft and hard target. Ammunition temperatures may be varied (+52°C to -46°C) to determine the temperature effect on functioning characteristics versus impact media. Sensitivity when impacting soft targets (snow, mud) should be as reliable as possible without imposing undue handling hazards. This test includes three sub-tests: Graze, Plate, and Rain or Light Brush.

(a) Graze This test is conducted to determine whether the fuzed round will function when fired to impact on horizontal targets, over the ranges of intended use. (Graze is defined as a glancing impact, 80° to 90° from the normal to the impact surface). A statistically adequate sample of the test cartridges are fired to impact against a horizontal target at the minimum, median, and extreme tactical ranges of the cartridge. The spectrum of impact media should extend from a relatively soft surface (dry, disked earth, or snow) to a hard surface (concrete or macadam) for complete sensitivity evaluation. Possible intermediate impact media may be mud, water, sod, etc., with extreme care used in defining the media; e.g., moisture content, depth of condition, preliminary preparations used, smoothness, surface hardness, etc. To further aid in keeping variables to a minimum it is most desirable to continue using the same impact area and move the weapon to adjust for range requirements. The percentage (number) of rounds functioning on initial impact is recorded for each impact medium and range. Angles of projectile approach are computed using data generated from the Firing Table test (Section 3.7). In some tests, data on the distance from the point of impact. to point of detonation are required. High-speed cameras are positioned normal to the line of fire to observe and record these actions.

(b) Plate Plate firings are conducted to determine the minimum thickness of plate that will reliably function the fuzed projectile. Two other parameters are considered during these firings: range and angle of obliquity of the plate. (Obliquity is the acute angle between the trajectory at the point of impact of a projectile and the perpendicular to the surface of the target at the point of impact, per US TOP 4-2-016 and US MIL-STD-331B). Initial attempts are made to fire into a plate positioned at the minimum tactical range and at maximum plate angle as proposed in the requirements documents or item specifications. Plates are sloped back and away from the gun. If the fuzed round functions with the required reliability on the plate, the range is then increased. If the round does not meet the reliability standards established, the plate obliquity is decreased until the functioning standards are met. (it might be of further interest to decrease the plate thickness at the maximum plate angle for information purposes). This procedure is repeated at the median and maximum tactical ranges.

(c) Rain, light brush, and grass This phase of the test is conducted to determine whether the fuzed projectile will function on raindrops, light brush, or heavy grass. A functioning target of 1.6 mm chipboard is positioned forward of the gun (beyond the all-arm distance), and a statistically adequate sample of rounds are fired through the target. If a projectile functions on the chipboard, it is judged not rainsafe and it will function on light brush and heavy grass. Chipboard is used rather than foliage because of the difficulty of providing reproducible foliage targets. (No simulated functioning targets are known to exist at present for the conduct of tests to assure. with nigh confidence, that a fuzed round will not function in rain. For a description of the US procedure, see US TOP 4-2-016 and US MIL-STD-331B).

6.5 SELF DESTRUCT

6.5.1 Object Area target ammunition may be used in a combat role requiring troop manoeuvre through an area where grenades have just been fired. It may, therefore, be desirable that the grenades that miss their target, or impact a surface against which they are insensitive (e.g. snow), or otherwise result in non-functioning upon impact, contain some form of self-destruct feature to preclude dud hazard to friendly manoeuvring troops. Grenades used in such a combat role may contain a mechanism (mechanical or pyrotechnic) to initiate the grenade after a certain elapsed time period. The purpose of this test is to verify that the grenade ammunition possesses such a mechanism and that it functions within the prescribed time delay.

6.5.2 Method Reference US TOP 4-2-016 and US MIL-STD-331B

This test is usually accomplished by firing the grenade ammunition single-shot and determining the time from firing to elf destruct. One method that can be used to verify the self destruct feature and its performance reliability is to measure the time interval from firing to self-destruct manually with stopwatches. This data shall be compared to the performance requirements of the item.

SECTION 7

TESTS FOR SIGHTING SYSTEMS

7.1 BACKGROUND

7.1.1 The primary sighting system of the control and test weapons may be iron sight, optical, laser aiming, or thermal. In addition to the primary sight there may be additional sighting systems (including those recommended by the manufacturer), either permanently fitted or mountable/dismountable, such as:

- secondary sight
- emergency battle sight
- snap-shooting sight
- sniper sight
- low light-level sight
- night sight (I^2)
- area target sight - individual weapon
- indirect fire sight)
- air defense sight) support weapon
- tank main armament sight)

7.1.2 Because of the direct relationship between gunner-sight-weapon, the major part of the sighting system assessment will be covered during military testing (Section 9). However, there is still a requirement to record sight characteristics and assess performance during technical testing.

7.2 METHODS/RECORDS/ASSESSMENTS

7.2.1 The primary sighting system, whether iron, optical, thermal, or laser, should be subjected to full technical testing as part of the weapon system.

7.2.2 Additional sighting systems, as presented by the manufacturer, although not necessarily subject to full technical testing, may nevertheless be examined and assessed from the technical viewpoint as to serviceability and effectiveness when used with the weapon system.

7.2.3 Visual inspection and measurement of the primary sighting system will have been carried out as part of the overall inspection and measurement of the complete weapon system (Section 2). All additional sighting systems provided may also be subjected to such inspection and measurement. Details of special carriers or containers should also be recorded.

7.2.4 Technical testing and assessment of primary sight effectiveness as such is to be carried out by skilled and experienced gunners at different ranges (out to the maximum range specified in the requirement), at different light-levels and under different light conditions. This may be done in conjunction with the Military Tests.

7.2.5 Where not already covered during the technical testing of a sight as part of the overall weapon system, certain additional technical testing and assessment should be carried out to cover:

(1) sight mounting systems;
(2) ease of mounting/dismounting;
(3) suitability for carriage (in container, if applicable);
(4) robustness
(5) ability to withstand extreme climatic or environmental conditions;
(6) ease of zeroing;
(7) ease of adjustment;
(8) maintenance of zero;
(9) sight/mounting interchangeability;
(10) suitability of sight control buttons location;
(11) durability of sight control buttons;
(12) readability of characters on display screen;
(13) suitability of display for target acquisition;
(14) screen resolution;
(15) compatibility with ballistic/laser eye protection;
(16) type and effectiveness of electronic links between weapon and display;
(17) ease of changing power supply;
(18) failure mode of power supply;
(19) suitability and ease of use of range finder;
(20) suitability and ease of use of digital compass/directional pointer;
(21) effectiveness of system hardening against battlefield counter measures;
(22) effectiveness of recognition and identification capability;
(23) global position system (GPS) capability;
(24) wind measuring capability;

7.3 IRON SIGHTS

7.3.1 The use of iron sights should be inspected to insure the sights are fully functional for maximum and minimum elevations.

7.3.2 For rifle grenade, ensure sights are compatible with the rifle grenade when attached.

7.3.3 For grenade launchers that are attached to rifles (e.g. US M2O3 system) make sure rifle sights are fully functional when the grenade tube is attached.

7.3.4 Ensure the grenade tube sights are functional through maximum and minimum elevations. Record the information below for both grenade launcher and rifle.

a. front site (type, dimensions, means of adjustment)
b. rear sight (type, dimensions, means of adjustment)
c. length of sight baseline
d. height of sight line above bore line (Distance Bx)
e. distance from rear sight to a line projected from the top rear of the stock, this line being perpendicular to the bore axis (Distance Cx)
f. number of settings and the range to which they refer

7.4 ADDITIONAL DATA/CONFIRMATION

If the primary sight of any weapon system submitted for test is an optical, laser aiming, image intensifier or thermal, certain additional testing will be carried out, mostly under laboratory conditions, in order to obtain full data on the optical systems, as follows:

7.4.1 Optical Testing

- Type
- Dimensions
- Means of adjustment
- Magnification
- Field of View (FOV)
- Entry pupil
- Exit relief
- Eye relief
- Possible obscured area of Exit Pupil.
- Diopter scale
- Distance Bx
- Sight settings
- Reticules/pointers
- Reticule illumination
- Filters
- Focus
- Eyepiece
- Type of anti-reflective coated lenses
- Type of anti-reflective devices/filters
- Type of reticule/reticule/pointer illumination
- Power source/type
- Power supply life
- Type of laser hardening
- Operating temperature range
- Resolution.
- Light transmission.
- Possible presence of dirt and image defects
- Waterproofness
- Weapon mounting method
- Number of sight settings and the distance to which they refer
- Provisions for back-up sights
- Minimum/Maximum ranges
- Confirmation of image verticality
- Confirmation of visibility of graduations

7.4.1.1 Optical Sighting Systems Performance Tests

7.4.1.1.1 Objective

This procedure describes the test methods and techniques necessary to determine technical and operational performance of optical sights and their suitability as a military optical sighting device.

7.4.1.1.2 Method

Optical sighting systems performance testing will be performed per US TOP 10-2-109.

7.4.1.1.3 Results to be recorded

Data should be summarised to reveal discrepancies between the test units performance requirement and the observed performance and be presented in chart, tabular or graphic form as appropriate.

7.4.2 Laser Aiming Systems

- Type, weight
- Dimensions
- Means of adjustment
- Visible laser classification
- Infrared laser classification
- Visible laser wavelength and output power
- Infrared laser wavelength and output power
- Power source/type
- Power supply life
- Operating temperature
- Beam size
- Beam divergence
- Range
- Weapon mounting method
- Provisions for back-up sights
- Laser range resolution

7.4.2.1 Laser Systems Performance Tests

Objective This procedure describes instrumentation and techniques for measuring the characteristics and performance of laser devices such as designators and rangefinders. The test procedures are designed for medium powered pulsed lasers with expanded, collimated output beams and are not, in some cases, directly applicable to other types of lasers. The laser characteristics selected for inclusion into this test procedure are considered to be those essential to the successful performance of military laser devices.

Facilities and Instrumentation

Facilities:

ITEM	REQUIREMENTS
Laser test Facility	Must provide positive personal control through locks and interlocks. Normal building heating and cooling systems are required for temperature control.

Instrumentation

All instrumentation will have calibration certification

The specific instrumentation required for testing of a particular laser device is dependent on the output characteristics of the device under test. However, the following instrumentation (or equivalent) is adequate for testing of most military laser devices.

ITEM	CHARACTERISTICS
Calorimeter	0-10 watts average power input 0.4-11 microns spectral response, ± 3 % accuracy
Mirror	Concave spherical, 8 inch diameter (203.2 mm), surface of λ/10 reflectivity known at all wavelengths of interest
Mirror	Concave spherical, low reflectance, 8 inch (203.2 mm) diameter, surface of λ/10, 10 m focal length known to accuracy of ± 1 mm
Aperture Plate	Series of circular holes ranging in diameter from 0.5 to 5 mm, diameter known to accuracy of 0.001 mm
X-Y Translator	Orthogonal linear stages with vernier read out accurate to ±0.001 mm
Diopter Meter	Variable from +4 to -5 diopters
Fast Detector	Spectral response at wavelength of interest, rise time of less than 1 nanosecond
Transient Digitizer	Composite video output conforming to EIA RS-170, vertical bandwith of 500 MHz, horizontal sweep rate of 500 picoseconds/division
Timer-counter	Gate-on times up to 1 min
Video hard copy unit	Accepts composite video conforming to EIA RS-170

Digital video processor	512 x 512 pixel memory, composite video output in EIA RS-170 format

WARNING: The beam from military laser devices has sufficient power to cause blindness if allowed to enter the eyes directly or by reflection from a specular surface. Personnel performing tests on laser devices MUST wear safety eyeware before any laser device is energised.

7.4.2.1.1 Output Power/Energy

Perform the following steps:

a. Arrange the laser device under test and instrumentation as shown in Figure 7.1 Keep the angle subtended at the spherical mirror by the device and the calorimeter as small as possible. The distance between the mirror and calorimeter should be greater than the mirror's focal length such that the laser beam has passed through the focus and re-expanded to a cross-sectional area which is approximately two-thirds the size of the sensitive area of the calorimeter.

b. Set the calorimeter to the power mode and warm up until it stabilises. Adjust the calorimeter zero offset to exclude ambient light effects from the readings. It may be desirable to minimise room lighting if the calorimeter is sensitive to visible light.

c. Trigger the laser device and record the calorimeter voltage reading when the output power stabilises.

d. Repeat step c. for other pulse codes of the laser device specified in the test plan.

e. If the laser device can be single-pulsed, set the calorimeter to the energy mode.

f. Trigger a laser pulse and record the maximum voltage reading from the calorimeter.

g. Repeat step f. for a total of ten pulses.

h. Data to be recorded:

1. Reflectivity of the spherical mirror at the wavelength of the laser device order test
2. Pulse code(s) of the laser device
3. Calibration factor of the calorimeter at the wavelength of the laser device under test in volts/watts
4. Calorimeter voltages, for the continuously-pulsed and/or single-pulse tests
5. Time constant of the calorimeter in seconds

7.4.2.1.2 Beam Divergence

a. Arrange the laser device under test and instrumentation as shown in Figure 7.1 The angle subtended at the low-reflectance, spherical mirror by the device and the calorimeter should not exceed 3°. Mount the aperture plate on a 2-axis translator and precision rotator such that the plane of the plate is perpendicular to the axis of the laser beam at an accurately measured distance from the spherical mirror (l0 m) which is equal to the focal length of the mirror. The distance from the aperture plate to the calorimeter is not critical. However, this distance should be selected so that, after the laser beam has passed through its focal point at the aperture plate, it has re-expanded to a cross-sectional area which is approximately two-thirds the size of the sensitive area of the calorimeter.

b. Set the calorimeter in the power mode and warm up until it stabilises.

c. Adjust the calorimeter zero offset to exclude ambient light effects from the calorimeter readings. It may be desirable to minimise room lighting if the calorimeter is sensitive to visible light.

d. Turn the aperture plate to a 100X (power) or "open" aperture.

e. Trigger the laser device and record the calorimeter reading when the output power stabilises.

f. Using the specifications of the laser device under test, select an aperture which would be expected from calculations to pass 90X (power) of the laser output.

g. Rotate this aperture into position in front of the calorimeter by means of the precision rotator. Look through the optical sight of the laser device and use the X-Y translator and precision rotator to move the image of the aperture under the crosshairs of the optical sight. It is helpful to illuminate the backside of the aperture with a penlight during this procedure.

h. Trigger the laser device by means of a test set, if available, or a remote-electrical switch. Even slight pressure on the manual trigger can cause significant movement of the laser aimpoint. Move the aperture by means of the X-Y translator until the calorimeter reading is maximised. Record the maximum stable calorimeter output. Divide this reading by the 100% reading obtained in step e.

i. Repeat steps c. through h. until data are obtained on the four available apertures which most closely bound the aperture size through which 90% of the incident energy is transmitted.

j. Repeat steps c. through i. for other pulse codes of the laser device specified in the test plan.

k. If the laser device can be single-pulsed, set the calorimeter to the energy mode and repeat steps c through i. A large number of single pulses may be necessary in step h. to ensure that the aperture is located at the laser aimpoint.

l. Data to be recorded:

1. Diameter of each aperture used in m
2. Focal length of the spherical mirror in m
3. The calorimeter reading for the 100% aperture at each pulse code
4. The calorimeter reading for each aperture used at each pulse code

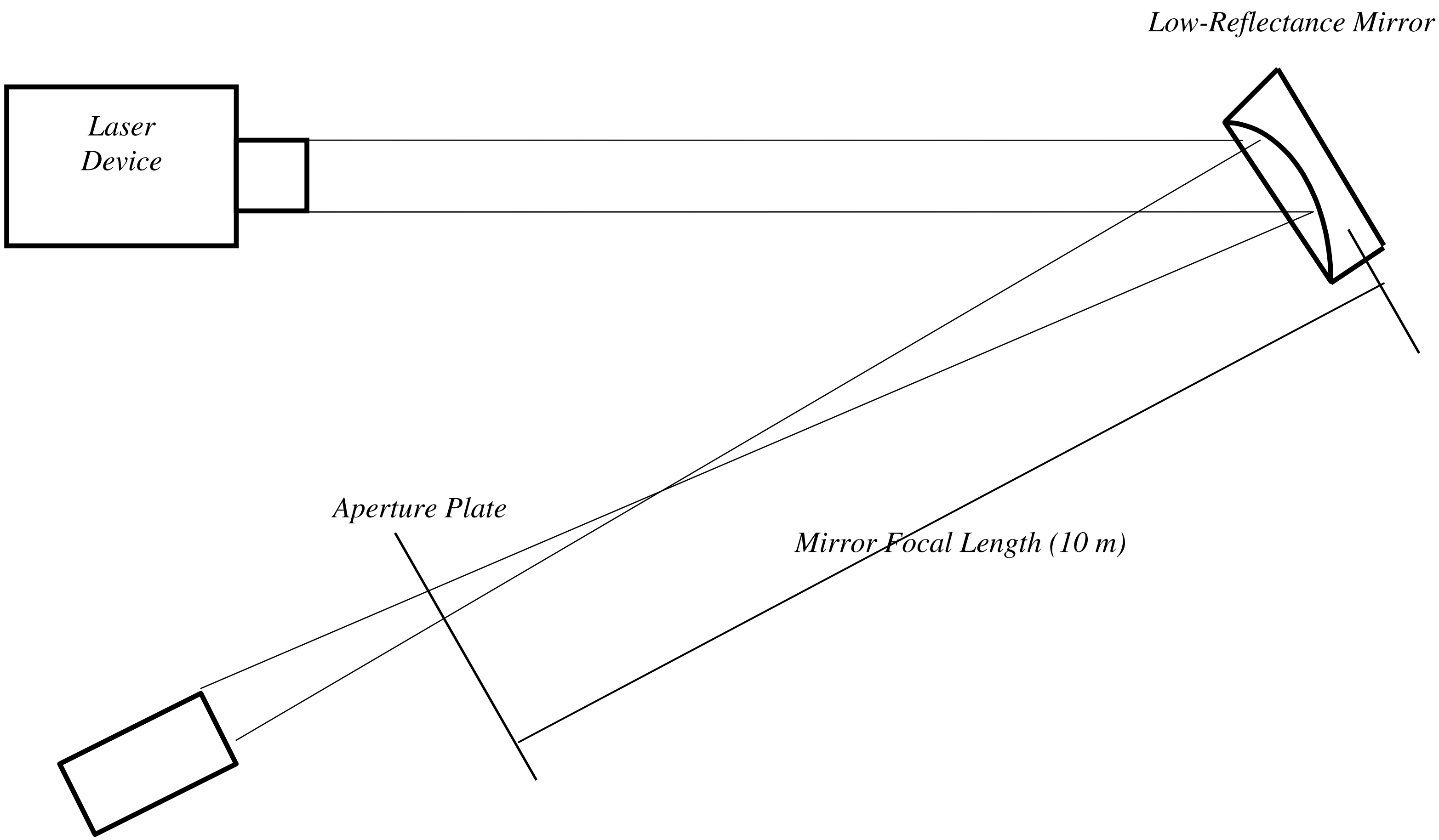


Figure 7.1 Beam Divergence and Boresight Test Configuration

7.4.2.1.3 Boresight Error

a. Arrange the laser device under test and instrumentation in the same configuration as that for the beam divergence test, shown in Figure 7.1.

b. Set the calorimeter in the power mode and warm up until it stabilises.

c. Adjust the calorimeter zero offset to exclude ambient light effects from the calorimeter readings. It may be desirable to minimise room lighting if the calorimeter is sensitive to visible light.

d. Turn the aperture plate to the smallest available aperture diameter.

e. Mount a Diopter meter on the optical sight of the laser device and align until its crosshairs overlay those of the optical sight.

f. Use the X-Y translator to move the image of the aperture directly under the centre of the dual set of crosshairs. It is helpful to illuminate the back side of the aperture with a penlight during this procedure.

g. Read and record both the X and Y micrometers of the translator.

h. Trigger the laser device by means of a test set, if available, or a remote electrical switch. Move the aperture by means of the X-Y translator until the calorimeter reading is maximized.

i. Turn the laser off, then read and record both the X and Y micrometers of the translator.

j. Repeat steps f. through i. for other pulse codes of the laser device specified in the test plan.

k. If the laser device can be single-pulsed, set the calorimeter to the energy mode and repeat steps f. through i. A large number of single pulses may be required in step h. to ensure that the aperture is located at the laser aimpoint.

l. Data to be recorded:

- Focal length of the spherical mirror in metres
- Initial readings, X_i and Y_i, in mm of the X and Y micrometers of the translator
- Final readings, X_f and Y_f in mm of the X and Y micrometers of the translator after the calorimeter reading has been maximised

7.4.2.1.4 Pulse Shape

a. Arrange the laser device under test and instrumentation as shown in Figure 7.2. The location of the detector is not critical, but its distance from the low-reflectance mirror should be greater than the focal length of the mirror.

b. Turn on all instrumentation and warm up until it stabilizes.

c. Place the transient digitizer in the Non-Store mode.

d. Set the laser device to the desired pulse code and trigger the laser.

e. While observing the pulse waveform on the TV monitor, adjust the amplifier gain time base and other controls of the transient digitizer until the desired waveform image is displayed on the monitor.

f. Push the Image Grab button on the digital image processor to capture the image of an individual laser pulse waveform.

g. Push the Copy button on the video hard copy unit.

h. Repeat steps f. and g. forty-nine (49) times.

i. Repeat steps d through h for other pulse codes of the laser device specified in the test plan.

j. If the laser device can be single-pulsed repeat steps d through h. A large number of single pulses may be necessary in step e in order to adjust the transient digitizer properly.

k. Data to be recorded:

(1) Horizontal scale factor of the transient digitizer for each pulse recorded (s/cm)

(2) Vertical scale factor of the transient digitizer for each pulse recorded (V/cm)

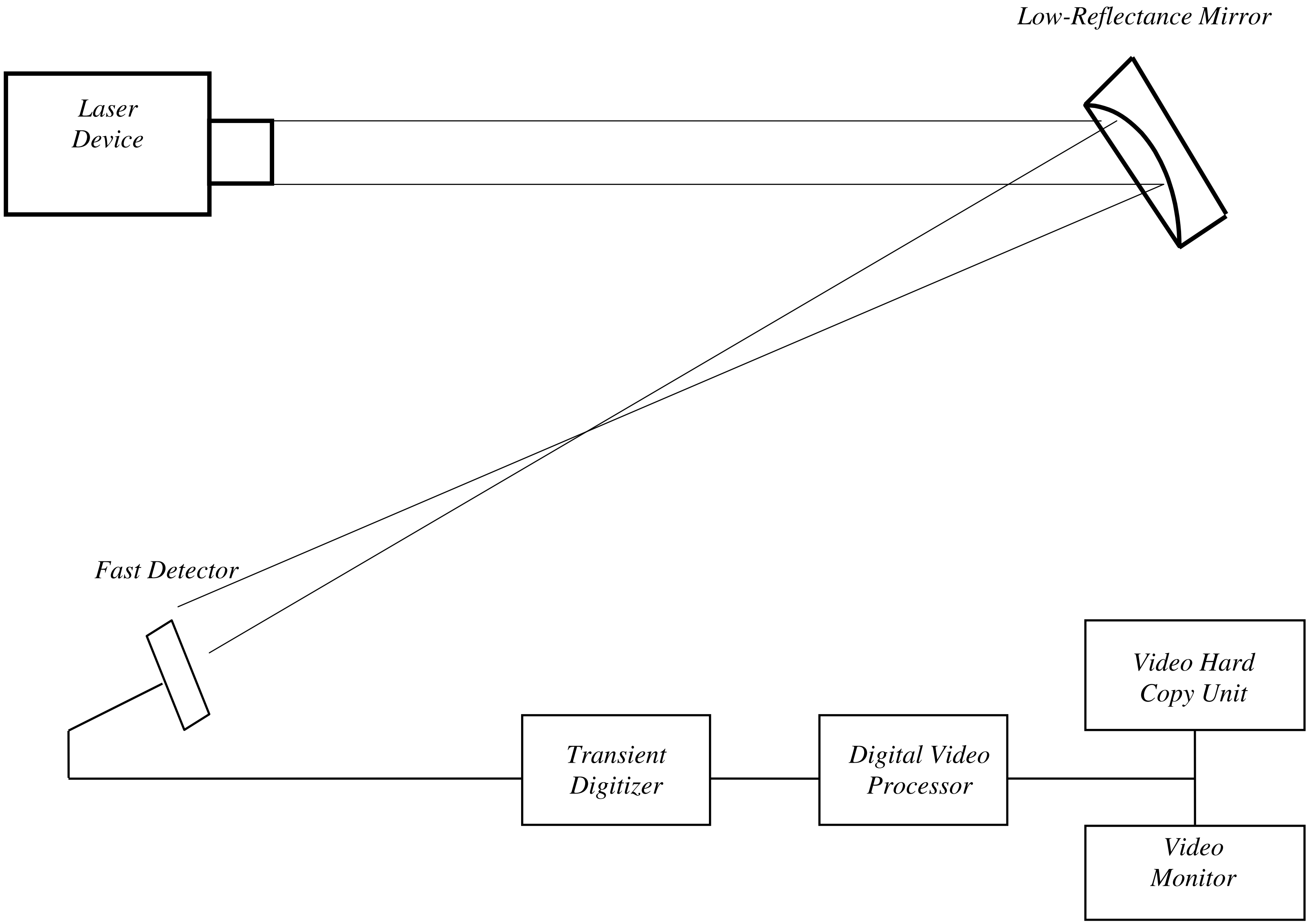


Figure 7.2 Pulse Shape Test Configuration

7.4.2.1.5 Pulse Code Accuracy

a. Arrange the laser device under test and instrumentation as shown in Figure 7.3. The location of the detector is not critical, but its distance from the low-reflectance mirror should be greater than the focal length of the mirror.

b. Turn on the timer-counter and warm up until it stabilises.

c. Set the function switch of the timer-counter to frequency.

d. The accuracy of the frequency measurement of most timer-counters is ±l count ± the time base accuracy. It is, therefore, important that the timer/counter be gated-on long enough to accumulate the total number of pulses necessary to obtain the required accuracy of the frequency measurement. For many military laser devices, approximately 1000 pulses are required.

e. Set the Gate Time of the counter-timer to the necessary value.

f. Set the laser device to the desired pulse code and trigger the laser.

g. Record the frequency measured by the timer-counter.

h. Repeat steps e. through g. for other pulse codes of the laser device specified in the test plan.

i. Data to be recorded:

(1) True frequency of each pulse code tested
(2) Measured frequency for each pulse code tested

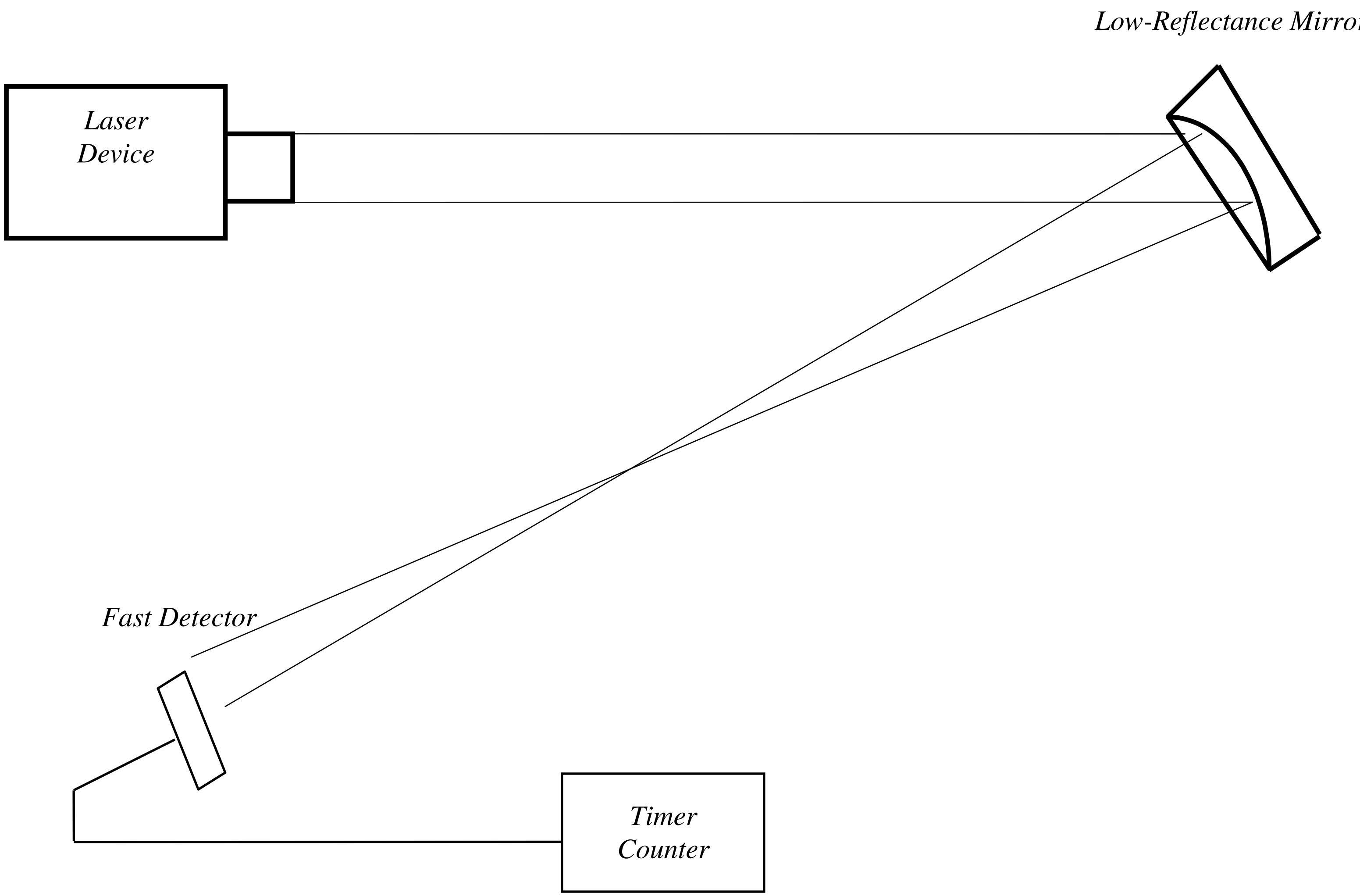


Figure 7.3 Pulse Code Accuracy Test Configuration

7.4.2.1.6 Detector Pulse Response

Perform the following:

a. Apply pulsed signals, from a controllable signal source, to the detector input of the test item receiver at the wavelength of the test item transmitter.

b. Measure and record the detector pulse response including:
- Pulse rise time
- Pulse amplitude
- Pulse delay
- Pulse rise time degradation

NOTE: Slow detector pulse rise time severely affects the resolution capability of the test item and the overall repeatability of ranging information.

1. Repeat steps a. and b. until minimum of ten sets of measurements have been made.

2. Record the following for the test item detector:
   - Type
   - Sensitivity (radiant)
   - Bandwidth
   - Maximum power
   - Operating voltage
   - Aperture diameter

7.4.2.1.7 Range Counter Pulse Response

Perform the following:

a. Apply pulsed signals to the input of the range counter (through the test item receiver section).

b. Decrease the pulse amplitude and determine and record the minimum pulse energy required to trigger the range counter.

c. Repeat steps a. and b. until a minimum of ten determinations have been made.

7.4.2.1.8 Range Counter Accuracy

Perform the following:

a. Apply pairs of start-stop pulsed signals, separated in time by 1 µsec, simultaneously, to the test item range counter and to a 100 MHz standard time interval counter, for a specified time.

b. Record the reading from each counter readout.

c. Repeat steps a. and b. for pulsed signals which are separated by 5 µsec, 10 µsec, 20 µsec, 30 µsec, etc., (increasing the interval by 10 µsec until maximum interval is achieved).

d. Record the time interval between pulses for each determination.

e. Record any apparent test item range counter instability.

7.4.2.1.9 Field/Outdoor Tests

a. Select a suitable site for the performance of field test.

b. Select targets for field tests as specified in the test plan.

c. Ensure that there is strict adherence to range safety during all phases of field testing.

d. Conduct field tests under the following conditions:
- Clear daylight
- Fog or haze
- Rain, if applicable
- Clear darkness, if applicable
- Battlefield obscurants

e. Measure and record the following for each field test:
- Ambient air temperature
- Barometric pressure
- Relative humidity

f. Record the weather conditions for each field test.

NOTE: Field tests shall require no direct test item instrumentation since they provide data to verify the laboratory data (basic parameter).

7.4.2.1.10 Maximum Range Capability

Perform the following:

a. Determine and record the maximum range at which each of three targets, selected as specified in the test plan, may be detected by the test item.

b. Repeat step a. until a minimum of five determinations have been made for each target.

c. Record the target identity for each determination.

7.4.2.1.11 Optical Collimation Accuracy

Perform the following:

a. Position the test item at a distance of 2000 m from a selected highly reflective target.

b. Measure the range from the test item to the target and record the range counter readout.

c. Progressively increase the distance between the test item and the target and repeat step b. until ranging becomes erratic.

NOTE: At long ranges, target discrimination is affected by the accuracy with which the sighting, transmitting, and receiving optics are collimated.

7.4.2.1.12 Target Discrimination

Perform the following:

a. Position a minimum of 15 closely spaced targets at ranges and angular directions from the test item as specified in the test plan.

NOTE: Generally, lateral discrimination is dependent on the diameter of the test item laser beam at the target while range (depth) discrimination is dependent upon the length, in space of the laser output pulse.

b. Determine the range to each target using the test item and record the test item readout.

c. Repeat step b. until a minimum of three determinations have been made for each target.

d. Record the designation of identifying number for each target during each observation.

7.4.2.1.13 Aiming and Sighting Capability

Determine the characteristics of the test item aiming and sighting system using the criteria of US TOP 10-2-109 (for telescopic system) or US TOP 6-2-135 (for infrared system) as appropriate.

7.4.2.1.14 Power Requirements

a. While performing the above procedures (sections 7.4.2.1.1 – 7.4.2.1.13), subject the test item, as a unit, to the applicable procedures of US TOP 6-2-514 to determine the test item's sensitivity to input power variations.

NOTE:

1. Input power frequency and voltage variations within the established tolerance limits for the item may cause output and ranging parameter to deteriorate below acceptable limits.

2. Ensure that no critical combination of voltage and frequency are omitted.

b. Maintain a log of the test item operating time throughout the test to determine any test item performance degradation due to battery usage, etc.

7.4.2.1.15 Electromagnetic Compatibility

a. While performing the above procedures (sections 7.4.2.1.1 – 7.4.2.1.13), subject the test item to the applicable procedures of US TOP 6-2-560 to determine the electromagnetic compatibility of its transmitter and receiver components.
b. Determine and record the interference effects of electromagnetic radiation emanating from the test item on nearby equipment.
c. Determine and record the effects of electromagnetic radiation on the test item where radiation is emanating from an external source.

7.4.2.1.16 Pulse Code Stability

Perform the following steps:

a. Arrange the laser device under test and instrumentation as shown in Figure 7.3. The location of the detector is not critical but its distance from the low-reflectance mirror should be greater than the focal length of the mirror.

b. Turn on the timer-counter and warm up until it stabilises.

c. Set the Function switch of the timer-counter to Time Interval A to B.

d. Set the Time Base Multiplier of the timer-counter such as to obtain the desired time resolution.

e. Set the input selectors of the timer-counter to start the timer at A and stop at B from a single input source.

f. Set the laser device to the desired pulse code and trigger the laser.

g. Record the time interval (laser period) measured by the timer-counter.

h. Reset the timer-counter and repeat steps f. and g. forty nine (49) times.

i. Repeat steps d. through h. for other pulse codes of the laser device specified in the test plan.

j. Data to be recorded:

- True period of each pulse code tested
- Measured period for each pulse code tested

7.4.2.1.17 Laboratory Tests of Receiver Performance

Signal Detectability

Perform the following:

a. Expose the test item receiver to radiation at the transmitter wavelength from a controllable external source or from the range finder transmitter.

NOTE: When the test item transmitter is used as a radiation source vary the "range" or "reflectivity" of the target receiver or change the transmittance of the intervening space with the appropriate optical filters.

b. Decrease the flux density of the radiation at the receiver until the signal level is just enough to consistently trigger the range counter.

c. Measure and record the signal flux density using an appropriate proven measuring device.

d. Repeat steps a. through c. until a minimum of 10 measurements have been made.

7.4.3 Night Vision Devices (Image Intensifiers)

- Type, Dimensions, Weight
- Magnification
- Field of View
- Eye Relief
- Reticule (Fixed or Adjustable)
- Operational range
- Resolution
- Power Supply
- Performance (Full Moon/StarLight)
- Mounting on Weapon

7.4.3.1 Night Vision Devices Performance Tests

7.4.3.1.1 Objective This procedure describes, in general terms, the tests required to evaluate image intensifier night vision devices (not thermal imaging devices), including safety tests and procedures for measuring the optical and operational characteristics of the item. The specific tests listed below shall be conducted under procedures contained herein:

a. Safety test - This subtest determines the inherent safety associated with use of the night vision device.

b. Optical measurements - This subtest determines the magnification, angular field of view, resolution, luminous gain, adjustment of the night vision device.

c. Operational measurements - This subtest determines the operational range of the night vision device against various types of targets and its electrical characteristics.

d. The variety of night vision devices to which this procedure applies precludes detailed coverage of any particular item. (This procedure deals with image intensifiers, not thermal imaging devices). The testing methods outlined are intentionally general to provide test coverage for various night vision devices and may be adapted, as necessary, to accommodate specific equipment.

Facilities and Instrumentation

Facilities

Item	Requirements
Standard resolution charts	Equal or similar to US National Bureau of Standards charts
Appropriate target facility	To have sufficient contrast to be easily seen through the image intensifier at the required ranges

Instrumentation

Device for Measuring	Permissible Error of Measurement *
Light levels (e.g. light level meter)	5% of full scale
Optical traversing mount	0.05 mil in azimuth and elevation

*The permissible error of measurement for instrumentation is the two-sigma value for normal distribution. Thus, the stated errors should not be exceeded in more than one measurement of 20.

Required Test Conditions

a. Carefully inspect each test item to ensure that no damage has occurred during transit and that each item is free of obvious manufacturing defects. Record any damage or deficiencies noted.

b. Record the following information:

(1) Nomenclature, serial numbers, and the name of the manufacturer of the test items

(2) Nomenclature, serial number, accuracy tolerances, calibration requirements, and last calibration date of the test equipment selected for the tests

c. Ensure that all test personnel are familiar with the required technical and operational characteristics of the test item, as stipulated in the requirements documents.

d. Review all instructional material issued with the test item by the manufacturer, contractor, or Government, as well as reports of previous similar tests conducted on the same type of test items, and familiarize all test personnel with the contents of such documents. These documents shall be kept readily available for reference.

e. Prepare record forms for systematic entry of data, the chronology of testing, and an analysis in the final evaluation.

f. Prepare adequate safety precautions to provide safety for personnel and equipment, and ensure that all safety Standard Operating Procedures (SOP) are observed throughout the tests.

7.4.3.1.1 Safety Test

Method

a. Perform a safety assessment of the test item in accordance with the manufacturer's instructions

b. Using a calibrated light level meter, perform an output light level measurement test in accordance with published instructions. During this test, evaluate any flash protection portion (automatic brightness control) of the test item.

c. Verify the Safety Assessment Report (SAR) of the manufacturer by determining whether the intensity of the output light flash from the test item (before automatic system shutdown) is safe for the eye of the observer when the item is exposed to intense light sources. Determine beforehand that the automatic brightness control (ABC) will prevent damage to the image tubes when exposed to these sources of intense light.

Data Required

Record the following:

(1) Safety assessment

(2) Any unsafe or hazardous conditions associated with the operation of the test item

(3) Output light level when the test item is exposed to intense light sources

(4) Investigation of any irritation or possible damage to eyes or vision of personnel operating the test item at night

7.4.3.1.2 Optical Measurements

7.4.3.1.2.1 Magnification

a. Method

(1) Mark a number of connected squares of equal size in a line on a distant white wall.

(2) Establish a level of illumination low enough to prevent damage to the screen or phospher of the night vision device, but not so low as to prevent the squares from being viewed with the eye and the night vision device simultaneously.

(3) Observe the squares with both eyes, the right eye using the night vision device.

NOTE: The right eye will receive a magnified view of one or two squares; the left eye will receive a natural view of a number of squares. The overall visual impression will consist of a large square superimposed by a number of smaller squares.

(4) Repeat the test as necessary to obtain the required data or to resolve incongruities.

b. Data required

Record the following:

(1) Number of small squares per one large square

(2) Light level used during each measurement

c. Magnification. The magnification of the night vision device is the visually observed ratio of the number of smaller squares per one large square.

7.4.3.1.2.2 Field of View

a. Method

(1) Install a target containing a vertical line and a horizontal line on a distant white wall.

(2) Place the night vision device in an optical traversing mount equipped with levels and calibrated azimuth and elevation scales.

(3) Level the night vision device, and traverse the mount until the vertical target line is viewed at the left edge of the field of view.

NOTE: Ensure that the eye is centred along the optical axis, and not moved to the left or right edges of the exit pupil to obtain field of view.

(4) Read the azimuth scale on the fixture.

(5) Traverse the device until the vertical target line is at the right edge of the field of view.

NOTE: Extreme care must be taken when traversing the device to avoid errors due to backlash in gearing.

(6) Read the azimuth scale on the fixture.

(7) Repeat steps (3), (4), (5), and (6) at least two times.

(8) Elevate the mount until the horizontal target line is viewed at the bottom edge of the field of view.

(9) Read the elevation scale on the fixture.

(10) Depress the mount until the horizontal target line is viewed at the top edge of the field of view. (Care must be taken that the eye is centred along the optical axis and backlash avoided, as in measuring the azimuth field of view.)

(11) Read the elevation scale on the fixture.

(12) Repeat steps (8), (9), (10), and (11) at least two times.

b. Data required

Record the following:

(1) Azimuth scale readings with the vertical target line at the left and right edges of the field of view

(2) Elevation scale readings with the horizontal target line at the top and bottom edges of the field of view

c. Field of View. The difference between the azimuth scale reading with the vertical line at the left edge of the field of view and the scale reading with the vertical target line at the right edge of the field of view is the angular measurement of the horizontal field of view of the night vision device. The angular measurement of the vertical field of view is the difference between the elevation scale readings with the horizontal target line at the top and bottom edges of the field of view.

7.4.3.1.2.3 Resolution

a. Method

(1) Install standard resolution charts (obtained from the US National Bureau of Standards or equivalent) in a darkened room, at the chart specified distances at which resolution is to be measured.

(2) Illuminate the resolution chart with a background light level of $\pm 50 \times 10^{-5}$ foot-candles (5.38×10^{-3} lumen/m^2)

(3) Using the night vision device, observe the set of chart resolution lines most closely spaced that are just discernible as distinctly separated lines.

(4) Repeat steps (1), (2), and (3) above, illuminating the resolution charts with background light levels of 1.076×10^{-2}, 1.076×10^{-1}, 1.076, $1.076 \times 10^{+1}$ lumen/m^2 (10^{-4}, 10^{-3}, 10^{-2} and 10^{-1}foot-candles)

b. Data required

Record the following:

(1) Numerical resolution of the night vision device as indicated by the chart for the set of lines that are just discernible as distinctly separated lines

(2) Light level used for each measurement

c. Resolution. The resolution of the night vision device is read directly from the standard resolution charts for each background light level

7.4.3.1.2.4 Luminous Gain

a. Method

(1) Install the night vision device in a darkened room, and establish a light level of 10^{-5} foot-candles ($1.076x10^{-3}$ lumen/m^2)

(2) Using a photometer or other calibrated light-measuring instrument, measure the light being emitted from the image intensifier tube of the night vision device.

b. Data required

Record the following:

(1) Light level entering the night vision device

(2) Light level being emitted from the image tube

c. Luminous Gain. The ratio of the illumination level of the light being emitted from the image intensifier tube to the illumination level of the light entering the image intensifier tube is the luminous gain of the tube.

7.4.3.1.2.5 Reticule Accuracy

a. Method

(1) Fixed Reticule.

(a) Install a target containing a vertical line and a horizontal line on a distant white wall. The width of the vertical and horizontal target lines should be approximately equal to the viewed width of the reticule lines in the test item to enhance measurement accuracy.

(b) Place the night vision device in an optical traversing mount equipped with levels and calibrated azimuth and elevation scales.

(c) Level the night vision device, and traverse the mount in azimuth until the vertical target line is set coincidental with one azimuth reticule division line.

(d) Read the azimuth scale on the fixture.

(e) Traverse the device and fixture in azimuth until the vertical target line is coincidental with the adjacent reticule division line.

(f) Read the azimuth scale on the fixture.

(g) Repeat steps (e) and (f) above, for each division of the reticule.

(h) Then, traverse the mount in elevation until the horizontal target line is coincidental with one elevation reticule division line.

(i) Read the elevation scale on the fixture.

(j) Traverse the device and fixture in elevation until the horizontal target line is coincidental with the adjacent reticule division line.

(k) Read the elevation scale on the fixture.

(1) Repeat steps (j) and (k) above, for each division of the reticule.

(2) Adjustable Reticule.

(a) With the night vision device placed in the same optical mounting fixture that was used above, set the reticule centre coincidental with the target line (azimuth or elevation).

(b) Read the scale on the fixture (azimuth or elevation).

(c) Turn the reticule knob one click (one increment of adjustment) and traverse the device and fixture until the reticule centre is again coincidental with the target line.

(d) Read the scale on the fixture.

(e) Repeat the test for each click of the reticule knob in azimuth and elevation.

b. Data required

Record the following:

(1) Fixed reticule

(a) The azimuth scale reading when the vertical target line is set coincidental with each azimuth reticule division line

(b) The elevation scale reading when the horizontal target line is set coincidental with each elevation reticule division line

(2) Adjustable Reticule

(a) The azimuth scale reading when the vertical target line is set coincidental with each azimuth reticule division line

(b) The elevation scale reading when the horizontal target line is set coincidental with each elevation reticule division line

c. Reticule

(1) Fixed reticule. The difference between the azimuth or elevation scale readings from one reticule division line to the adjacent reticule division line is the subtended angle per reticule division of the night vision device.

(2) Adjustable reticule. The difference between the azimuth or elevation scale readings from one reticule division line to the adjacent reticule division line is the angle of adjustment per one reticule knob click. The total of the angles read is the total angle of adjustment of the night vision device reticule.

7.4.3.1.2.6 Focus

a. Method

(1) Set the focus adjustment knob of the night vision device for minimum range, and illuminate a darkened room at a level of 10^{-2} foot-candles (1.076 lumen/m^2).

(2) Slowly move a standard resolution chart toward the night vision device until it reaches the minimum distance at which the chart lines (as viewed by the night vision device) are clearly focused.

(3) Measure the distance established in step (2) above as the minimum range of focus of the night vision device.

(4) Set the focus adjustment knob of the device for maximum range and slowly move the chart away from the device until the maximum range for focusing clearly is reached.

(5) Measure the distance established in step (4) above as the maximum range of focus of the night vision device.

NOTE: If a star in the sky can be clearly focused, maximum range of focus is considered to be infinity.

b. Data required

Record the following:

(1) Minimum distance at which the chart lines can be clearly focused

(2) Maximum distance at which the chart lines can be clearly focused

c. Focus. Determine the minimum and maximum ranges of focus that can be obtained with the night vision device by measuring the distance from the standard resolution chart to the night vision device.

7.4.3.1.3 Operational Measurements

7.4.3.1.3.1. Operational Range

a. Method

(1) Establish various targets, of the type normally encountered with the night vision device being used, using the following criteria:

(a) Employ both stationary and moving type targets.

(b) The types of targets and the range of each shall, initially, be unknown to the observer.

(2) Vary the distance between the night vision device and the targets until detection, recognition, and identification of the targets have been accomplished.

(3) One method is to place a target at a range greater than the maximum range of the night vision device, and decrease the distance between them. Another method is to present an array of randomly placed targets to the observer who attempts to detect, recognise, and identify them.

NOTES:
1. Detection - Indication of the presence of a target of potential military interest by sensing a contrast between the target and the background.
2. Recognition - Discrimination between targets as to class (e.g., tank, truck, man) by defining the target silhouette.
3. Identification - Discrimination between targets within a class (e.g., US Ml tank, M60 tank) by observing individual characteristics.

(4) Repeat the entire test as necessary to obtain the required data.

b. Data required

Record the following:

(1) Detection, recognition, and identification range for each target

(2) Direction and speed of the moving targets

(3) Phase of the moon

(4) Ambient light level (measured with a photometer every 30 minutes and also whenever starlight or moonlight conditions change due to cloud cover or other conditions affecting a light level reading)

(5) Type of background

(6) Contrast of each target with its background

(7) Time to acquire the target(s)

(8) Weather conditions, including:

(a) Haze
(b) Fog
(c) Rain
(d) Snow
(e) Temperature
(f) Relative humidity
(g) Wind velocity
(h) Visibility
(i) Percentage of cloud cover.

c. Operational range. Compare the distances between the night vision device and various types of targets at detection, recognition and identification of the targets with specifications for the night vision device.

7.4.3.1.3.2 Dry Nitrogen Pressure

a. Method

(1) Measure the internal dry nitrogen pressure inside the test item, using the appropriate equipment and methods described in the maintenance Technical Manual for that test item.

b. Data required

(1) Record the pressure of the dry nitrogen atmosphere in the test item

c. Dry nitrogen pressure. Compare the dry nitrogen pressure value to the specifications for the night vision device.

7.4.3.1.4 Mount - Dismount Boresight Retention

a. Method

(1) Zero sight per instructions in manual. Test accuracy between sight and weapon using a transit theodolite or equivalent (do not measure alignment using actual firing at targets). Remove sight from weapon, replace, then retest sight alignment. Repeat for a total of ten (10) measurements. Repeatability shall be measured as the difference between the initial mounting and the tenth mounting.

7.4.3.1.5 Weapon Shock

a. Method

(1) Zero sight per instructions in manual. Test accuracy between sight and weapon using a transit theodolite (do not measure alignment using actual firing at targets). Induce vibration as would be expected through field use (for example, weapon firing may be done to induce shock). Retest sight for alignment.

7.4.4 Thermal Sighting Systems

- Type of System (passive or active)
- Dimensions and Weight
- Distance/Height above bore line of weapon
- Type of mounting system/weapon interface
- Field of View, degrees, wide and narrow
- Field of View change time
- Field of View inter-alignment
- Field of View focus retention
- Range (clear conditions, day, night and dusk)
- Range (obscured conditions, day, night and dusk)
- Power Supply
- Power Supply Life
- Minimum Resolvable Temperature
- Operating Temperature in clear conditions
- Fire Control Performance (Targeting and accuracy)

- Zero Retention after remounting
- Boresighting and boresight retention
- Target detection and recognition
- Target image integrity
- Reliability (MTBOMF-Hours)(Mean Time Between Operational Mission Failures)
- Target Hit Probability
- System Ready Time (off to on cool down requirements) (standby to on time)
- Hardening against NBC, DEW, Electro-Optical Countermeasures, High Altitude Electro Magnetic Pulse (HAEMP)
- Vulnerability to counter measures
- Out-of-Band optical cross section specification
- In-band optical cross section specification
- Type of compass/directional pointer
- Global positioning capability (if any)
- Connector type
- Interface protocol
- Reticule type/display
- Video capability/type
- Recognition and identification capability
- Search and detection capability
- Auto-training function
- Built in test equipment type (if any)
- Types of display for target acquisition
- Type and location of controls
- Laser range finding capability
- Laser range resolution

7.4.4.1 Thermal Weapon Sights Performance Tests

7.4.4.1.1 Scope This procedural document describes the tests to be performed on a Thermal Weapon Sight (TWS).

7.4.4.1.2 Purpose Of Test This procedure establishes and provides test personnel with the methodology and discrete procedural instructions to be used in the performance of testing.

7.4.4.1.3 Equipment To Be Tested

Testing in accordance with (IAW) the tests and procedure contained herein.

The term Unit-under-test (UUT) will be used in this document to refer to the assembled configuration that is to be tested within a specific environmental test procedure.

7.4.4.1.4 Standard Ambient Conditions

Unless otherwise specified, inspections and tests shall be made at room ambient conditions as follows:

a - Temperature	25 ± 10°C(77 ± 18°F)
b - Relative Humidity:	Uncontrolled room ambient
c - Atmospheric Pressure	Site pressure

7.4.4.1.5 Test Tolerances

Unless otherwise specified, the maximum allowable tolerances on test conditions and supplied services will be as follows:

a - Temperature (chamber):	± 2°C
b - Pressure:	± 5% (± 200 Pa)
c - Humidity:	± 5% RH
d - Vibration (acceleration g's):	± 10%
e - Shock (amplitude g’s):	± 15%
f - Time:	± 1%
g - Voltage:	± 1.0 VDC
h - Air Velocity	± 10%

7.4.4.1.6 Temperature Stabilisation

The temperature of the UUT will be stabilised when the indicator measuring the greatest thermal lag does not vary more than 2°C per hour. The temperature of the chamber air will be stabilised when the temperature sensor used for chamber control is within 2°C of the desired temperature. Structural and passive members of the test unit are not normally considered for stabilisation purposes.

7.4.4.1.7 Test Item Operating

Unless otherwise specified, temperature stabilisation is attained when the temperature of the operating part of the UUT considered to have the longest thermal lag reaches a temperature within test tolerances of the nominal temperature, except that any critical component will be within 1°C (1.6°F). Structural and passive members are not normally considered for stabilisation purposes. When changing temperatures, for many test items, the temperature of the chamber air may be adjusted beyond the test condition limits to reduce stabilisation time, provided the extended temperature does not induce response temperature in a critical component or area of the UUT beyond the test temperature limits for the UUT.

7.4.4.1.8 TWS Test Station Equipment

The following test equipment, or equivalent, will be used to conduct TWS Test Procedures, unless otherwise specified:

Manufacturer	Model	Description
Tektronix	7854	Oscilloscope
Hewlett Packard	3585A	Spectrum Analyzer
Hewlett Packard	5384A	Frequency Counter
Hewlett Packard	3478A	Multimeter
Hewlett Packard	6624A	Quad DC Power Supply
IO Tech	Digital 488	Digital I/O Converter
Electro Optical Industries		Temperature Controller
Electro Optical Industries		60 inch (152.4 cm) Collimator
Epson	FX85/HP	Printer
Conrac	QQA17/RS	17 inch (43.18 cm) Monitor
Panasonic	WV-5370A	7 inch (17.78 cm) Monitor
Sony	EV-S3000	Hi 8 NTSC VCR
View Sonic	4E 7033D	Computer Monitor
SSI	486DX-50	CPU
Keytronic	KB101 Plus	Keyboard

7.4.4.2 TWS Technical Test Procedures

7.4.4.2.1 Field-Of-View (FOV)

7.4.4.2.1.1 Number of Units and Configuration

This test is performed on one Heavy TWS (HTWS) and one Medium TWS (MTWS).

7.4.4.2.1.2 Setup

Step 1. Mount TWS to fixture on test station, rotary table.
Step 2. Bring TWS to full operational condition.
Step 3 Install a blackbody target on collimator, of sufficient ΔT to be plainly visible in TWS. Designate a corner or other “single point” feature of the blackbody target to be used as the “target” in this procedure.

7.4.4.2.1.3 Procedure

Step 1. Record FOV selected (i.e. Narrow or Wide).
Step 2. With target approximately centred vertically in FOV, slew TWS horizontally until target is at extreme left edge of image in TWS eyepiece. Record rotary table ANGLE 1.
Step 3. Slew TWS horizontally until target is at extreme right edge of image in TWS eyepiece. Record rotary table ANGLE2.
Step 4. The horizontal FOV is ANGLE1-ANGLE2. RECORD HFOV.
Step 5. Requirements: Compare test results with test unit requirements and record.
Step 6. Repeat for vertical FOV
Step 7. Repeat for other FOV.

7.4.4.2.2 FOV Interalignment

7.4.4.2.2.1 Number of Units and Configuration

This test is performed on one HTWS and one MTWS.

7.4.4.2.2.2 Setup

Step 1. Install a blackbody target on collimator, of sufficient ΔT to be plainly visible in TWS. Designate a corner or other "single point" feature of the blackbody target to be used as the "target" in this procedure.
Step 2. Mount TWS to selected weapon
Step 3. Put TWS in fully operational mode.
Step 4. Set TWS into WFOV.
Step 5. Select the following reticule for different configurations and field-of-view:

HWTS: WFOV- M16 Rifle or NATO 5.56mm equivalent
NFOV- MK19 Grenade Machine Gun or 40mm GMG equivalent

MWTS: WFOV - M16 Rifle or NATO 5.56mm equivalent
NFOV- M16 rifle or NATO 5.56mm equivalent

7.4.4.2.2.3 Procedure

Step 1. Centre the reticule on the target.
Step 2. RECORD the EL angle and the AZ angle.
Step 3. Switch the FOV from WFOV to NFOV.
Step 4. Select the corresponding reticule from step 5 of setup.
Step 5. Centre the reticule on the target.
Step 6. RECORD the EL angle and AZ angle.
Step 7. Calculate the differences of the EL angle and of the AZ angle.
Step 8. Calculate the RSS of the two differences:

$$RSS = (\Delta\theta_{EL}^2 + \theta_{AZ}^2)^{1/2}$$

NOTE:1 degree = π/l80 rad.

Step 9. Requirement: Compare RSS test results with test unit requirements and record.

7.4.4.2.3 FOV Focus Retention

7.4.4.2.3.1 Number of Units and Configuration

This test is performed on one HTWS and one MTWS.

7.4.4.2.3.2 Setup

Step 1. Mount TWS to test station fixture.
Step 2. Bring TWS into full operational mode.
Step 3. Place TWS in NFOV.
Step 4. Install an easily visible blackbody target on collimator.
Step 5. Focus TWS on target.

7.4.4.2.3.3 Procedure

Step 1. Switch FOV eleven times without touching focus control.
Step 2. Place TWS in WFOV without touching focus control.
Step 3. Verify system is in sharp focus in WFOV without refocusing. RECORD.
Step 4. Switch FOV eleven times without touching focus control.
Step 5. Place TWS in NFOV without touching focus control.
Step 6. Verify system is in sharp focus in NFOV without refocusing. RECORD.
Step 7. Requirement: After initial focusing NFOV, TWS shall remain in sharp focus by visual inspection in both WFOV and NFOV.

7.4.4.2.4 Low Battery Indicator

7.4.4.2.4.1 Number of Units and Configuration

This test is performed on one HTWS and one MTWS.

7.4.4.2.4.2 Test Equipment

The following equipment or its equivalent shall be used:

- Stopwatch
- Batteries, of non-sequential serial or lot numbers (partially discharged batteries are acceptable)

7.4.4.2.4.3 Setup

Step 1. Install battery in TWS.
Step 2. Put TWS in fully operational mode.

7.4.4.2.4.4 Procedure

Step 1. RECORD start-of-operation time. Continue running TWS until low battery indicator (LBI) illuminates. RECORD time when low battery indicator (LBI) first illuminates.

Step 2. Verify LBI does not obscure the centre half (vertically and horizontally) of display area. RECORD.

Step 3. Continue running TWS in fully operational mode until sight imagery degradation becomes obvious. RECORD time.

Step 4. Requirement: Time from first illumination of LBI until sight imagery becomes obviously degraded shall be compared to test unit performance requirement

7.4.4.2.5 Mount - Dismount Boresight Retention

7.4.4.2.5.1 Number of Units and Configuration

This test is performed on one HTWS and on one MTWS unit.

7.4.4.2.5.2 Setup

Step 1. Install a blackbody target on collimator, of sufficient ΔT to be plainly visible in TWS. Designate a corner or other "single point" feature of the blackbody target to be used as the "target" in this procedure.

Step 2. Mount TWS to rail holding fixture on test station.

Step 3. Put TWS in fully operational mode.

7.4.4.2.5.3 Procedure

Step 1 Select narrowest field of view mode available on TWS configuration being tested.

Step 2 Centre TWS reticule on centre of blackbody point target. RECORD.

Step 3 Dismount and remount TWS five times.

Step 4. Determine number of reticule adjustment steps in azimuth and elevation needed to bring reticule to centre of blackbody point target. RECORD number of azimuth and elevation steps required (estimate fractional steps)

Step 5. Requirement: TWS reticule must remain centred on blackbody target within one reticule adjustment increment (one step) in azimuth and elevation.

7.4.4.2.6 FOV Boresight Retention

7.4.4.2.6.1 Number of Units and Configuration

This test is performed on one HTWS and one MTWS.

7.4.4.2.6.2 Setup

Step 1. Install a blackbody target on collimator, of sufficient ΔT to be plainly visible in TWS. Designate a corner or other "single point" feature of the blackbody target to be used as the "target" in this procedure.
Step 2. Mount TWS to rail holding fixture on test station.
Step 3. Put TWS in fully operational mode.

7.4.4.2.6.3 Procedure

Step 1. Select narrowest field of view mode available on TWS configuration being tested.
Step 2. Centre TWS reticule on blackbody point target. RECORD.
Step 3. Switch TWS from NFOV to WFOV and back to NFOV twenty times.
Step 4. Determine number of reticule adjustment steps in azimuth and elevation needed to bring reticule to of blackbody point target. RECORD number of azimuth and elevation steps required (estimate fractional steps).
Step 5. Requirement: TWS reticule must remain centred on blackbody target within one reticule adjustment increment (one step) in azimuth and elevation.

7.4.4.2.7 Reticule Travel

7.4.4.2.7.1 Number of Units and Configuration

This test is performed on one HTWS and on one MTWS unit.

7.4.4.2.7.2 Setup

Step 1. Mount TWS to fixture on test station rotary table.

Step 2. Bring TWS to full operational condition.

Step 3. Install a blackbody target on collimator, of sufficient ΔT to be plainly visible in TWS. Designate a corner or other "single point" feature of the blackbody target to be used as the "target" in this procedure.

Step 4. Centre reticule in FOV.

7.4.4.2.7.3 Procedure

Step 1. Move rotary table to align reticule to blackbody target. RECORD rotary table azimuth angle A_{AO}.

Step 2. Move reticule until reticule touches left edge of FOV.

Step 3. Move rotary table to align reticule to blackbody target. rotary table azimuth angle A_L.

Step 4. Move rotary table to place blackbody target at extreme left edge of FOV. RECORD rotary table azimuth angle A_{LFOV}.

Step 5. Calculate reticule travel as a fraction of the FOV:

$$T_L = (A_L - A_{AO})/(A_{LFOV} - A_{AO})$$

RECORD.

Step 6. REQUIREMENT: Compare T_L with test unit requirement.

Step 7. Move reticule until reticule touches the right edge of FOV.

Step 8 Move rotary table to align reticule to blackbody target. RECORD rotary table azimuth angle A_R.

Step 9 Move rotary table to place blackbody target at extreme right edge of FOV. RECORD rotary table azimuth angle A_{RFOV}.

Step 10. Calculate reticule travel as a fraction of the FOV:

$$T_R = (A_R - A_{AO})/(A_{RFOV} - A_{AO})$$

Step 11. REQUIREMENT: Compare T_R with test unit requirement.

Step 12. Centre reticule in FOV.

Step 13. Move rotary table to align reticule to blackbody target. RECORD rotary table elevation angle A_{EO}.

Step 14. Move reticule until reticule touches the upper edge of FOV.

Sep 15. Move rotary table to align reticule to blackbody target. RECORD rotary able elevation angle A_U.

Step 16. Move rotary table to place blackbody target at extreme upper edge of FOV. RECORD rotary table elevation angle A_{UFOV}.

Step 17. Calculate reticule travel as a fraction of the FOV:

$$T_U = (A_U - A_{EO})/(A_{UFOV} - A_{EO})$$

Step 18. REQUIREMENT: Compare T_U with test unit requirement.
Step 19. Move reticule until reticule touches the lower edge of FOV.
Step 20. Move rotary table to align reticule to blackbody target. RECORD rotary table elevation angle A_D.
Step 21. Move rotary table to place blackbody target at extreme lower edge of FOV. RECORD rotary table elevation angle A_{DFOV}.
Step 22. Calculate reticule travel as a fraction of the FOV:

$$T_D=(A_D - A_{EO})/(A_{DFOV} - A_{EO})$$

Step 23. REQUIREMENT: Compare T_D with test unit requirement.
Step 24 Repeat Step 1 through Step 22 for the other FOV.

7.4.4.2.8 Reticule Stability

7.4.4.2.8.1 Number of Units and Configuration

This test is performed on one HWTS and on one MWTS unit.

7.4.4.2.8.2 Setup

Step 1. Mount TWS to fixture on test station rotary table.
Step 2. Bring TWS to full operational condition.
Step 3. Centre reticule in FOV (reticule position indicators read 000).

7.4.4.2.8.3 Procedure

Step 1. RECORD FOV selected.
Step 2. Adjust reticule one increment to the left.
Step 3. Verify by visual observation that reticule has not changed size, shape or orientation. RECORD any reticule anomalies observed.
Step 4. Continue adjusting reticule one increment to left, verifying by visual observation that reticule does not change size, shape or orientation. Continue moving the reticule until it touches the edge of the FOV. RECORD any reticule anomalies observed.
Step 5. Centre reticule in FOV (reticule position indicators read 000).
Step 6. Adjust reticule one increment to the right.
Step 7. Verify by visual observation that reticule has not changed size, shape or orientation. RECORD any reticule anomalies observed.

Step 8. Continue adjusting reticule one increment to right, verifying by visual observation that reticule does not change size, shape or orientation. Continue moving the reticule until it touches the edge of the FOV. RECORD any reticule anomalies observed.

Step 9. Centre reticule in FOV (reticule position indicators read 000).

Step 10. Adjust reticule one increment down.

Step 11. Verify by visual observation that reticule has not changed size, shape or orientation. RECORD any reticule anomalies observed.

Step 12. Continue adjusting reticule one increment down, verifying by visual observation that reticule does not change size, shape or orientation. Continue moving the reticule until it touches the edge of the FOV. RECORD any reticule anomalies observed.

Step 13 Centre reticule in FOV (reticule position indicators read 000).

Step 14. Adjust reticule one increment up.

Step 15. Verify by visual observation that reticule has not changed size, shape or orientation. RECORD any reticule anomalies observed.

Step 16. Continue adjusting reticule one increment up, verifying by visual observation that reticule does not change size, shape or orientation. Continue moving the reticule until it touches the edge of the FOV. RECORD any reticule anomalies observed.

Step 17. Repeat procedure (Step 1 through Step16) for other field of view.

Step 18 REQUIREMENT: Reticule size, shape, and orientation must remain stable over entire adjustment range in both FOVs.

7.4.4.2.9 Reticule Brightness

7.4.4.2.9.1 Number of Units and Configuration

This test is performed on one HTWS and on one MTWS unit.

7.4.4.2.9.2 Setup

Step 1. Mount TWS to fixture on test station.

Step 2. Bring TWS to fully operational condition.

Step 3. Install a blackbody target on collimator, of sufficient ΔT to be plainly visible in TWS. The purpose of the target is simply to provide light and dark scene regions against which the reticule will be viewed and evaluated for visibility. Therefore, target size and shape is not critical.

Step 4. Set TWS polarity to white hot.

Step 5. Adjust TWS pointing angle so reticule crosses both light and dark regions of scene.

7.4.4.2.9.3 Procedure

Step 1. RECORD FOV selected.

Step 2. Vary TWS brightness from minimum to maximum while evaluating reticule visibility against background. RECORD any inability to distinguish reticule from background.

Step 3. Change TWS polarity to black hot.

Step 4. Vary TWS brightness from minimum to maximum while evaluating reticule visibility against background. RECORD any inability to distinguish reticule from background.

Step 5. Repeat for other FOV, if applicable.

Step 6. Requirement: all portions of reticule must remain visible over the full range of brightness settings for both polarity settings.

7.4.4.2.10 Electronic Interface

7.4.4.2.10.1 Number of Units and Configuration

This test is performed on one HTWS and on one MTWS unit.

7.4.4.2.10.2 Setup

Step 1. Record type of electronic interface (e.g. RS-170 Video and Frame Rate)

Step 2. Connect test station monitor to TWS I/O port.

Step 3. Put TWS in fully operational mode.

7.4.4.2.10.3 Procedure

Step 1. Verify that scene imagery and applicable reticules are displayed on test station monitor, confirming presence of video type. RECORD.

Step 2. Requirement: scene imagery must appear at test station monitor.

Step 3. Connect frequency counter to I/O connector INDEX Signal.

Step 4. Measure index signal period, T_i, s. RECORD.

Step 5. Calculate Frame rate = (3/ T_i)Hz. RECORD.

Step 6. Requirement: Compare measured frame rate against test unit requirement (Frame rate = frames/s).

7.4.4.3 TWS Environmental Test Procedures

7.4.4.3.1 Low Temperature - Storage

7.4.4.3.1.1 Purpose Of Test

The purpose of this environmental test is to determine if the UUT can be stored under expected low temperature conditions and operated safely after storage without experiencing physical damage or deterioration in performance.

7.4.4.3.1.2 Equipment To Be Tested

One TWS. Each TWS sensor shall be mounted to the rail holding fixture. Battery simulators will be used to power the UUTs.

7.4.4.3.1.3 Test Requirements

a. Test duration: Storage - 3 hour exposure

b. Location of temperature sensors: On outside of case at the base of TEC (Thermal Electric Cooler).

c. Test temperature and how temperature was derived: For Low Temperature Storage test - minimum temperature should be set at the test units low temperature operational requirement.

c. Relative humidity control requirements (if necessary): Humidity is uncontrolled.

7.4.4.3.1.4 Required Test Equipment

The following test equipment or equivalent will be used to conduct the environmental test. Changes may be made considering availability, status, and calibration dates.

Description	Manufacturer	Model No.
Test chamber	Therotron	S8
Temperature controller	Honeywell UDC-500	H437258
Chart recorder	Barber-Coleman	H-A02244
Data Logger (D.L.)	Fluke 2240B	H-374440
D.L. Interface/Server	Hewlett-Packard	HP 7946
Process controller (Profiler)	Hewlett-Packard	HP 9835A
Process monitor	Hewlett-Packard	HA 89102
HP 9122/Interface	Hewlett-Packard	HA 04533
Data Acquisition	Hewlett-Packard	HP 9835A
HP 9000-300 Disk Storage	Hewlett-Packard	HP 9835A
Real time clock	Systron	HA 89101
Remote CRT	Lear Siegler	8730

7.4.4.3.1.5 Procedural Steps

7.4.4.3.1.5.1 Pre-environmental examination procedure

Step 1. Conduct the operational checks and tests using the manufacturer's procedure and document the results.

Step 2. Install temperature sensors on the UUTs.

Step 3. Insert the UUTs in the chamber and stabilize the UUTs at the controlled ambient conditions.

Step 4. Conduct a visual examination of the UUTs with special attention to the stress areas, such as corners of molded cases.

Step 5. Document the results.

7.4.4.3.1.5.2 Environmental test procedure

Step 1. Place the UUTs in their operational configuration, with no power applied.

Step 2. Adjust the chamber air temperature to test units low temperature operational requirement. The rate of temperature change shall not exceed 3°C (4.8°F) per minute.

Step 3. Maintain this temperature until temperature stabilisation of the UUTs has been achieved.

Step 4. After temperature stabilisation, maintain the UUTs at the chamber air temperature of the test units low temperature operational requirement for a period of 3 hours.

Step 5. After the 3 hour exposure period, conduct a visual examination of the UUTs, as chamber access limitations will allow and document the results.

Step 6. If no problems are evident, go to procedure 7.4.4.3.2 (Low Temperature - Manipulate); otherwise continue to next step.

Step 7. If a failure has occurred, prepare a Trouble and Failure Report (TFR).

7.4.4.3.1.5.3 Post-environmental examination procedure

Step 1. Conduct the operational checks and tests using the manufacturer's procedure and document the results.

Step 2. Compare the pre-environmental examination data with the post-environmental examination data.

7.4.4.3.2 Low Temperature - Manipulate

7.4.4.3.2.1 Purpose Of Test

This procedure is performed to determine if a UUT can be handled (manipulated) as required to make it operational without affecting its functional performance.

7.4.4.3.2.2 Equipment To Be Tested

One UUT, either TWS. Each TWS sensor shall be mounted to the rail holding fixture. Battery simulators will be used to power the UUTs.

7.4.4.3.2.3 Test Requirements

a. Test duration: Manipulate - 2 hour exposure.

b. Location of temperature sensors: On outside of case at the base of the Thermal Electric Cooler (TEC) on each unit.

c. Test temperature and how temperature was derived: For Manipulate test - minimum temperature is the test units low temperature operational requirement.

d. Relative humidity control requirements (if necessary): Humidity is uncontrolled.

e. Additional guidelines: Controls for On/Off brightness, Contrast/Gain, Polarity, Standby, Emergency Mode, shall be manipulated at the low temperature. These controls shall be independently varied one at a time from one extreme to the other. No quantitative measurements shall be made for this check; This is a qualitative check only.

f. One or more individuals meeting the hand dimensions for a 5th to 95th Percentile ground troop male.

7.4.4.3.2.4 Required Test Equipment

The test equipment as listed in 7.4.4.3.1.4 or equivalent will be used to conduct the environmental test. Changes may be made considering availability, status, and calibration dates.

7.4.4.3.2.5 Procedural Steps

7.4.4.3.2.5.1 Pre-Environmental Examination Procedure

[Note: If this test is performed immediately following and as part of procedure 7.4.4.3.1, go to procedure 7.4.4.3.2.5.2]

Step 1. Conduct the operational checks and tests using the manufacturer's procedure and document the results.

Step 2. Install temperature sensors on the UUTs.

Step 3. Insert the UUTs in the chamber and stabilise the UUTs at the controlled ambient conditions.

Step 4. Conduct a visual examination of the UUTs with special attention to the stress areas, such as corners of moulded cases.

Step 5. Document the results.

7.4.4.3.2.5.2 Environmental Test Procedure

Step 1. With the UUTs in the chamber, adjust the chamber air temperature to the test units low temperature operational requirement.

Step 2. Maintain the low operating temperature for two hours following temperature stabilisation of the UUTs.

Step 3. Place the UUT in the ON mode.

Step 4. Visually examine the UUTs for any damage, and record the results.

Step 5. Manipulate the controls per 7.4.4.3.2.3(e).

Step 6. Conduct as complete a visual examination of the UUTs as chamber access limitations will allow, document the results.

Step 7. At the completion of the two hour exposure, adjust the chamber air temperature to standard ambient conditions of 7.4.4.1.4. Maintain this temperature until temperature stabilisation of the UUTs has been

7.4.4.3.2.5.3 Post-environmental examination procedure

Step 1. Compare the pre-environmental examination data with the post-environmental examination data.

7.4.4.3.3 Minimum Resolvable Temperature

7.4.4.3.3.1 Requirement

The MRT tests shall be performed on 4 UUTs. The tests shall be performed with a minimum of 3 observers each resolving 3 targets in a 45 degree direction. The high frequency measurement on the HWTS may be done in the horizontal direction. The targets shall be resolved in the Narrow Field of View (NFOV). The completed test data records shall be maintained with the UUTs.

7.4.4.3.3.2 Test Equipment

The test is performed using equipment from the TWS Test station

7.4.4.3.3.3 Method

Step 1. Mount TWS to rail holding fixture on sensor station.

Step 2. Verify that target wheel #2 is installed and the targets are correctly oriented.

Step 3. Put the UUT in a fully operational mode and wait until it reaches cooldown.

Step 4. Put the TWS in the narrow field of view (NFOV). All the measurements will be in the narrow field of view.

Step 5. Set the SBIR to LOCAL

Step 6. Set the blackbody target ΔT so that the target is easily resolvable.

Step 7. Focus the Unit for best focus.

Step 8. Align the UUT with the collimator target. The target should be close to the centre of the field of view. A reticule can be chosen or moved so that it does not interfere with the target

7.4.4.3.3.3.1 Procedure for Heavy TWS:

Step 1. The TWS contrast brightness focus and polarity controls may be changed at any time during the test to accommodate the preferences of the observer.

Step 2. Select target wheel position number 5 which corresponds to a 1.5 cy/mr target at a 45^0angle.

Step 3. Set the temperature on the SBIR LED READOUT to 0.00 degrees.

Step 4. Slowly increase the temperature displayed on the SBIR in the positive direction by 0.01 degree increments.

Step 5. Wait for 30 seconds for the temperature to stabilise.

Step 6. View the target to determine if the four bar target is discernible.

Step 7. Continue with steps 4 through 6 until the bar target is discernible.

Step 8. Record the positive delta on the table as Tp.

Step 9. Select target wheel position number 6 which corresponds to a 2.1 cy/mr target at a 45^0 angle.

Step 10. Repeat steps 4 through 9. Then proceed to step 11.

Step 11. Select target wheel position number 7 which corresponds to a 3.49 cy/mr target with the bars in the vertical direction (which corresponds to the horizontal MRT).

Step 12. Repeat steps 4 through 8. Then proceed to step 13.

Step 13. Select target wheel position number 5 which corresponds to a 1.5 cy/mr target at a 45^0 angle.

Step 14. Set the temperature on the SBIR LED READOUT to 0.00 degrees. Wait 30 seconds for the temperature to stabilise.

Step 15. Slowly decrease the temperature displayed on the SBIR in the negative direction by .01 degree increments.

Step 16. Wait for 30 s for the temperature to stabilise.

Step 17. View the target to determine if the four bar target is discernible.

Step 18. Continue with step 15 through 17 until the bar target is discernible.

Step 19. Record the negative delta temperature on the table as Tn.

Step 20. Select target wheel position number 6 which corresponds to a 2.1 cy/mr target at a 45^0 angle.

Step 21. Repeat steps 15 through 19. Then proceed to step 22.

Step 22. Select target wheel position number 7 which corresponds to a 3.49 cy/mr target with the bars in the vertical direction (which corresponds to the horizontal MRT).

Step 23. Repeat steps 15 through 19. Then proceed to step 24.

Step 24. Calculate the MRT value Tz[(Tp-Tn)/2= Tz], and record on TDR.

7.4.4.3.3.3.2 Procedure for Medium TWS

Step 1. The TWS contrast, brightness, and polarity controls may be changed at any time during the test to accommodate the preferences of the observer.

Step 2. Select target wheel position number 1 which corresponds to a 0.4cy/mr target at a 45^0 angle.

Step 3. Set the temperature on the SBIR LED READOUT to 0.00 degrees.

Step 4. Slowly increase the temperature displayed on the SBIR in the positive direction by 0.01 degree increments.

Step 5. Wait for 30 seconds for the temperature to stabilise.

Step 6. View the target to determine if the four bar target is discernible.

Step 7. Continue with steps 4 through 6 until the bar target is discernible.

Step 8. Record the positive delta on the table as Tp.

Step 9. Select target wheel position number 2 which corresponds to a 0.7cy/mr target at a 45^0 angle.

Step 10. Repeat steps 4 through 8. Then proceed to step 11.

Step 11. Select target wheel position number 4 which corresponds to a 1.0 cy/mr target at a 45^0 angle.

Step 12. Repeat steps 4 through 8. Then proceed to step 13.

Step 13. Select target wheel position number 1 which corresponds to a 0.4 cy/mr target at a 45^0 angle.

Step 14. Set the temperature on the SBIR LED READOUT to 0.00 degrees. Wait 30 seconds for the temperature to stabilise.

Step 15. Slowly decrease the temperature displayed on the SBIR in the negative direction by .01° increments.

Step 16. Wait for 30 seconds for the temperature to stabilise.

Step 17. View the target to determine if the four bar target is discernible.

Step 18. Continue with step 15 through 17 until the bar target is discernible.

Step 19. Record the negative delta temperature on the table as Tn.

Step 20. Select target wheel position number 2 which corresponds to a0.7 cy/mr target at a 45^0 angle.

Step 21. Repeat steps 15 through 19. Then proceed to step 22.

Step 22. Select target wheel position number 4 which corresponds to a 1.0 cy/mr target at a 45^0 angle.

Step 23. Repeat steps 15 through 19. Then proceed to step 24.

Step 24. Calculate the MRT value Tz[(Tp-Tn)/2= Tz], and record on TDR.

7.4.4.3.4 High Temperature - Storage

7.4.4.3.4.1 Purpose Of Test

This procedure is performed to determine if the UUTs can be stored under hot climatic conditions without experiencing physical damage and operated at standard ambient conditions without deterioration in performance.

7.4.4.3.4.2 Equipment To Be Tested

One TWS. Each TWS sensor shall be mounted to the rail holding fixture.

7.4.4.3.4.3 Test Requirements

(1) Test duration: Storage - 3 hour exposure

(2) Location of temperature sensors: On outside of case at the base of the TEC.

(3) Test temperature and how temperature was derived: For Storage test - maximum storage temperature is the test units high temperature operational requirement .

(4) Relative humidity control requirements (if necessary): Shall not exceed 20% RH.

(5) Additional guidelines: None

7.4.4.3.4.4 Required Test Equipment

The test equipment as listed in 7.4.6.1.4 or equivalent will be used to conduct the environmental test. Changes may be made considering availability, status, and calibration dates.

7.4.4.3.4.5 Procedural Steps

7.4.4.3.4.5.1 Pre-Environmental Examination Procedure

Step 1. Conduct the operational checks and tests using the manufacturer's procedures and document the results.

Step 2. Install temperature sensors on the UUTs.

Step 3. Insert the UUTs in the chamber and stabilise the UUTs at the controlled ambient conditions.

Step 4. Conduct a visual examination of the UUTs with special attention to the stress areas, such as corners of moulded cases.

Step 5. Document the results.

7.4.4.3.4.5.2 Environmental Test Procedure

Step 1. With the UUTs in the chamber, place them in their storage configuration (i.e. Objective lens cover closed, batteries, if any, removed, etc.)

Step 2. Adjust the chamber temperature to test units high temperature operational requirement and 20% or less relative humidity. The rate of temperature change shall not exceed 3°C (5.4°F) per minute.

Step 3. Maintain this temperature until temperature stabilisation of the UUTs has been achieved.

Step 3a. The humidity readings will be verified at one hour intervals.

Step 4. After temperature stabilisation, maintain the UUTs at the chamber air temperature of the test units high temperature operational requirement for a period of 3 hours.

Step 5. At the completion of the 3 hour exposure, adjust the chamber air temperature and humidity to the standard ambient conditions in 7.4.4.1.4.

Step 6. Maintain the UUTs at the standard ambient conditions until temperature stabilisation (per 7.4.4.1.6) of the UUTs has been achieved.

Step 7. Conduct a visual examination of the UUTs.

7.4.4.3.4.5.3 Post-environmental examination procedure

Step 1. Compare the pre-environmental examination data with the post-environmental examination data. Document the results.

7.4.4.3.5 Temperature Shock

7.4.4.3.5.1 Purpose Of Test

This procedure is performed to determine if the UUTs can withstand sudden changes in the temperature of the surrounding atmosphere without experiencing physical damage or deterioration in performance, and can be safely operated following exposure.

7.4.4.3.5.2 Equipment To Be Tested

One TWS, in a non-operating mode.

7.4.4.3.5.3 Test Requirements

(1) Test temperature extremes: Test units High and Low temperature operational requirement.

(2) Location of temperature sensors: As a minimum, a temperature sensor shall be mounted to the UUT case at the base of the TEC.

(3) Duration of exposure at each temperature and number of cycles: At the low temperature extreme, duration shall be two hours or until the UUTs have been stabilised, whichever is longer. At the high temperature extreme, duration shall be two hours or until the UUTs have achieved thermal stabilisation at this temperature, whichever is longer. The UUTs shall be exposed to three cycles.

(4) Additional guidelines: Performance of the optical parts shall be verified by physical examination for damage or internal condensation.

7.4.4.3.5.4 Required Test Equipment

The test equipment as listed in 7.4.6.1.4 or equivalent will be used to conduct the environmental test. Changes may be made considering availability, status, and calibration dates.

7.4.4.3.5.5 Procedural Steps

7.4.4.3.5.5.1 Pre-Environmental Examination Procedure

Step 1. Conduct the operational checks and tests using the manufacturer’s procedures and document the results.

Step 2. Install temperature sensors on the UUTs.

Step 3. Insert the UUTs in the chamber and stabilise the UUTs at the controlled ambient conditions.

Step 4. Conduct a visual examination of the UUTs with special attention to the stress areas, such as corners of moulded cases.

Step 5. Document the results.

7.4.4.3.5.5.2 Environmental Test Procedure

Step 1. With the UUTs in the chamber, adjust the chamber air temperature to test units high temperature operational requirement.

Step 2. Maintain this temperature for two hours or until the UUTs have been stabilised per 7.4.4.1.6, whichever is longer.

Step 3. Transfer the UUTs to the low-temperature environment (chamber air temperature shall be test units low temperature operational requirement) in no more than five (5) minutes. Chamber control shall be such that after insertion of the UUTs, the chamber air temperature shall be within the specified test tolerances in section 7.4.4.1.5 after a period of not more than 5% of the exposure time.

Step 4. Maintain this low-temperature environment for two hours, or until the UUTs have been stabilised per 7.4.4.1.6, whichever is longer.

Step 5. Transfer the UUTs to the high-temperature environment (chamber air temperature shall be test units high temperature operational requirement) in no more than five (5) minutes. Chamber control shall be such that after insertion of the UUTs, the chamber air temperature shall be within the specified test tolerances in 7.4.4.1.5 after a period of not more than 5% of the exposure time.

Step 6. Maintain this temperature for two hours, or until the UUTs have stabilised per 7.4.4.1.6, whichever is longer.

Step 7. Repeat Steps 3 to 6.

Step 8. Repeat Steps 3 and 4.

Step 9. Return the UUTs to controlled ambient conditions of 7.4.4.1.5.

Step 10. Conduct a visual examination of the UUTs with special attention to the optical parts and stress areas, such as corners of moulded cases, and document the results.

7.4.4.3.5.5.3 Post-Environmental Examination Procedure

Step 1. Compare the pre-environmental examination data with the post-environmental examination data.

7.4.4.3.6 Shock (Functional) - Weapon Firing

7.4.4.3.6.1 Purpose Of Test

This procedure is performed to determine if the UUT can withstand the effects of platform induced shocks encountered in the service environment.

7.4.4.3.6.2 Equipment To Be Tested

One TWS. Batteries will be used to power the UUTs.

7.4.4.3.5.3 Test Requirements

(1) Operational requirements: UUTs will be powered during the weapon firings. No degradation in performance during or after completion of the firings.

(2) Test (shock) levels and duration: Number of rounds per unit will be determine by test units operational requirement with NATO qualified/interchangeable 5.56mm ammunition using an US M16A2 or NATO equivalent rifle.

(3) Test set-up description: UUTs shall be securely fastened to the weapon mount for tactical usage.

(4) Temperature extremes (if necessary): None applicable

(5) Additional guidelines: Controls for On/Off brightness, Contrast/Gain, Polarity, Standby and Emergency Mode shall be adjusted during the weapon firing test. No quantitative measurements shall be made for this check. This is a qualitative check only.

7.4.4.3.6.4 Required Test Equipment

A US M16A2 rifle or NATO equivalent capable of firing 5.56mm NATO qualified ammunition.

7.4.4.3.6.5 Procedural Steps

7.4.4.3.6.5.1 Pre-Environmental Procedure

Step 1. Conduct the operational checks and tests using the manufacturer's procedures and document the results.

Step 2. Examine the UUT for any physical defects, and document the results.

7.4.4.3.6.5.2 Environmental Test Procedure

Step 1. Mount the UUT on the test weapon.

Step 2. Make sure the UUT is safely fastened to the weapon by tightening the mounting knob until it clicks once.

Step 3. Observe the range safety requirements whenever handling the weapon.

Step 4. Choose a target on the range and fire several rounds at it.

Step 5. Adjust the UUT RETICULE ADJUST to move the strike of the round to the aim point of the TWS sensor.

Step 6. Repeat steps 4 and 5, as necessary. Verify that the UUT can be zeroed, and document the results.

Step 7. Continue the firing test until all rounds have been expended. Periodically adjust the UUT controls per 7.4.4.3.2.3 (e). Document the results.

Step 8. Remove the TWS unit from' the test weapon.

Step 9. Visually inspect the UUT externally, and document the results.

Step 10. Place the second TWS unit onto the weapon.

Step 11. Repeat procedure 7.4.4.3.6.5.2, steps 1-8.

Step 12 Proceed to 7.4.4.3.6.5.3

7.4.4.3.6.5.3 Post-Environmental Examination Procedure

Step 1. Conduct the operational checks and tests using the procedure in

Step 2. Compare the pre-environmental examination data with the post environmental examination data.

7.4.4.3.7 Power Source Test for Optical, I^2, Laser and Thermal Sighting Systems

7.4.4.3.7.1. Objective

To assess the failure mode of the power source.

7.4.4.3.7.2 Method

(1) Power source shall be operated/placed under an appropriate load that simulates the power draw of the device(s) that use this power. A constant draw shall be made until power drops below the minimum required levels of the device(s). Measurements shall be recorded that will illustrate the reduction in power levels from a point 10 minutes from what is considered minimum operating power level and carefully monitored until the power source no longer is able to provide minimum power requirements. Upon completion, it shall be characterised as gradual or sudden power loss.

Note:

- A gradual power loss is to be defined as a slow loss in power that will provide a warning to the operator that the source is beginning to lose its power and will not be able to maintain sufficient power levels to operate system.

- A sudden power loss is to be defined as a reduction in power output that is characterised by a drop in power sufficiently rapid to not provide a warning of impending loss of function.

Power source shall be tested at operational temperature as specified by the appropriate requirements documents that specify the expected environment the unit will be subjected.

The power source shall be placed in the appropriate device(s) and operated in two ways to test the life of the power source.

(a) Constant Use: Device will be operated continuously with all functions operating. For any devices that operate through a charge then fire cycle, the device shall be continuously cycled through the operated sequence. This shall be done until any feature of the device has ceased to function adequately. A time measurement shall be taken from the initiation of this test until function has ceased.

(b) Intermittent Use: Device will be operated in an on-off cycle as the requiring service deems necessary. Time shall be recorded from the initiation of the test until that time at which the device ceases to correctly function

(2) A sample of three batteries of each type required by the sight candidates will be monitored, for remaining voltage, during the course of the test.

7.4.4.3.7.3 Results to be recorded

(a) Time versus voltage for each battery.
(b) Time to system failure for candidate sight system.

7.4.4.3.8 Global Positioning System Performance Test for Optical, I^2, Laser and Thermal Sighting Systems

7.4.4.3.8.1 Objective

To assess the ability of the GPS subsystem to accurately and repeatably establish positions.

7.4.4.3.8.2 Method

The following procedure shall be used:

(a) Position accuracy: Establish known positions on the test field using a calibrated GPS system. Using GPS subsystem of sighting system, establish the position of each of the known positions and measure against the known locations.

(b) Position repeatability: Using the established positions, test the GPS subsystem of sighting system at each position. Repeat in a random order several times to establish the repeatability of the system.

7.4.4.3.8.3 Results/Assessment

Compare the readings of the GPS subsystem with the established known positions and compute the distance error.

7..4.4.3.9 Wind Measuring System Performance Test for Optical, I^2, Laser and Thermal Sighting Systems

7.4.4.3.9.1 Objective

To assess the ability of the wind measuring subsystem to accurately measure wind velocity.

7.4.4.3.9.2 Method

A calibrated anemometer will be placed next to the point of wind measurement. The wind shall be measured concurrently through both devices and measured and any differences shall be recorded.

7.4.4.3.9.3 Results/Assessment

Compare the readings of the wind measuring subsystem with the anemometer readings and compute the difference in wind measurement.

Fig 7.4 EXAMPLE OF COMPARATIVE DATA SHEET

Serial	Sight Characteristics	*Unit*	*Weapons Ref. No.*	
1.	Sights			
a.	Iron Sights			
(1)	Front Sight			
	- type and dimensions			
	- means of adjustment			
(2)	Rear Sight			
	- type and dimensions			
	- means of adjustment			
	- number of settings			
(3)	Length of sight base line			
(4)	Distance Bx			
(5)	Distance Cx			
(6)	Number of settings and range to which they refer			
b.	Optical sights			
(1)	Type			
(2)	Dimensions			
(3)	Means of adjustment			
(4)	Magnification			
(5)	Field of View (FOV)			
(6)	Entry pupil			
(7)	Exit relief			
(8)	Eye relief			
(9)	Possible obscured area of Exit Pupil.			
(10)	Diopter scale.			
(11)	Distance Bx			
(12)	Sight settings			
(13)	Reticules/pointers			
(14)	Reticule illumination			
(15)	Filters			
(16)	Focusing			
(17)	Eyepiece			
(18)	Type of anti-reflective coated lenses			
(19)	Type of anti-reflective devices/filters			
(20)	Type of reticule/reticule/pointer illumination			
(21)	Power source/type			
(22)	Power supply life			
(23)	Type of laser hardening			
(24)	Operating temperature range			
(25)	Resolution.			
(26)	Light transmission.			

(27)	Possible presence of dirt and image defects.			
(28)	Waterproofness;			
(29)	Weapon mounting method;			
(30)	Number of sight settings and the distance to which they refer;			
(31)	Provisions for back-up sights;			
(32)	Minimum/Maximum ranges.			
(33)	Confirming image verticality.			
	Confirming visibility of graduations.			
c.				
(1)	Laser Systems			
(2)	Type, weight			
(3)	Dimensions			
(4)	Means of adjustment			
(5)	Visible laser classification			
(6)	Infrared laser classification			
(7)	Visible laser wavelength and output power			
(8)	Infrared laser wavelength and output power			
(9)	Power source/type			
(10)	Power supply life			
(11)	Operating temperature			
(12)	Beam size			
(13)	Beam divergence			
(14)	Range			
(15)	Weapon mounting method			
(16)	Provisions for back-up sights			
	Laser range resolution			
d.				
(1)	Night Sights (Image Intensifiers)			
(2)	Type, Dimensions, Weight			
(3)	Magnification			
(4)	Field of View			
(5)	Eye Relief			
(6)	Reticule (Fixed or Adjustable)			
(7)	Operational range			
(8)	Resolution			
(9)	Power Supply			
(10)	Performance (Full Moon/StarLight)			
	Mounting on Weapon			
(1)	Thermal Sighting Systems			
(2)	Type of System (passive or active)			
(3)	Dimensions and Weight			
(4)	Distance/Height above bore line of weapon			
(5)	Type of mounting system/weapon interface			
(6)	Field of View, degrees, wide and narrow			
(7)	Field of View change time			

(8)	Field of View inter-alignment			
(9)	Field of View focus retention			
(10)	Range (clear conditions, day, night and dusk)			
(11)	Range (obscured conditions, day, night and dusk)			
(12)	Power Supply			
(13)	Power Supply Life			
(14)	Minimum Resolvable Temperature			
(15)	Operating Temperature in clear conditions			
(16)	Fire Control Performance (Targeting and accuracy)			
(17)	Zero Retention after remounting			
(18)	Boresighting and boresight retention			
(19)	Target detection and recognition			
(20)	Target image integrity			
	Reliability (MTBOMF-Hours)(Mean Time Between			
(21)	Operational Mission Failures)			
(22)	Target Hit Probability			
	System Ready Time (off to on cool down			
(23)	requirements) (standby to on time)			
	Hardening against NBC, DEW, Electro-Optical			
(24)	Countermeasures, High Altitude Electro Magnetic			
(25)	Pulse (HAEMP)			
(26)	Vulnerability to counter measures:			
(27)	Out-of-Band optical cross section specification			
(28)	In-band optical cross section specification			
(29)	Type of compass/directional pointer			
(30)	Global positioning capability (if any)			
(31)	Connector type			
(32)	Interface protocol			
(33)	Reticule type/display			
(34)	Video capability/type			
(35)	Recognition and identification capability			
(36)	Search and detection capability			
(37)	Auto-training function			
(38)	Built in test equipment type (if any)			
(39)	Types of display for target acquisition			
(40)	Type and location of controls			
	Laser range finding capability			
	Laser range resolution			

7.4.4.4 Weapon Mounted Video Camera

7.4.4.4.1 Objective. The purpose of this test is to verify that the Weapon Mounted Video Camera satisfies the requirements of the Video Camera Specification

7.4.4.4.2 Test Item Description The Weapon Mounted Video Camera is a small, light weight, black and white unit used for daylight operation. The camera provides an electronic interface (e.g. RS-170) that is linked to a soldier worn subsystem.

7.4.4.4.3 Test Equipment The following test equipment and instrumentation will be used to perform Video Camera test procedures:

- Collimating lens
- Calibrated light source
- Focus Test Box
- Resolution Target (EIA 1956)
- Micrometer stage
- Monitor
- Power Supply

7.4.4.4.4 Test Procedure

7.4.4.4.4.1 Camera Focus / Resolution

Method

1. Mount the Video Camera to the test fixture and set up per Figure 7.5. Turn on and adjust the light source for 3.23 lumen/m^2 (0.3 foot-candles) and focus on the Resolution Target. Observe the number of TV lines that can be resolved. The maximum resolution will correspond to the location on the target at which the observer can no longer see the separate target lines. Record the results on the test data sheet. Record the type of resolution target used.

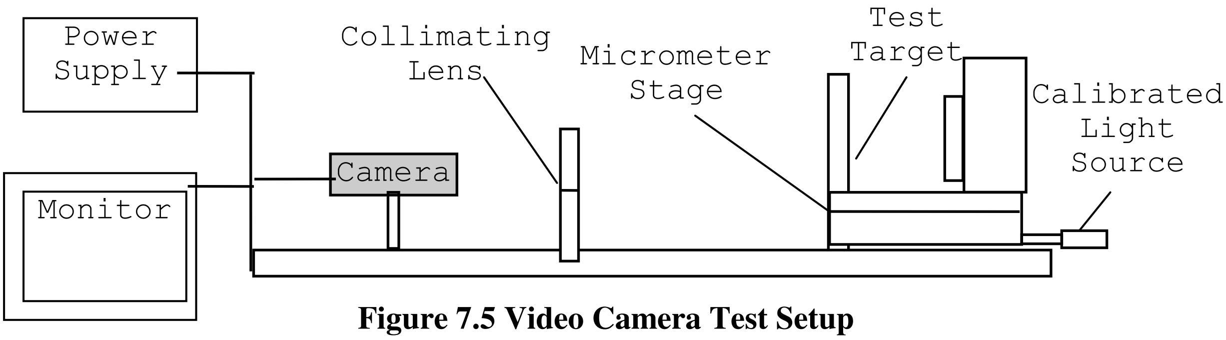


Figure 7.5 Video Camera Test Setup

Figure 4. Video Camera Test Setup

2. Increase the light level to full room level 161.4 – 322.8 lumen/m^2 (15-30 foot-candles) and record the level. Repeat the resolution measurement. Record results on data sheet.

3. View the image and verify that no ghost images are created by the light source within the field of view.

4. Position the camera to view the resolution target at 1 meter. Observe the number of TV lines that can be resolved. The maximum resolution will correspond to the location on the target at which the observer can no longer see the separate target lines. Record results on data sheet.

5. Decrease the light level to 3.23 lumen/m^2 (0.3 foot-candles) and repeat resolution measurement. Record results on data sheet.

6. Position the camera to view a scene at full daylight illumination (point the camera outside). Verify a clear, usable image on the monitor with no ghost images.

7.4.4.4.4.2 Video Output

Method

1. Display the waveform of the electronic interface (e.g. RS-170) video signal on the scope. Determine the width and frequency of the blanking pulse. Compare the measurements to verify that the waveform conforms to the electronic interface specifications for analog video. Record pass/fail on data sheet.

7.4.4.4.4.3 Electronic Iris Monitor the Video Camera output and verify that the camera provides acceptable video of the scene. Point the test fixture (video camera) at an area that is much brighter than the scene that was previously viewed (ceiling light, outside, etc.).

1. Verify that the Video Camera adjusts to the brighter light conditions and provides acceptable video as seen at the monitor. Enter pass/fail on the data sheet.

7.4.4.4.4.4 Power Consumption

Method

1. Measure the ambient room temperature. Record results on data sheet.
2. Install the Video Camera onto the test fixture. Apply appropriate level of voltage (VDC) to the Video Camera through the Weapon harness. Connect the (e.g. RS170) output to the monitor and verify that the scene is displayed. Measure the current and voltage required by the video camera and verify the power consumption is less than specified in the Video Camera performance requirement. Record results on data sheet.

7.4.4.4.4.5 Sacrificial Filter

Method

1. Inspect Vendor certification and verify that the sacrificial filter has at least 90% transmission in the visual spectral band.

7.4.4.4.4.6 Image Orientation Test

Method

1. Place unit on fixture and verify that mounting rail fixture mount surface is level with local gravity. Aim camera at cable to which a plumb bob is attached. Switch monitor to "Pulse Cross" display and note displacement of plumb cable. Displace bottom of cable so that it hangs at an angle not exceeding one degree to the left. Verify that the displacement displayed on the video has increased. Displace bottom of cable so that it hangs at an angle not exceeding one degree to the right. Verify that the displacement on the video exceeds that displayed when the cable was at plumb. Switch monitor back to normal mode. View scene and verify that video is neither reversed (left to right) nor inverted (top to bottom). Record angle of any misorientation of the video to vertical on the data sheet. Error should be less than or equal to one degree. Also record if video is reversed or inverted.

7.4.4.4.5 Data Reduction and Analysis Calculate the power consumption of the Video Camera using voltage and current measurements recorded on the Data Sheet.

Video Camera

Functional Test

Today's Date: ____________ System Configuration: ________________

Serial Number: _____________ **Part Number:** _______________________

Test Equipment information:

MANUFACTURER/MODEL	CALIB. LAST	CALIB. DUE
Light Source		
Micrometer Table		
Power Supply		
Holding Fixture		

Resolution:

Test Para.	Light Level (lumen/m^2)	TV Lines Resolved	Spec. Value	Pass (🗐)	Fail (🗐)
7.4.4.4.4.1.1	3.23				
7.4.4.4.4.1.2					
7.4.4.4.4.1.3					
7.4.4.4.4.1.4					
7.4.4.4.4.1.5	3.23				
7.4.4.4.4.1.6	Daylight	Usable image			

Test Para.	Light Level (lumen/m^2)	TV Lines Resolved	Spec. Value	Pass (🗐)	Fail (🗐)
		without ghost images			

Data Sheet

Today's Date: ____________________ Serial Number: ____________________

7.4.4.4.4.2 Video output conforms to spec. Pass ____ (🗐) Fail ___ (🗐)

7.4.4.4.4.3 The electronic iris functions normally Pass _____ (🗐) Fail ___ (🗐)

7.4.4.4.4.4.1 Ambient room temperature ______________________

7.4.4.4.4.4.2 Camera Current: __________________

7.4.4.4.4.4.2 Camera Voltage: __________________

7.4.4.4.4.4.2 Calculated Power Consumption: _________________

7.4.4.4.4.4.2 Power Consumption Pass ____ (🗐) Fail __________ (🗐)

7.4.4.4.4.5 Sacrificial Filter (>90% transmission)Pass ____(🗐) Fail ___ (🗐)

7.4.4.4.4.5 Vendor Certifications are attached ______________ (🗐)

7.4.4.4.4.6 Video misorientation to vertical ______________ degrees

7.4.4.4.4.6 Video is within 1 degree of vertical Pass ____ (🗐) Fail ___ (🗐)

7.4.4.4.4.6 Video is not reversed or inverted Pass ____ (🗐) Fail ___ (🗐)

Notes:

Test Operator: ____ Date _______

7.5 Position Disclosing Effects

7.5.1 Weapon Sight Emissions

Where special sights (such as optical sights, laser aiming sights, thermal weapon type sights) are the primary sights, an assessment of the sighting systems signature effects such as acoustic emissions, electromagnetic radiation, laser light emissions, optical reflections and video or radio emissions, an assessment should be performed.

7.5.1.1 Optical Reflection/Luminance Emissions

7.5.1.1.1 Objective

To assess the ability of a device to reduce the reflection of a visibly exposed lens of an optical device to inhibit any off axis reflection of light outside the field of view or the luminance of weapon sight displays which could reveal a users position.

7.5.1.1.2 Method

The following methods of observation shall be used:

(a) Photographic measurement

The reflection caused by the lens and/or the luminance emanating from the display of the sighting device will be evaluated as regards to its position disclosing effect. A camera will be placed 50 and 100 m in front of the lens of the sighting device and 30° and 60° off the axis of the line of fire.

(b) Human observation

The reflection produced by the lens and/or the luminance emanating from the display of the sighting device will be evaluated as regards its position disclosing effect. The observers will be placed in flanking positions at angles to the line of fire of 30° and 60° at distances down range of 50, 100, 200, and 300 m. This test will be conducted both day and night. Additional testing should be carried out to establish more precisely the angles of reflection.

(c) Night vision device

(1) The reflection produced by the lens and/or the luminance emanating from the display of the sighting device will be evaluated as regards its position disclosing effect. The observers will be placed in flanking positions at angles to the line of fire of 30° and 60° at distances down range of 50, 100, 200, and 300 m. Additional testing should be carried out to establish more precisely the angles of reflection. This test should be conducted at night.

(2) Additionally, for a thermal weapon sight, three observers shall be placed in a dark room 5 m distance from the TWS. The TWS and an operator shall be placed on a rotating platform to permit 360° rotation. After the observers have adapted to the dark for 20 min, the operator shall turn on the TWS and get into position for use. The absence or presence of light emission shall be recorded. This shall be repeated for the operator away from the TWS and the TWS turned off.

7.5.1.1.3 Results and Assessment

(a) The results obtained by photographic measurement shall not, in the case of doubt, take precedence over human observation.

(b) The projection of reflections and luminance emissions will be evaluated and compared to that of the same sighting device without a reflection reducing device attached.

(c) The test device will be considered to have caused significantly less (or greater) reflection than the control device if:

(1) human observation: Out of the 96 comparative observations, the observers consider that the reflection from the UUT is significantly greater (or less) more than 58 occasions;

(2) Photographic measurement: The reflection from the test weapon gives a difference in density of 30% or more. This must be a provisional criterion to be correlated with human observations in due course.

(d) The Anti Reflection Device (ARD), when mounted on an optical device, must inhibit reflection to the point where optic reflection is not a contributor to a user's detection

(e) There must not be more than a 10% reduction in observation capability.

7.5.2 Electromagnetic Emissions

7.5.2.1 Objective

This establishes general techniques for use in the measurement and determination of the electromagnetic emission and characteristics.

7.5.2.2 Method

(a) Bandwidths

The measurement receiver bandwidths listed in Table 7.1 shall be used for emission testing. These bandwidths are specified at the 6 dB down points for the overall selectivity curve of the receivers. Video filtering shall not be used to bandwidth limit the receiver response. If a controlled video bandwidth is available on the measurement receiver, it shall be set to its greatest value. Larger bandwidths may be used; however, they may result in higher measure emission levels. No bandwidth correction factors shall be applied to test data due to the use of larger bandwidths.

Table 7.1 Bandwidth and Measurement Time

Frequency Range	6 dB Bandwidth	Dwell Time	Minimum Measurement Time Analog Measurement Receiver
30Hz -1 kHz	10 Hz	0.15 sec	0.015 sec/Hz
1 kHz -1 kHz	100 Hz	0.15 sec	0.15 sec/Hz
10 kHz -1 kHz	1 kHz	0.15 sec	0.015 sec/Hz
250 kHz -1 kHz	10 kHz	0.15 sec	1.5 sec/MHz
30 MHz -1 kHz	100 kHz	0.15 sec	0.15 sec/MHz
Above 1 GHz	1 MHz	0.15 sec	15 sec/GHz

(b) Emission Identification

All emissions regardless of characteristics shall be measured with the measurement receiver bandwidths specified in Table 7.1 and recorded. Identification of emissions with regard to narrowband or broadband categorization is not applicable.

(c) Frequency Scanning

For emission measurements, the entire frequency range for each applicable test shall be scanned. Minimum measurement time for analog measurement receivers during emission testing shall be as specified in Table 7.1. Synthesized measurement receivers shall step in one-half bandwidth increments or less, and the measurement dwell time shall be as specified in Table 7.1.

(d) Emission Data Presentation.

Amplitude versus frequency profiles of emission data shall be automatically and continuously plotted. The applicable limit shall be displayed on the plot. Manually gathered data is not acceptable except for plot verification. The plotted data for emissions measurements shall provide a minimum frequency resolution of 1% or twice the measurement receiver bandwidth, whichever is less stringent, and minimum amplitude resolution of 1 dB. The above resolution requirements shall be maintained in the reported results of the ElectroMagnetic Interference Test Report (EMITR).

7.5.2.3 Results and Assessment

Results shall be assessed against the limits in US MIL-STD-461.

7.5.3 Acoustic Signature

7.5.3.1 Objective

To assess the ability of the device to minimise the sound signature to inhibit position disclosure due to noise.

7.5.3.2 Method

The following methods shall be used:

a) Record complete list of all equipment used.
b) Record date, time and location of test.
c) Record a description of test area, and sketch of positions of TWS, microphone, and any personnel present.
d) Record air temperature, relative humidity, and if outdoors, wind direction, speed, and weather conditions.
e) Use slow meter damping for all sound measurements. With microphone 1.2 m (4 feet) above ground, record background sound levels in each of the 8 octave bands listed in Table 7.2.
f) Bring TWS into full operational mode.
g) Place sound measurement microphone 5m from TWS (US MIL-STD-1474), 1.2m above ground.
h) Monitor sound level while a trained TWS operator holds TWS 0.9 to 1.5 m above ground, and operate all controls (trying to do so quietly).
i) Record maximum sound level for each octave listed in data sheet.
j) Repeat measurements for total of eight approximately equally spaced locations around TWS (either TWS may turn relative to microphone or microphone may be restationed on 1.25 m radius circle around the TWS).
k) Requirements: Sound level shall not exceed the following maximum levels in the listed frequency bands. Background noise correction (see ANSI S1.13) is permitted.
l) In case of failure to meet US MIL-STD-1474 requires listener tests be performed at 5 m distance
m) Alternate requirement: Inability of three observers with normal hearing to hear the TWS operating at 5 m distance.

Table 7.2 **Background Noise Octave Bands**

OCTAVE BAND CENTRE FREQUENCY (Hz)	MAXIMUM SOUND LEVEL (dB)
63	48
125	34
250	32
500	32
1000	32
2000	32
4000	32
8000	32

7.6 Other Tests

A. Controls and their marking.
B. Optical adjustment limits both horizontally and vertically.
C. Mechanical adjustment limits both horizontally and vertically.
D. Measurement of overall adjustment limits both horizontally and vertically.

7.6.1 On completion of technical testing of the complete weapon system, the measurements, results and skilled gunner assessment directly related to the sighting systems should be extrapolated, analysed and included as a separate "sighting systems" section of the overall weapon system technical testing report. This will then provide a technical background to the equivalent "sighting systems" section of the military testing report, on which the main sighting system assessment will be made.

7.6.2 Results to be recorded

In addition to the particular results from this test itself, the following data will be extracted from the results of all the other tests and included in the summarised report on this test:

(a) Weapon data concerning the sighting systems (see section 2).
(b) Any damage to or failure of the sighting system during other tests (particularly environmental and rough handling tests).
(c) Judgement and comments of gunners on the sighting systems during firing on other tests as well as the additional testing of the sighting systems on this test.

7.6.3 Sight Characteristics (All Sights)

(a) Vertical distance and/or horizontal distance from line of sight to barrel axis.

(b) Distance from line of sight to ground in 45° firing with rifle-mounted grenade launchers.

(c) Distance from sight notch or rear sight to a line passing through the top of the butt plate and perpendicular to the barrel axis.

(d) Sight and sleeve graduation and measurements applicable to the optical sighting system or to any other sighting system.

SECTION 8

HUMAN FACTORS/ENGINEERING

8.1 HUMAN ENGINEERING FACTORS RELATED TO WEAPONS

8.1.1 Object

Human engineering factors shall be applied to determine the degree to which the test weapon system has incorporated features conducive to soldier acceptance and compatible with user comfort and ease of operation.

8.1.1 Method

The requirements documents in support of a new or improved weapon system will normally provide specifications relating to human factors. The following are typical of the weapon system aspects to be considered:

a. capability of being fired from either the right or left shoulder in all normal firing positions;

b. absence of undue discomfort to the firer from blast noise or recoil;

c. a cartridge ejection pattern that does not interfere with the firer or an adjacent firer;

d. absence of undue muzzle rise;

e. minimum heat transfer from weapon to firer (combustion or reflected sun-induced);

f. a safety control and sights both positioned so as to permit maximum ease of operation with a minimum of unnatural effort;

g. overall configuration, length and balance such as to facilitate ease of operation in all firing positions;

h. display for target acquisition and fire control system (if associated on the weapon or with the operator);

i type of built in test equipment (if any);

j. firing control system with autotraining functioning mode;

k. readibility of the character on the screen of the display;

l. engagement and re-engagement sequence procedure with fire control system;

m. time required to convert from fixed to a flex mount (only for crew served weapons);

n. time to assemble and remove from the ground mount (only for crew served weapons);

o. time for extra operations in weapon assembly/disassembly attributed to addition of extra components for flexible use.

All human factor testing is applicable to a vehicle mounted system as well as a ground mount (only for crew served weapons).

Observations will therefore be made either during other tests or during specially arranged tests to cover all such aspects and in particular soldiers concerned, the particular data noted in paragraph 8.1.3 below.

8.1.3 Results to be Recorded

a. General comfort and handling characteristics in all firing positions including with any bipod/monopod/special mounting system.

b. Length and shape of butt, including different lengths, if available.

c. Eye relief for the various sighting devices.

d. Positions and shape of hand guard and grip.

e. Shape of trigger and trigger pull.

f. Height of rest / mount, if any.

g. Ease of handling: insertion and removal of magazine, belt and/or charger.

h. Cocking lever, safety catch and change lever, sharp and abrasive surfaces and positions.

i. Indication of ammunition remaining in magazine/holding opening device

j. Effect of recoil.

k. Effect of noise or blast on firer or nearby soldiers.

l. Effect of empty case ejection.

m. Protection against burning with a hot weapon.

n. Adjustment of elevation gear and time taken.

o. Time for loading and reloading in various positions including preparation for any grenade projection in accordance with current manuals.

p. Highest practical rate of effective fire.

q. Ease of barrel changing.

r. Weight and bulk considerations.

s. Ease of clearing stoppages and time required.

t. The effect of the above on a left-handed firer.

u. Weight and shape of the display.

v. Size of characters on the screen of the display.

w. Sensitivity and regulation of the luminance and of the contrast of the screen of the display.

x. Shape of the electronic link between weapon and display.

y. Position and type of the command buttons.

z. Time and procedure for the zeroing.

aa. Ability to operate safety devices.

8.1.4 General Assessment

a. Effectiveness

b. Possible Modifications

8.2 VULNERABILITY OF FIRER

8.2.1 **Object** To obtain information on the vulnerability of rifleman / gunner(s) while employing the weapon.

8.2.2 **Method/Records/Assessment** Typical vulnerability factors to be considered are:

- Percentage of cross - sectional area of the firer exposed as a function of firing position or weapon operation.
- Ability of enemy to detect the firers' position using the audible and/or visual signature of the weapon as a function of range.
- Ability of enemy to detect the firers position using: reflections of optical lenses, visible/infra-red light emissions, acoustical emissions, electromagnetic radio/video signal emissions from sighting devices.

8.3 HUMAN FACTORS EVALUATION RELATED TO AMMUNITION

8.3.1 **Object** Throughout all phases of fuzed and non-fuzed ammunition testing the test item is evaluated for man-item relationships.

8.3.2 **Method** The human factors areas to be assessed based on experience accumulated with the area target munition and weapon system during the evaluation tests include, but are not limited to:

a. ease of handling;

b. readily recognizable shapes and markings between the types of munitions for the system (i.e., HE, HEDP, TP, Smoke, etc.);

c. effects of flash, smoke, blast and toxic fumes;

d. possibility of injury from improper use, malfunctions, design characteristics, firing residue, etc.;

e. Fatigue factor from excessive firing (especially with Rifle Grenades);

f. Rapidity of re - load;

g. Operators Manual or technical instructions requiring clarification.

SECTION 9

MILITARY TESTS - WEAPON SYSTEMS

9.1 GENERAL

9.1.1 Objectives and Scope The objective of NATO military tests is to determine the military value of the test weapons when used by troops representative of the intended users. Test exercises are to be conducted under simulated tactical conditions or conditions similar to those expected in the areas of operational use. These test exercises are to be conducted by day, night, dawn and dusk with and without the use of battlefield obscurants (ie. smoke, dust, fog, ... etc). Furthermore, a wide range of climatic and environmental conditions are to be included (thus requiring some testing in areas representative on the north and south flanks on NATO in Europe). Instrumented test facilities are to be used together with recording and computer support as appropriate.

9.1.2 Test Considerations Military testing requires very careful and detailed planning which should be documented in a trials/exercise plan and include the following considerations:

- Weapon Systems for testing;
- Number of weapons per system required available for testing (normally a minimum of 10);
- Quantity of ammunition per system required/available;
- Stage of development;
- Initial inspection and checking that weapons/ammunition are the same as those used in Technical Testing;
- Availability of ancillaries; spare parts and instruction manuals;
- Test soldiers to be provided from different NATO armies, also weapon training instructors and armourers;
- Need to establish ergonometric data on the test soldiers;
- Administrative support;
- Language translation/interpretation;
- Range facilities available;
- Test preparation advice from analysis and specialists;
- Targets and hit recording system;
- Photography (still and video);
- Computer facilities available or obtainable;
- Trained computer personnel;
- Data format for subsequent analysis and evaluation;
- Need to treat all weapon systems "equally";
- Basic individual webbing equipment and thus ammunition load carried;
- Need for "pilot" test cycles;

- Need to ensure test soldiers adequately trained on each test weapon system;
- The problem of "learning" curves when testing similar weapons;
- Responsibilities for test control;
- Control of weapon cleaning and maintenance, including lubricants and lubrication;
- Recording of malfunctions;
- Dealing with Test Queries during testing;
- Clerical and reproduction support;
- Safety considerations;
- Limiting dates for testing;
- Visibility and climatic conditions;
- Security of weapons, ammunition and information.
- Time recording system to measure time to acquire, identify, range, illuminate, sight and engage targets;

9.1.3 Control Weapons In as far as they possess similar capabilities or are to be replaced by the test items, in-service weapons and ammunition shall be used for control and comparison with the test equipment. Whenever possible they shall be subjected to the same tests as the latter in order to provide data for comparison and evaluation. Where the term "test weapon" is used this is also to cover control weapons, as appropriate. Consideration must be given to the choice of control weapons either using:

a. The particular national in-service weapon with which the test soldiers are familiar; or

b. Only the particular control weapons used in the technical tests, with which some of the test soldiers may not be familiar.

9.1.4 Preliminary Inspection – Safety Before the firing tests begin, there will be an inspection to ensure that the weapons and ammunition are complete and in good working condition and that the technical safety tests (particularly for overpressure) have been performed.

a. A record of the following will be made:

b. Any damage to, or deterioration of, the packaging, containers or test weapon and also any shortage or other discrepancy;

c. The results of preliminary test firings (including the results of the technical safety tests);

d. Any divergencies from the Technical Test weapon systems.

9.1.5 Methods The methods indicated provide general guidance for the military tests. Detailed specific methods will depend on the test weapon and the criteria laid down in the requirements. These will consist of a series of appropriate tests to ascertain the functional performance of the test weapon and its safety and ergonomic aspects including compatibility, in short a study of the military value of the weapon. During all phases of the test, photographic or cinematographic records shall be made where necessary to supplement the other information obtained. Furthermore, methodology personnel will be called upon before testing commences to assist in developing the appropriate statistical model and supply sampling techniques, such as: choice of size of the samples needed to evaluate the true performance; the average performance (or variability of performance from a sample); to compare equipment or products with respect to their average performances; to estimate the number of firers and to determine how often a particular test needs to be repeated (see also 9.1.6.2 and 9.1.9). Also, before testing commences, advance action must be taken on the framing of detailed questionnaires, for completion by test and supervisory personnel, and on the supervision of questionnaire completion.

9.1.6 Personnel Required

9.1.6.1 Sampling Soldiers conducting tests will be representative of those who will use the test items and, as such, will represent a cross-section of experience, length of service, age, physical condition, size, weapon proficiency, mentality and other factors as appropriate. Furthermore, depending on the strength of the representative team, the proportion of left-handed soldiers and spectacle-wearers will be the same as the proportion found in the total number of users in the NATO forces.

9.1.6.2 Number of Firers and the Instruction They are to Receive The number of firers required will be determined by consulting the statistical tables which lay down the size of the representative team needed to detect the degree of difference between the control weapons and the test weapons at the desired confidence level. It would be desirable to use at least 30 individual weapons, 10 support weapons and 10 grenade launchers (insofar as it is an independent system). Should a technical compromise be necessary owing to shortage of resources, the most critical evaluation tests must be conducted as close as possible to the desired confidence level. The minimum number of firers must be no fewer than the smallest team I that would yield acceptable data, at an acceptable confidence level. This number will be determined on the basis of available statistics, former experiments and previous conclusions. However, the number of weapons tested shall not be fewer than 10 and, initially, new weapons shall be used.

For information purposes, a small group of expert marksmen may be employed to establish the best practical performance for the test and control weapons. The results will not be included in the overall statistical analysis of the representative team of testsoldiers, but will be the subject of a separate comparison. The test soldiers will be divided into groups that are as follows:

a. As many representatives as possible of the actual users.
b. National Inputs

Prior to conducting the tests, the soldiers will be instructed in the operation and maintenance of the test and control items and will fire an appropriate familiarisation course with all the test and control weapons. If the control weapon being used in the military tests is not the soldier's normal national in-service weapon then he must also fire a similar course to establish his basic standard of firing with his own national in-service weapon. The effects of the instruction on the tests will be ascertained and mentioned in the test reports, the test soldiers being trained in the normal way according to the plan set forth in the instruction manual. Ergonometric data on the test soldiers must also be obtained.

9.1.6.3 **Clothing Used by Test Soldiers** During all phases of testing, the test soldiers will be equipped with field uniforms, weapons and equipment appropriate to the prevailing weather and the activities being conducted. Test soldiers will be informed of the overall test objectives and the specific objectives of each test phase in which they participate. Extreme conditions of temperature and environment must be covered by adequate tests; NBC equipment will also be used.

9.1.7 **Training Cycles** In the Military Tests of the 1977-79 NATO Tests a system of Test Cycles was evolved. Each Test Cycle consisted of a week of training and known distance firing followed by two weeks of field firing and other testing. Fuller details of these Military Tests can be found in Chapter 4 of the NSMATCC Standing Instructions.

9.1.8 **Hit Probability - Definition of Targets**

9.1.8.1 **Firing at a Known Distance - Targets to be Used for Calculating Hit Probability** Firing will be conducted against spare white targets, at least 1.8 m x 1.8 m, with a central aiming point consisting of a black upper half circle, with a diameter equal to 1/500th of the firing distance (range). The dimensions of an imaginary inner square of rectangle to be used as a basis for calculating hit probability may be, according to distance:

a. 90 cm x 45 cm or 20 cm x 20 cm

b. Silhouette targets (see 9.1.8.2) may also be used, particularly for firings under controlled low light

c. Conditions (both at target area and at firing point).

9.1.8.2 Tactical Fire: Examples of Targets to be Used

(a) Human Target Dimensions, silhouette figure targets and postures shall be according to STANAG 4512 (Annex A and B).

(b) Vehicle Targets

Dimensions and shape of targets as listed, shall be according to pictorial target description reported on annexes of STANAG 4498

- Light truck
- Medium truck
- Helicopter

Dimensions are to be as follows:

- Armoured vehicle, front view: 230 cm x 230 cm
- Armoured vehicle, side view: 230 cm x 460 cm

(b) Conditions of use:

Type of target	Position	Crossing speed (m/s)	Approaching speed	Exposure time (s) Close target < 300m	Exposure time (s) Distant target>300m
Silhouette Under cover	Standing	0		3	6
	Crouching	0		5	10
	Prone	0		4	8
Silhouette	Standing	2,8	(9)	2,5	10
	Crouching	2,8	(9)	2,65	10
	Standing	1,5	(5)	5	12
	Crouching	1,5	(5)	5	12
	Standing	0,5	(1,5)	6	12
	Crouching	0,5	(1,5)	6	12
	Standing	5	(16)	2	8
	Crouching	5	(16)	2	8
Véhicule	Front view	5	(16)	30	60
	Side view	5	(16)	30	60
	Front view	10	(33)	30	60
	Side view	10		30	60

In real life the firer can tell from the limb movements of a human target the approximate speed of movement. Therefore, to make the firings against moving silhouette targets more realistic, the firer should be told before commencing any firing the approximate type of movement (walking, running, etc.) of the moving targets to be engaged. Silhouette figure targets (including moving targets) should fall when hit, if range facilities allow.

9.1.9 Recording and Analysis of Results During each sub-test, sufficient data must be collected to support statistically valid conclusions. An up-to-date, chronological weapon record must be kept, containing remarks, observations, meteorological data (temperature, temperature gradient, atmospheric pressure, relative humidity, rainfall, wind speed and direction, light intensity, etc.), times involved (length of time firing in interrupted, for instance), comparisons, data related to use, malfunctions, rupture and other relevant incidents and information. An efficiently kept record will hasten the collection of the data needed to support the conclusions of each test. Photographs, films, diagrams, charts and other illustrations or visual aids are suggested as a basis for evaluation to supplement the narrative reports. A computer facility will provide immediate initial analysis and cross checking on the data from the testing. The results obtained will be compared with the required characteristics to ascertain to what extent the test weapon system meets the requirements specified. The following measurements of effectiveness may be used in this comparison (some of them may not be appropriate for the assessment of a weapon for what suppressive for is an important characteristic).

(1) Hit Probability

(a) Hit probability (per round fired, per burst fired, per equivalent weight, volume and cost of ammunition, per engagement).

(b) The firing results may be further categorised for each target range, mode of fire, type of mount and visibility condition.

(2) Response Time

(a) Time to first round (from target exposure until the first round is fired).

(b) Time to first hit (from target exposure until a target is hit).

(c) Time between bursts (when more than one burst is fired in the automatic mode). This provides information on recoil and the man/weapon sight combination when the weapon is fired.

(d) Time required to shift fire (after achieving a target hit)$_1$ which includes acquisition of new target, position change, aiming and firing.

(3) Combat Performance

(a) This measurement reflects the tactical operation of a weapon in a combat environment in relation to the basic load of ammunition.

(b) It may be expressed as hits achieved per unit weight of ammunition expended, or hits achieved per basic load of ammunition.

(4) Overall Cost Effectiveness

This is an analysis of the overall 'cost' of the total hits obtained, based on:

(a) Cost of service ammunition to obtain hits;

(b) Cost of weapon (complete to equipment schedule)

(c) Cost of training ammunition) to reach standard of

(d) Cost of training personnel) firing training needed

(e) Cost of training facilities) to obtain these hits

This analysis will have to be 'subjective' in part and be based on the consensus of opinion of weapon instructors and test supervisory personnel concerned in training the test soldiers for these military tests.

As examples the following data may serve as a basis for assessing the effectiveness of the test weapon:

- Number of targets hit in relation to the total number of targets exposed;
- Numberof targets hit at least once on first engagement;
- Number of direct hits in relation to the number of targets hit;
- Number of direct hits in relation to the total ammunition used;
- Number of direct hits in relation to the relative production cost of the total ammunition fired; number of direct hits per round fired; number of targets hit per trigger activation; FRPET in relation to the total weight of ammunition used;
- FRPET in relation to cartridges used; results of offensive firing; results of defensive firing; results of firing against moving targets.

Note FRPET: Fractional Reduction of Programmed Exposure Time. (Ratio of real exposure time to programmed exposure time.)

9.1.10 **Identicality with Technical Tests** For the purposes of the final Overall Evaluation of the results from both Technical and Military Testing it is essential to ensure that the weapons and the ammunition in both the Technical Tests and the Military Tests are identical. Only where Safety considerations require this, should any modifications be permitted for the Military Test weapon systems - and even then there will be doubts on the validity for any Overall Evaluation of results obtained for a weapon system partly in its unmodified state and partly in its later, modified state.

9.1.11 **Safety** The Director of the Military Tests will be responsible for all Safety aspects and will ensure firing is stopped immediately if Safety considerations demand this.

9.2 MILITARY TESTS COMMON TO ALL SMALL ARMS WEAPON SYSTEMS

9.2.1 General

9.2.1.1 Data is required for specific assessment of each of the aspects covered by the following paragraphs:

9.2.2 Training implications.
9.2.3 Suitability of ancillary items.
9.2.4 Sighting Systems
9.2.5 Position disclosing effects
9.2.6 Portability/transportability
9.2.7 Reliability, durability and maintainability.
9.2.8 Logistics and organization
9.2.9 Compatibility with special clothing and equipment
9.2.10 Human engineering factors.
9.2.11 Vulnerability of firer.
9.2.12 Safety of weapon system in the field
9.2.13 Air defence effectiveness.
9.2.14 Value analysis.

9.2.1.2 The data for this assessment may be obtained during other military tests or may require specifically designed tests. The data required are basically common to all small arms systems: where a particular type of system requires special data this is noted under the test detail for that type of weapon system.

9.2.2 Training Implications

9.2.2.1 Object There is a requirement to establish the ease of training soldiers with the test weapon system, as compared to the control weapon system, and also to determine whether special ranges and/or other training facilities would be required.

9.2.2.2 Method

9.2.2.2.1 Much of the information required can be obtained while test soldiers are being trained on the test weapon system prior to the military testing as such. During this training period, however, it is essential that the training produce a test soldier as familiar with the test weapon system as he is with the control item. This may require a considerable amount of weapon training, preliminary marksmanship exercises and familiarisation firing with the test item to attain the desired level, particularly with regard to good shooting techniques in general and moving target shooting in particular.

9.2.2.2.2 An evaluation of the ease of assembly and disassembly will be made during this training period. Supervisory personnel should note the relative difficulties encountered, if any, and solicity comments and opinions from the test soldiers as the latter progress through familiarisation, nomenclature$_1$ and weapon functioning exercises.

9.2.2.3 However, certain specific information on training aspects may not be covered during this preliminary training period and separate sub-tests may be necessary to consider training devices available/practicable (sub-calibre Systems and blank and short-range training ammunition) and also what additional training equipment, facilities and firing ranges may be required.

9.2.2.3 Results to be recorded

(a) Type and duration of instruction required to train soldiers in the use and maintenance of the test weapon, including ancillaries, mountings and sights; also any training problems encountered.

(b) Effectiveness of training particularly in comparison with the control item.

(c) Training results using additional training devices provided.

(d) Is blank/training ammunition safe and satisfactory? Does it cause excessive fouling? Are fumes acceptable?

(e) Ease of fitting blank firing attachment and/or other training components and their suitability. Can they be easily identified?

(f) Usefulness of any practice or reduced charge ammunition. Are the training advantages such as to justify its use?

9.2.2.4 Assessment

(a) Ease of instruction and savings, if any, in training time, personnel and facilities compared to control items.

(b) Value of additional training devices.

(c) Suitability of existing ranges and training stores or need for new ones.

(d) Any modifications to the weapon system that would ease the training problems.

9.2.3 Suitability of Ancillary Items

9.2.3.1 Object

To determine the usefulness and effectiveness of those items not covered by other tests.

9.2.3.2 Method/Records/Assessment

9.2.3.2.1 The following points are among those that must be considered:

(a) Means of carrying cleaning tools/spare parts/spare barrels;

(b) Suitability of any detachable bipod or monopod;

(c) Transit and/or service package (weapon and ammunition);

(d) Suitability of any aim corrector for dry training (also for live firing);

(e) Suitability of any training device (for example: air rifle system);

(f) Suitability and effectiveness in use of bayonet, both on and off the individual weapon.

9.2.4 Sighting Systems

9.2.4.1 Object As the sighting system forms an essential element of any small arms weapon system, it is essential that a full evaluation be made under realistic field conditions of all sighting systems for use with the weapon.

9.2.4.2 Method

9.2.4.2.1 The basic (daylight) sighting system will normally be considered as an integral part of the weapon and military test results will automatically be of the basic weapon/sight system combination. Special sights (such as night sights, sniper sights) may also be used for certain of the military test. However, where special sights (such as optical sights, laser aiming lights, thermal weapon type sights) are the primary sight and the standard iron sight is the back-up sight, then the special sight will automatically be tested as the primary basic weapon sight system combination.

9.2.4.2.2
However, to ensure that a separate, full assessment of all sighting system aspects can be made:

(a) Results, comments and assessments of the weapon system as a whole, which are however directly attributable to the sighting system, will be extrapolated from the weapon system results and considered, analysed and assessed under this 'sighting systems' paragraph.

(b) Optical sights, in particular will require additional evaluation of reticula patterns, stadia lines, Reticle Illumination, Anti-Reflective Optical Coatings/Filters, Laser Hardening, Power Supply/Type, ranging ability and other features, characteristics of that particular type of sight. Other sighting systems that may require special assessment are:

- Combination main armament/coaxial weapon sight
- Rifle grenade launcher/auxiliary sights for rifles
- Night sighting systems, such as image intensifier
- Infra-red or nuclear source illumination
- Visible/infra-red laser aiming lights
- Thermal weapon sights with integral laser range finder/digital compass and video transmission capability

9.2.4.3 Results to be Recorded

9.2.4.3.1 Data reports and comments are to be obtained during other military testing or from special, additional sight systems tests to cover as applicable:

- Suitability of sight settings
- Ease of zeroing
- Retention of sight settings
- Suitability of sight control buttons
- Ease of operation of sight control buttons
- Ease of auto training mode
- Readability of characters on display screen
- Suitability of display for target acquisition
- Necessity and frequency of adjustment
- Effectiveness of screen size

- Effectiveness of search and detection capability
- Effectiveness of system hardening against battlefield countermeasures
- Effectiveness and suitability of screen displays
- Screen resolution
- Compatibility with ballistic/laser eye protection devices
- Type and effectiveness of electronic link between weapon and display
- Effectiveness of video transmission/video capture
- Effectiveness and accuracy of digital compass
- Accuracy and ease of use of global positioning
- Effectiveness and accuracy of range finder
- Ease of system operation
- Maximum effective range of systems under:
    - (1) Daylight conditions
    - (2) Daylight conditions with battlefield obscurants
    - (3) Poor light conditions
    - (4) Poor/low light conditions with battlefield obscurants
    - (5) Artificial light conditions (flares, etc)
    - (6) Artificial light conditions with battlefield obscurants
    - (7) Dark conditions
    - (8) Dark conditions with battlefield obscurants
- Duration of firing sequence
- Magnification achieved, where applicable
- Range finding/estimation problems
- Ease/effectiveness of range setting (including in dark)
    - (1) Co-alignment of weapon/sight axis

    1. Robustness of sighting system and mounting
    2. Any adverse effects from specific climatic or environmental conditions
    3. Overall weight, balance and handling qualities of the weapon with various sight systems
    4. Ease of changing over sighting systems under field conditions
    5. Ease of changing power supply under field conditions
    6. Effectiveness and durability of power supply under field conditions
    7. Level of detection susceptibility, emissions and vulnerability of sighting device (acoustic, electromagnetic, infrared)
    8. Sighting system reliability
    9. Recognition and identification capability
    10. Effectiveness of sighting system for indirect fire and fixed lines of fire
    11. Compatible with NBC protective ensemble
    12. Compatibility with sight and respirator
    13. Sight packaging/carrying/stowage and any particular problems encountered on these

9.2.4.4 Assessment

9.2.4.4.1 All sighting system aspects of the test weapon system, with comparison, where applicable, to the control weapon system.

9.2.4.4.2 Any suggested improvements, including use of different sighting systems from those presented for test which could enhance performance.

9.2.5 Position Disclosing Effects

9.2.5.1 Military tests must include an assessment of firer exposure and signature effects, such as:

- Silhouette;
- Smoke;
- Sand/dust;
- Flash;
- Blast;
- Noise;
- Reflections;
- Acoustic emissions from sighting systems;
- Electromagnetic emissions from sighting systems;
- Light (infra-red/visible) emissions;
- Optical reflection from sighting systems;
- Video/radio emissions from sighting systems;

resulting from day and night firing with and without battlefield obscurants of the test weapon/ammunition combination.

9.2.5.2 Such assessment will be additional to the basic 'laboratory' condition tests of these effects carried out under the technical testing (Sections 2.7 and 7.5) and will provide the most practical evaluation of these effects on the firer, neighbouring troops and the enemy under realistic field and tactical conditions.

9.2.6 Portability /Transportability

9.2.6.1 Object Portability (man/crew) and transportability must be tested to determine the suitability of the test weapon system:

a. To be carried as a component part of soldiers' fighting and/or existence loads while performing their assigned duties

b. For transportation both on and off the battlefield.

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9.2.6.2 Method

9.2.6.2.1 The combat-orientated field firing exercises in the military tests should provide the opportunity to observe the test weapons in the hands of soldiers (individually, as crews or in tactical formations) as they handle, carry and transport them through a variety of conditions and circumstances.

9.2.6.2.2 However, certain additional testing may be necessary to include transport:

(a) On foot in the field (including the case where the grenade or grenade discharger - or night sight - is fixed to the weapon) in the following conditions:

(1) In approach march and on patrol;
(2) Crawling (with and without support on elbows), slithering, going through undergrowth, clearing obstacles (ditches, walls, etc.);
(3) Special case of mountain troops (scaling, skiing, special way of carrying the weapon);
(4) During the assault;
(5) Firing from field defences (sangar and trench slits);

(b) On foot in barracks:

regulation arms drill will be carried out. It may be necessary to devise and/or suggest new drills if the test weapon is unorthodox in design; ~

(c) In the following vehicles (including entering and leaving):

(1) Motor cycle;
(2) Liaison vehicles;
(3) Tactical transport;
(4) Troop transport;
(5) Mechanised infantry combat vehicle;
(6) Tank (crew);

(d) In aircraft:

(1) transport helicopter;
(2) transport aircraft;

(e) On air drop operations. an actual parachute jump (possibly preceded by a parachute drop with a dummy) to ascertain whether a representative parachutist is able to complete a jump successfully while carrying the weapon system;

(f) For air supply. an air drop delivery when rigged to an air drop platform, skids or in containers. Container loads may be dropped from aircraft ramps, personnel doors, wing shackles or helicopter cargo hooks.

9.2.6.3 Results to be recorded

9.2.6.3.1 Test results and comments on the parts intended for carriage and transport (grip, sling, attachment devices in the vehicle, etc.).

9.2.6.3.2 Test results and comments on the weapon configuration from the transport standpoint: weight, size (dimensions), balance, abrasive areas, etc.

9.2.6.4 Assessment

9.2.6.4.1 Portability and transportability of the weapon system.

9.2.6.4.2 Possible modifications to improve portability and transportability.

9.2.7 Reliability, Durability and Maintainability (both by firer/crew and at other levels)

9.2.7.1 Object

9.2.7.1.1 To determine, in comparison with control equipment, the ability of representative soldiers to maintain test items and to determine the capability of the test items to withstand field usage and to function reliably under such conditions

9.2.7.1.2 To determine whether the test item can be properly maintained at the planned levels of maintenance and to determine the adequacy of the maintenance kit.

9.2.7.2 Method

9.2.7.2.1 Reliability and durability

(a) A careful review of all requirement documents and test directives will be made to ensure that specific requirements which relate to the durability and reliability of the test weapon are thoroughly examined.

(b) Throughout the conduct of all other sub-tests, all failures and occurrences which pertain to durability and reliability will be noted and the data assessed under this sub-test. Throughout all testing, a record will be kept for each major component of the test weapon and its ancillary equipment: the record will include accurate entries concerning the time and circumstances of events relating to these components.

(c) Tactical field exercises conducted will include adequate evaluation of the test and control weapons in a simulated combat environment so as to develop a history of deterioration, degradation, weaknesses and malfunctions. The exercises conducted must be of sufficient duration to determine whether the durability and reliability criteria stated in applicable requirement documents are met.

9.2.7.2.2 Maintainability

(a) The evaluation of the test weapons' maintainability characteristics will be a continuing process conducted concurrently with the other phases of the test.

(b) Ease of maintenance of the test items by the individual soldier will be determined and compared with that of the control item. Any difficulty or inadequacy will be noted.

(c) The test soldiers will be instructed in procedures for maintenance of the test and control items prior to the start of other tests and will use them throughout testing. Special attention will be devoted to determine:

(1) Ease of disassembly and assembly;
(2) Adequacy of prescribed procedure;
(3) Adequacy of maintenance tools and equipment, manuals and lubricants furnished and prescribed;
(4) Ease of cleaning and maintenance;
(5) Special techniques required;
(6) Whether parts are tamper proof and/or capable of being incorrectly assembled to the detriment of proper functioning;
(7) Whether the weapon can be fired with parts missing essential to the safety of the firer, e.g. breech locking piece;
(8) Capability of being fired or used for long periods without cleaning and lubrication. (This will be covered in a final test so that other results are not distorted).

(d) First echelon maintenance will be assigned to normal rifle section or crew members and performance closely supervised and the resultant condition of the test weapon accurately recorded. Higher echelon maintenance will be performed by personnel representative of the skills and capabilities normal to the level of operation.

(e) All maintenance must be performed using the maintenance kit tools, equipment and spare parts and following the maintenance kit instructons and user handbook.

9.2.7.3 Results to be recorded

9.2.7.3.1 A record of all test and control weapon malfunctions, breakages or other weaknesses which occurred during the test period together with the conditions or circumstances under which they occurred. The procedure used during the 1977-79 NATO tests, is outlined in Annex C. Annex K titled, Reliability, Availability, Maintainability (RAM) Data is the recommended procedure for future tests.

Minor malfunctions

Malfunctions which do not cause a stoppage, or cause only a very short stoppage (a few seconds) which can be rectified by simple action on the part of the combatant.

Serious malfunctions

Malfunctions which cause a stoppage (of several minutes) and interrupt the operation being carried out by the weapon, but which can be rectified by the combatant with his own resources.

Critical malfunctions

Malfunctions which make the weapon unserviceable and which cannot be rectified by the firer in the field, or those which make the weapon dangerous for friendly personnel.

9.2.7.3.2 Reliability and Durability Rrecords are to Include: (See also Annex C)

(a) Breakages and conditions under which they occurred;

(b) Number and type of rounds fired by each weapon, and, as applicable, under what conditions fired (sustained fire, automatic fire,.adverse conditions of mud, dust, rain, etc.) in relation to all malfunctions;

(c) Cause of malfunctions and breakages if such can be determined;

(d) Based on data accumulated, the degree of reliability and durability of the test items will be evaluated and compared with that of the control items. Any lack of reliability and durability will be noted.

9.2.7.3.3 Reliability records are to include:

(a) The comments, observations and opinions of test personnel which pertain to care and cleaning, repair, use of spare parts and ease of keeping the test weapon in a serviceable condition. Any features of the test weapon which require complex, frequent and time-consuming maintenance or repairs will be identified;

(b) Comments and supporting data to judge the adequacy of the maintenance kit;

(c) Maintenance data for test and control weapons. These will include information on time out of action (including malfunctions corrected by firer), repair time and availability of spare parts.

9.2.7.4 Assessment

9.2.7.4.1 Significant data will be collated and an analysis of information prepared based on comments, observations and opinions of test personnel. This analysis will be supported with appropriate photographs where applicable and will include details of:

(a) Frequency of minor malfunctions corrected by the firer and time out of action;

(b) Maintenance rate expected in the light of the percentage of warped, broken and damaged parts;

(c) Maintenance and repair rate at unit, field or base level - and corresponding time out of action expected;

(d) Life of the various parts;

(e) Life of the weapon;

(f) Proposals on upkeep, maintenance and repair.

9.2.7.4.2 An appropriate statistical analysis will also be prepared to determine any significant differences between the test and control weapons or between the test weapon and established criteria.

9.2.8 Logistics and Organization

9.2.8.1 Object

To assess the impact of the test weapons on logistic support and unit organization and to compare this with the control weapon.

9.2.8.2 Method/recordslassessment

9.2.8.2.1 The following aspects will be examined, reported and assessed:

(a) Suitability of ammunition packages and method of ammunition supply;

(b) Suitability of packages for weapons and ancillary equipments;

(c) Dimensions and shape of the weapons and ancillaries;

(d) Carriage of ammunition of all types by the soldier, in comparison with control items;

(e) The impact on sub-unit organization of introducing the test weapons into service.

9.2.8.2.2 Tests must be included involving complete tactical sub-units in order to examine the effects of:

(a) Weapon and ammunition carriage and stowage;

(b) Ammunition resupply and component interchangabiliy between weapons of the same model or the same family.

(c) Fire control;

(d) Exchange of duties in event of casualties; and the overall effects on sub-unit mobility.

9.2.9 Compatibility with Special Clothing and Equipment

9.2.9.1 Object To determine the compatibility of the test items with specialised clothing, equipment and combat body armour.

9.2.9.2 Method/Records/Assessment

9.2.9.2.1 Test soldiers armed with the test and control weapons will be equipped with standard NBC protective gear, arctic clothing and equipment, tropical clothing and equipment and other types of specialised gear. Utilising such clothing and equipment, the test soldiers will conduct appropriate firing and portability exercises with the test and control items.

9.2.9.2.2 The compatibility of the test items with specialised gear will be observed and any incompatibility will be noted. Comparison with control items as to such compatibility will also be made.

9.2.9.2.3 Detailed records and assessment could include:

a. Mean time to put on NBC protective gear and assume a firing position;

b. Ease of putting the weapon in operation while in NBC protective clothing (bringing the weapon to a firing position, stock fit, hand guard and grip, eye relief, sight picture);

c. Adjusting of sight while in NBC protective clothing;

d. Changing of magazines while in NBC protective clothing;

e. Ease of putting the weapon in operation while in cold weather clothing (bringing the weapon to a firing position, stock fit, hand guard and grip, eye relief, sight picture);

f. Ease of firing while in cold weather clothing (trigger guard and pull, muzzle blast, recoil muzzle climb);

g. Use of the sighting system during cold weather;

h. Changing of magazines while wearing cold weather clothing;

i. Compatibility with in service fluids e.g. insect repellent and cooking fuel.

9.2.10 Human Engineering Factors

See Section 8.

9.2.11 Vulnerability of Firer

See Section 8.

9.2.12 Safety of Weapon System in the Field

9.2.12.1 Object To obtain information on the Safety aspects of operating the weapon in an operational environment.

9.2.12.2 Method/Results/Assessment

Factors for consideration should include not only firer safety but also safety of adjacent firers, including:

- Ejection pattern of spent cases/links or presence of sencondary explosions or ejection flames;
- Protection against burning with any surface part of weapon;
- Noise or blast on adjacent firer;
- Weapon firing with components missing or improperly assembled, causing a safety hazard and/or causing injury to personnel;
- Fumes and toxicity problems in enclosed areas;

    (1) Laser light emissions from aiming lights, designators, and rangefinders;

    (2) Chemicals/outgassing from batteries of sighting systems;

    (3) Acoustic, thermal and electromagnetic emissions from sighting systems;

9.2.13 Air Defence Effectiveness

9.2.13.1 Object To establish the effectiveness of small arms weapon systems, and support weapons in particular, required to fire at helicopters and other low, slow flying aircraft (heights up to 200 m and speeds up to 460 km/h, both at short range (600 m) and beyond.

9.2.13.2 Method

9.2.13.2.1 General. Air defence effectiveness is to be evaluated by extracting data from technical testing, carrying out supplementary tests to provide additional information required and then making an assessment. Where possible, the targets representing helicopters should be in accordance with STANAG 4498 (both pictorial target description and test target). The assessment of air defence effectiveness is to be made against a specified aircraft and is to cover the following three main aspects:

a. Chance of damage from a random hit;

b. Chance of hit under a variety of conditions;

(a) and (b) combined will then give the overall chance of hitting and damaging the aircraft under a variety of conditions;

c. Deterrent effect on the pilot.

9.2.13.2.2 Basic conditions. For ease of comparison, certain basic combinations of conditions should be chosen, such as:

Range:	300 m for individual weapon 600 m for light support weapon 1,000m)for medium and heavy 1,500m)support weapons, as 2,000m)applicable
Aircraft speed:	0 km/h (hovering) 140 km/h 280 km/h 460 km/h
Aircraft height:	10 m 100 m 200 m

9.2.13.2.3 Chance of damage. The damage likely to be caused by a random hit on a specified (potential enemy) aircraft is to be established from data obtained during technical testing (Section 3.8 and 3.10.4.1) and in such other special tests as may be required, depending on the aircraft constructions details.

9.2.13.2.4 Chance of hit. The chance of a hit on the moving aircraft specified is to be assessed under different visibility, climatic and terrain conditions, from the different mountings available and also using any additional air defence sights provided. Test firings will be required to provide the necessary data. These test firings should include the use of tracer and be against targets simulating the specified aircraft at the basic combinations of range, speed and height (as specified above). The effects of different aircraft, flight patterns and manoeuvres should also be considered.

9.2.13.2.5 "Deterrence". Particularly with support weapons of calibres below 10 mm (.39"), it is possible that the chance of hitting and damaging the helicopter or aircraft other than at short range is comparatively small and therefore effectiveness may depend to a greater extent on the deterrent effect on the pilot. This will, of necessity, be very difficult to test but, particularly for support weapons, below 10 mm (.39") for which "effectiveness" against helicopters or aircraft at ranges other than short range (thus over 600 m) is stated as a definite requirement, suitable tests and evaluation of "deterrent" effect must be formulated.

9.2.13.2.6 Testing of the deterrent effect must be considered in two phases:

(1) Will the pilot of the engaged aircraft be aware that he is being fired at?

(2) If he is so aware, will he be deterred?

Further general guidelines on such tests and evaluation are given in Appendix G.

9.2.13.3 Results to be recorded

9.2.13.3.1 Chance of hit or of causing damage assessed from technical testing (Section 2).

9.2.13.3.2 Chance of hit under field or simulated combat conditions, including details of:

a. Weapons and ammunition (including tracer mix)
b. Mountings (normal, air defence)
c. Sights (normal, air defence)
d. Firing position
e. Ammunition feed
f. Topography
g. Visibility
h. Climatic conditions

i.
j. Type of aircraft
k. Aircraft colouring and camouflage
l. Aircraft speed, height, direction and manoeuvres
m. Test method used (towed target, camera, laser system, etc.);
n. Hits recorded, position on aircraft - miss distances;
o. Comments of firer and observers on problems of aiming off and lead
p. Comments of firers and observers on tracer as aiming aid.
q. Representative target according to STANAGs 4512 and 4498.

9.2.13.3.3 “Deterrent” effectiveness data (see Annex G)

9.2.13.4 Assessment

9.2.13.4.1 Assessment of chance of hit under field or combat conditions - also comparison with theoretical chance of hit and damage assessment obtained from technical testing (Section 2).

9.2.13.4.2 Assessment of "deterrent" effect of weapon system fire on pilot at ranges stated as required - also of possible morale effect on "own troops" (see Annex G).

9.2.14 Value Analysis

9.2.14.1 Object The object of this paragraph is to identify fruitful areas for subsequent value engineering.

9.2.13.2 Method Throughout testing, note will be taken of any unnecessary, costly or nice-to-have features which might be modified or eliminated without compromising the effectiveness or safety of the test weapon.

9.2.14.3 Results to be recorded The comments, observations and reports on areas detected and identified as potential areas for an applicable value engineering effort should be recorded.

9.2.14.4 Assessment The data collected should be analysed and a relative recommendation prepared with a view to improvement.

9.3 MILITARY TEST - INDIVIDUAL WEAPONS AND LIGHT SUPPORT WEAPONS

9.3.1 General

9.3.1.1 Object and Scope

The object of the test methods and techniques described is to determine whether the test individual weapons and light support weapons meet the agreed requirements.

9.3.1.2 Tactical Employment

The individual infantry weapon is normally carried in the hand and is fired from the shoulder. It is used to engage relatively close targets with a volume of accurate fire. With the addition of a bipod, it can serve as a light support weapon and engage rather more distant targets with a volume of controlled fire.

9.3.2 Accuracy and Dispersion Firing at a Known Distance

9.3.2.1 Object

To determine and compare the accuracy and dispersion of test and control weapons against point targets at known distances.

Note: The technical accuracy and dispersion test results will provide information as to the theoretical accuracy of the weapon whereas firings at a known distance, where the weapon is actually handled by a soldier, correspond more closely to the real combat environment. Subsequent firings carried out in tactical and simulated combat conditions will provide additional data on accuracy in the field.

9.3.2.2 Method

(a) Subsequent to familiarisation training and practice firing, both test and control weapons will be zeroed in accordance with the procedures prescribed in applicable publications.

(b) Test soldiers will fire both test and control weapons in the semi-automatic and automatic modes (free bursts and controlled bursts), as appropriate, from the prone, kneeling and standing firing positions at a known range. Firing will be in 9-10 round groups (normally 3 rounds in each controlled burst) to determine and compare the dispersion characteristics of the test and control weapons. The number of rounds fired must be the same for each weapon being fired to allow completely accurate comparison.

(c) If the weapons are equipped with a bipod or special sling, the exercises listed in (b) above will be repeated using the bipod or special sling.

(d) Sufficient firings will be conducted at known distances (including at the maximum range specified in the requirement) and with large fixed targets (witness panels will be used to record all hits) to obtain maximum usable data for the evaluation of the accuracy of the man-weapon-ammunition combination.

(e) Firings should be included, at known distances, against snap (pop-up) targets exposed for various short periods of time (in some cases necessitating rapid engagement of several targets) and against moving targets by day, at dusk or dawn and at night with and without the use of battlefield obscurants (in some cases with flares, street lighting, etc).

(f) For an individual weapon, accuracy firing ("application") must be in the three positions (standing, kneeling and prone) in order to ascertain to what extent the firer can adapt himself to the weapon and hit the centre of the target. Firings of light support weapons will also include all appropriate positions. It will be stated in the test report whether and how the weapon is supported.

9.3.2.3 Results to be Recorded

The following data will be recorded:

- Range (distance) at which firing is conducted
- Type of targets utilised
- Number of test and control weapons used
- Type and lot number of ammunition used
- Dispersion x and y co-ordinates of each shot and extreme spread. For burst fire, the impact of each round in each burst will be recorded, if possible. Data to include identification of firer, weapon fired, sight used and ammunition used. From these co-ordinates will be obtained:
  mean point of impact (mpi)
  position of mpi in relation to centre of target (point of aim)
  “dispersion” mean radius for mpi
- Accuracy-Distance of each shot from center of target (point of aim). From these will be obtained:
  “accuracy” mean radius from centre of target
  “accuracy” standard deviation from centre of target.
- Surveillance/search time
- Time to detect/acquire target
- Time to range to target
- Time to recognize/identify target
- Sight/target gather time (ie. putting aim point on target)
- Time effects on target tracking
- Time effects of target countermeasures
- Time effects of fire control measurements on target engagement (ie. tracking, ranging, weapon cant, environmental, ... etc)
- Time to re-engage new target
- Effects of battlefield obscurants on target engagement times
- Scores achieved by weapon and firer
- Malfunction attributable to man, weapon or sighting system and also immediate necessary action undertaken to correct
- Time required to remedy malfunction
- Comments and observations of test personnel on the relative performance of test and control weapons at the same known range

9.3.2.4 Assessment Appropriate statistical analysis will be carried out to determine whether there are significant differences in dispersion and accuracy between the test and control weapons or between the test weapon and the requirement.

9.3.3 Tactical Fire

9.3.3.1 Object The object of this phase of testing is to determine the effectiveness of the test weapon in a combat-oriented environment represented by a tactical dispostion of targets at unknown ranges.

9.3.3.2 Method At least three instrumented, combat-mission oriented, tactical ranges should be fired an appropriate number of times under different visibility conditions (including dawn, dusk, flares, battlefield obscurants etc.) to obtain data to support a judgement as to the operational suitability of the test weapon. Firings will also be made from appropriate fighting vehicles, and both from and inside buildings.

a. Instinctive Firing (one possible type of range shown in, Annex F). This instrumented range is designed to test the response time and short-range accuracy of the man-weapon system. Test soldier, equipped with any combination of fighting or existence load, will move through a course of combat-type targets (including some moving targets) which are exposed for a short time at ranges varying from 20 to 150 metres. Targets will be randomly presented and the exposure times regulated. The number of rounds fired will not be limited but the firer may fire only while the targets are exposed. Each mode of fire, i.e. semi-automatic and automatic (free bursts and controlled bursts), will be tested as appropriate. For individual weapons, some firing from the hip should be included.

b. Defence, Day and Night - including low light levels and with and without battlefield obscurants (types of range shown in Annex F). This instrumented range is designed to test the accuracy, response time, sustainability, reliability and signature effects of the man-weapon system. Test soldiers, organized as rifle units, fire from emplacements at short-exposure-time (pop-up) targets arranged in various formations at ranges out to the maximum effective range of the weapon. Stationary targets and moving type target arrays are also available at selected ranges. The range is equipped with enemy fire signature simulation devices which add to the tactical realism of the range and assist in the identification of targets during both daylight and night firing exercises. Instrumentation produces both hit and near miss data. A very comprehensive range was designed by the US for the evaluation of their Advanced Combat Rifle (ACR) in 1990. Details as given in Annex H.

c. Attack, Day and Night - including low light levels and with and without battlefield obscurants

(1) Day (Annex F). This instrumented range is designed to test accuracy, response time, sustainability, reliability, portability and signature effects. Test soldiers in fire-teams negotiate a selected attack course over varied terrain while firing and moving under conditions simulating combat. During the attack, the test troops are required to run, jump, rapidly assume the prone position and assume various firing positions. The course is appropriate for testing semi-automatic, controlled burst, or automatic fire.

(2) Night (Annex F). In addition to the assault phase of the attack range outlined in (1) above, a separate night assault range can be utilised by small sub-units of combat-equipped test soldiers to provide an evaluation of a test weapon's compatibility with the equipment and tasks of a soldier during night operations. The categories of effectiveness as observed on the day attack range will be evaluated again, this time under the conditions dictated by darkness.

9.3.3.3 Results to be Recorded The following data (by range used, weapon fired and test soldier) will be recorded.

9.3.3.3.1 Instinctive Fire Range

- Number of test and control weapons fired
- Mode of fire
- Type and lot of ammunition
- Surveillance/search time
- Time to detect/acquire target
- Time to range to target
- Time to recognize/identify target
- Sight/target gather time (ie. putting aim point on target)
- Time effects on target tracking
- Time effects of target countermeasures
- Time effects of fire control measurements on target engagement (ie. tracking, ranging, weapon cant, environmental, ... etc)
- Time to re-engage new target
- Effects of battlefield obscurants on target engagement times
- Target distance
- Total time required to fire first round after exposure of target
- Target exposure time
- Time to first hit
- Time to shift fire
- Trigger pulls by individual, weapon and mode of fire
- Rounds fired, by individual, weapon and target
- Target hits, by individual, weapon, range and mode of fire
- Target hit, by individual, weapon, range and mode of fire
- Hits per trigger pull
- Percentage of targets hit at least once during initial engagement
- Distribution of misses
- Total number of targets presented by range:
  (1) Malfunctions
  (2) Time to remedy malfunctions
  (3) Compatibility of the test weapon with the combat-related tasks of a soldier in quick-fire situation

9.3.3.3.2 Defence Range, Day and Night

- Number of test and control weapons fire
- Mode of fire
- Type and lot of ammunition
- Surveillance/search time
- Time to detect/acquire target
- Time to range to target
- Time to recognize/identify target
- Sight/target gather time (ie. putting aim point on target)
- Time effects on target tracking
- Time effects of target countermeasures
- Time effects of fire control measurements on target engagement (ie. tracking, ranging, weapon cant, environmental, ... etc)
- Time to re-engage new target
- Effects of battlefield obscurants on target engagement times
- Target range
- Total time required to fire first round after exposure of target
- Target exposure time
- Time to first hit
- Time required to shift fire
- Number of trigger pulls
- Total number of rounds fired, by individual, and weapon
- Target hits, by individual, weapon, range and mode of fire
- Target hit, by individual, weapon, range and mode of fire
- Hits per trigger pull
- Percentage of targets hit at least once during initial engagement
- Distribution of misses
- Total number of targets presented by range
  (1) Flash effects (including tracer at night) on firer and adjacent firers
  (2) Malfunctions
  (3) Time to remedy malfunctions
  (4) Compatibility of the test weapon with the combat-related tasks of a soldier in quick-fire situation

9.3.3.3.3 Attack Range, Day and Night

- Number of test and control weapons fired
- Mode of fire
- Type and lot of ammunition
- Surveillance/Search time
- Time to detect/acquire target
- Time to range to target
- Time to recognize/identify target
- Sight/Target gather time (ie. putting aim point on target)

- Time effects on target tracking
- Time effects of target countermeasures
- Time effects of fire control measurements on target engagement (ie. tracking, ranging, weapon cant, environmental, ... etc)
- Time to re-engage new target
- Effects of battlefield obscurants on target engagement times
- Target exposure time
- Time to first hit
- Trigger pulls by individual, weapon and mode of fire
- Total number of rounds fired, by individual, and by weapon
- Target hits, by individual, weapon, range and mode of fire
- Target hits, by individual, weapon, range and mode of fire
- Hits per trigger pull
- Distribution of misses
- Number of targets presented by range
- Malfunctions
- Time to remedy malfunctions
- Compatibility of the test weapon with the combat-related tasks of a soldier in quick-fire situation

9.3.3.4 Assessment

a. An appropriate analysis of the comments, observations, and opinions expressed by the test participants will be prepared.

b. The test officer, in collaboration with a statistician, will evaluate the data collected against the established statistical model. All data of significance will then be subjected to the type of statistical or comparative analysis necessary to establish the measure of effectiveness.

c. The results will be presented in narrative form supplemented by tables, charts, graphs, photographs and film as appropriate.

9.4 MILITARY TESTS - MEDIUM AND HEAVY SUPPORT WEAPONS

9.4.1 General

9.4.1.1 Object and Scope The object of the test methods and techniques described is to determine whether the test support weapons meet requirements.

9.4.1.2 Support Weapon Mounts (See also Annex B) Medium support weapons may be provided with a bipod or rest which steadies the muzzle end of the barrel while the firer, in a prone position, supports the breech end or stock with his shoulder. Heavy support weapons, because of their weight, are usually mounted on tripods or similar mounts. Some support weapons are designed to be fired from either a bipod or tripod mount, depending on the tactical employment.

9.4.1.3 Tactical Employment The support weapon supports the riflemen in both attack and defence and is employed to engage distant targets with a heavy volume of controlled and accurate fire that is beyond the capability of individual weapons. It provides the rifleman with the heavy volume of close and continuous fire needed to accomplish his mission in attack. The long-range, close defensive and final protective fires delivered by the support weapon form an integral part of the unit's defensive fire.

9.4.1.4 Transport of Support Weapons and their Ammunition The problem of transporting the support weapon, its mount and the requisite supply of ammunition is often solved by assigning several men, rather than an individual soldier, to each support weapon, or by mounting it on a truck or other vehicle. A support weapon must therefore be tested in all its possible modes of employment, using all possible mounts (see also Annex B).

9.4.2 Mounts

9.4.2.1 Object

a. To determine the suitability of mounting systems supplied with the test item.

b. To determine the compatibility of the test item with existing mounting systems (if applicable).

9.4.2.2 Method

(a) A support weapon may have a mount which is an integral part of the weapon or it may have a mount that is detachable but considered to be a component of the support weapon. Furthermore, the test weapon may be designed for use with other mounts of standard type, for either ground or vehicular mounting.

(b) The military testing of a support weapon must include an evaluation of all mounting systems supplied with the test item. The integral mounts and the mounts that are components of the test weapon should be evaluated as an intrinsic part of the weapon. Any characteristics of the integral or component mount that affect safety accuracy, personnel training, manportability, transportability, durability, reliability, maintainability, unobtrusiveness, human engineering, or the value analysis should be noted and reported under the relevant area of evaluation. Regarding the other standard type mounts with which the test weapon can be used, the evaluation should be aimed at determining the compatibility of the test support weapon for use with these mounts.

(c) The evaluation of mounts must be conducted concurrently with other sub-tests to the maximum extent practicable. All test exercises must be conducted under tactical field conditions.

(d) Test personnel must attempt to mount the test weapon on all existing support weapon mounting systems.

(e) Test soldiers equipped and organized as support weapon crews must execute gun drill and bring the test and control weapons into and out of action in accordance with existing regulations.

(f) Firing exercises must include the use of all the mounting system supplied. Gunners will use all positions (sitting, kneeling, prone) which are applicable to the mount. During the firing, observations will be made on the following factors:

- Stability of the mounts;
- Ease of manipulation of the test weapon on the mount;
- Ease of manipulation of. the mount's controls;
- Adequacy of the indirect fire mechanism, if applicable.

9.4.2.3 Results to be recorded

(a) Existing mounting systems which can be used with the test weapon.

(b) Time required to bring the test and control weapons into action.

(c) Time required to take the test and control weapons out of action.

(d) The observations and comments of the test soldiers and test supervisory personnel.

(e) Hit probability and time required to shift fire for each type of mount (obtained from the results of the firing exercises in other sub-tests).

9.4.2.4 Assessment

(a) The results obtained concerning the suitability of the mounting systems supplied with the test weapon will be assessed.

(b) An appropriate statistical analysis will be made of the test results pertaining to compatibility of the test weapon with existing standard mounts to determine if statistically significant differences exist between the test and control weapons or the test weapon and established criteria.

9.4.3 Accuracy and Dispersion Firing at a Known Distance

9.4.3.1 Object To determine and compare the accuracy and dispersion characteristics of the test weapon and of the control weapon against targets placed at known distances.

9.4.3.2 Method

a. Test soldiers will fire the test and control support weapons against vertical targets at appropriate known distances. The modes of fire, number of rounds per burst or shots per target, type of ammunition, type of mount and target ranges will be determined from the specification of the weapon under test.

b. Firing will be at targets described in paragraph 9.1.8.1 and larger targets for longer ranges. The target will be large enough to ensure that the impact location can be ascertained for all rounds fired. When dispersion at a given range is greater than a practical sized target the range must be reduced and the reasons explained in the test plan and/or report, as applicable.

c. Accuracy firing will be conducted during daylight and night with and without the use of battlefield obscurants and in relatively stable weather conditions, since rapid changes in temperature, wind speed, or wind direction may cause inconsistencies in the firing results. To avoid unnecessary exposure to wind changes, the selected number of rounds for each target will be fired without undue delay. Ammunition on hand at the gun position will be sheltered from direct sunlight or other weather effects to minimise temperature changes in group firings. The temperature, barometric pressure and relative humidity will be recorded every hour during the firing, if possible; measurements of the wind speed and direction may also be recorded.

d. The weapon must be zeroed just prior to the accuracy firing. The initial zeroing must be verified at the end of the firing, or more often if sizeable shifts in the centre of impact become apparent during firing.

e. All modes of firing (semi-automatic, automatic (free bursts and controlled bursts)) appropriate for the weapon must be used. Trials with varying lengths of burst will be conducted as deemed appropriate. All mounting systems supplied with the test weapon must be used during the accuracy firings.

f. A sufficient number of groupings must be fired to obtain statistically adequate data for each mode of fire, burst length, type of ammunition, type of weapon, type of mount and target range.

g. Accuracy and dispersion firings will include all appropriate firing positions to ascertain the extent to which the firer can adapt to the weapon and hit the centre of the target. Firings to establish the size of the beaten zones (on the ground) and of the belt of fire (up to a man's height above the ground) must also be included.

h. The following data must be recorded for each group fired:

- Date and time of firing;
- Location of firing range;
- Firer's name;
- Target range (distance);
  weapon identification;
- Ammunition nomenclature and lot number; firing mode;
  length of burst;
  firing position;
- Beaten zone/belt of fire.

Furthermore, for each round fired, the location of impact on the target must be determined. These locations will be expressed in terms of horizontal and vertical distances also radial distances from the centre of the target (point of aim). Measurements will be made to the centre of each hole with the highest degree of precision that is practicable.

9.4.3.3 Results to be Recorded

a. In addition to the data from 9.4.3.2(h) above, the following data will be obtained:

(1) Range (distance) at which firing is conducted;
(2) Type of targets utilised;
(3) Number of test and control weapons used;
(4) Type and lot number of ammunition used;
(5) Dispersion x and y co-ordinates of each shot and extreme spread. For burst fire, the impact of each round in each burst will be recorded, if possible. Data to include identification of firer, weapon fired, sight used and ammunition used. From these co-ordinates will be obtained:

- Mean point of impact (mpi);
- Position of mpi in relation to centre of target (point of aim);
- "Dispersion" mean radius;
- "Dispersion" standard deviation;

(6) Accuracy-Distance of each shot from centre oftarget (point of aim). From these will be obtained:

- "Accuracy" mean radius;
- "Accuracy" standard deviation;

(7) Accuracy results of shot groups containing tracer rounds (combat mix) may require identification of tracer impacts so that three analyses (all shots, tracer only and non-tracer only can be made to determine the variations in characteristics. Tracer round impact points can be identified by applying non-drying paint, dye or other similar material to the tracer projectiles which will leave identifying traces on the target.
(8) Surveillance/Search time;
(9) Time to detect/acquire target;
(10) Time to range to target;
(11) Time to recognize/identify target;
(12) Sight/Target gather time (ie. putting aim point on target);
(13) Time effects on target tracking;
(14) Time effects of target countermeasures;
(15) Time effects of fire control measurements on target engagement (ie. tracking, ranging, weapon cant, environmental, ... etc)
(16) Time to re-engage new target;
(17) Effects of battlefield obscurants on target engagement times;
(18) Scores achieved by weapon and firer
(19) Malfunction attributable to man, weapon or sighting system and also immediate necessary action undertaken to correct.
(20) Time required to remedy malfunction
(21) Comments and observations of test personnel on the relative performance of test and control weapons at the same known range.

9.4.3.4 Assessment Appropriate statistical analysis will be performed to determine whether there are significant differences in the measurements of accuracy and dispersion between the test and control weapons, or between the test weapon and the requirement. The results of the comparison will indicate whether the test weapon is inferior to, equal to, or better than the control weapon or the requirement.

9.4.4 Tactical Fire

9.4.4.1 Object To determine the accuracy, response time and sustained firing capability of the test weapon when employed against targets in tactical disposition.

9.4.4.2 Method

9.4.4.2.1 General

(a) This sub-test will provide a realistic evaluation of weapon performance in a tactical environment. Tactical field exercises will provide influencing factors similar to those experienced in combat, such as fatigue, noise, dust, smoke, stress, dirt and rain. These field exercises also add realism to the test environment through the effects of terrain, vegetation, temperatures, simulated enemy weapons and tactics, fields of fire and engagement ranges.

(b) The test soldiers will be confronted with simulated tactical situations that require the test weapon to. be employed in both defence and attack, and in daylight, darkness and low light levels, also with various types of target obscuration. The test soldiers, with the test and control weapons and using combat mixes of ball and tracer ammunition, will engage targets that depict the enemy formations which support weapon gunners would be likely to engage on a battlefield. Field target firing courses could be used to provide this environment. These firing courses must be located on irregular terrain so that gunners have the opportunity to fire over various types of ground. Target arrays must include short exposure time (pop-up) targets, concealed targets, stationary targets and moving targets, also target arrays demanding a change in the beaten zone.

(c) The types of fire to be used, classified with respect to the weapon, must include fixed, traversing, searching, traversing and searching, swinging traverse and free gun fire, as appropriate for the type of target, the type of mount being used and the type of weapon. Indirect fire capability must also be tested.

(d) The range to be used (a diagram and description of the type of firing range is in Annex F) must have sufficient terrain on which to manoeuvre the tactical unit (platoon, squad, weapon crew or reconnaissance section) to which the support weapons are normally assigned. The firing area must be large enough to allow the test and control weapons to be fired at their minimum and maximum ranges of target engagement, including provisions for required safety buffer zones. when planning the firing area, maximum ranges will be determined from the characteristics of the support weapons to be fired and the operational ranges demanded in the requirement.

9.4.4.2.2 Daylight Defence

a. Test soldiers organized as weapon crews will be given simulated tactical missions for defensive situations, requiring them to deliver long-range, medium-range and very short-range fire.

b. The firing course will include short exposure time (pop-up) targets arranged in various tactical formations up to the maximum effective range, concealed targets arranged at graduated distances up to the maximum range, stationary targets at the longer ranges and realistically placed moving targets at graduated ranges.

c. The moving and pop-up targets must be so controlled and manipulated as to be exposed in a logical sequence to simulate enemy troops advancing; they must be equipped with devices to simulate enemy fire when the targets are exposed.

d. All applicable modes of fire (semi-automatic, automatic (free burst and controlled burst)) and all mounting systems supplied for the test must be used in this exercise. The firing time permitted for each target array must be controlled.

9.4.4.2.3 Night Defence - to include dusk/dawn conditions

a. Test soldiers organized as weapon crews will provide supporting defensive fire at night or during other periods of reduced visibility.

b. The test soldiers will emplace the test and control support weapons in firing positions during daylight or under conditions of good visibility. The support weapons will be laid for preselected sectors of fire and a final protective line (FPL), in accordance with techniques for predetermined fire described in the field manuals or instructions applicable to the weapons.

c. A range card will be prepared for each weapon with firing data for a series of selected aiming points. The range card data will be verified by firing during daylight.

d At night and during other periods of reduced visibility, the targets at the predetermined aiming points and the FPL will be exposed to simulate enemy crew-served weapon positions and enemy troops advancing. The test soldiers will fire the test and control support weapons at the exposed targets, using the range card data. All applicable modes of firing and all mounting systems supplied for the test must be used in this exercise.

9.4.4.2.4 Daylight Attack

a. Test soldiers organized as weapon crews will be given simulated tactical missions for attack situations, requiring them to assist the attacking troops with supporting fire, including close-up fire support during the assault. The simulated situations will require the support weapon crews initially to provide support by firing from the vicinity of the Line of Departure (LOD) and then to advance by bounds from position to position as the attack progresses.

b The firing course will contain personnel-type pop-up target arrays and stationary targets. As the test soldiers advance from position to position, the pop-up targets will be exposed in a logical sequence and engaged as soon as they are seen by the gunners. The stationary targets will be engaged at will as they are observed. The firing time permitted for each target must be controlled.

c All applicable modes of fire, all applicable firing positions and all appropriate mounting systems must be used in this exercise.

d. The exercise must include a simulated counter-attack during consolidation, from pop-up target positions located beyond the assault objective. The test soldiers will engage these targets from designated foxholes or other types of firing positions appropriate for the weapons being fired.

9.4.4.2.5 Night Attack - to include Dusk/Dawn Conditions

a. Test soldiers organized as weapon crews will participate in a night attack as part of the assault element. The simulated tactical mission will require the conduct of a surprise attack by night. During the move from the assembly area to the probable line of deployment, the support weapons will be located in the formation where they can best be deployed for the assault.

(b) The firing course will contain personnel type pop-up targets equipped with devices to simulate enemy fire. The test soldiers will move forward from the line of deployment on order. As they advance in the assault, the pop-up targets will be exposed in a logical sequence and engaged as soon as they are seen by the gunners. The firing time permitted for each target array will be controlled.

(c) All applicable modes of fire, all applicable firing positions and all appropriate mounting systems must be used in this exercise.

(d) The exercise must include a simulated counter-attack during consolidation, from pop-up target positions located beyond the assault objective. The test soldiers will engage these targets from designated foxholes or other types of firing positions appropriate for the weapons being fired.

9.4.4.3 Results to be Recorded For each exercise the following must be recorded:

- Identification of the weapon;
- Firer's name;
- Type of ammunition and lot number;
- Description range, targets and weapon emplacements;
- Number of targets presented, by range (distance);
- Target exposure time;
- Number of bursts fired, by range;
- Number of rounds fired, by range;
- Number of targets hit, by range;
- Number of hits on target, by range;
- Percentage of targets hit at least once during the initial engagement;
- Time to first round, for each target array;
- Time to first hit, for each target array;
- Time between bursts;
- Time required to shift fire;
- Surveillance/Search time;
- Time to detect/acquire target;
- Time to range to target;
- Time to recognize/identify target;
- Sight/Target gather time (ie. putting aim point on target);
- Time effects on target tracking;
- Time effects of target countermeasures;
- Time effects of fire control measurements on target engagement (ie. tracking, ranging, weapon cant, environmental, ... etc)
- Time to re-engage new target;
- Effects of battlefield obscurants on target engagement times;
- Visibility and effectiveness of tracers (for ranging or target designation)
  (1) Mode of fire (semi-automatic, automatic, controlled bursts);
  (2) Firing position (shoulder, underarm, hip, sling-supported
  (3) Types of mount used;
  (4) Meteorological data (temperature, precipitation, wind speed and direction);
  (5) Ambient light, in lux (at night or during other periods of low visibility);

9.4.4.4 Assessment

Appropriate statistical analysis will be performed to determine if there are significant differences during military testing in accuracy, response time and sustained firing capability between the test and control weapons, or between the test weapon and the requirements.

The results of the comparison will indicate if the test weapon is inferior to, equal to, or better than the control weapon or the requirements.

9.5 SPECIAL MILITARY TESTS FOR AREA TARGET WEAPON SYSTEMS

9.5.1 General

9.5.1.1 Object and Scope The test procedures described in this document apply to grenade-launching systems in general. These may be independent systems or systems for use in combination with another weapon, in which case they may be either detachable or permanently fixed to the other weapon. Infantry weapons, which permit the launching of grenades, either with or without the addition of a specific part, come into the category of grenade-launching systems; rifles with a detachable or fixed sleeve and firing finned grenades are normally used for this purpose.

By using these procedures, test personnel will accumulate sufficient objective and subjective data to enable them to determine whether the tested grenade-launching system satisfies the criteria stated in the appropriate requirements documents and its compatibility with the other sub-system of a dual-weapon system, if such is the case. All other ammunition, such as flare, smoke-producing, tear gas, etc., used by the test grenade-launching systems, which will already have been assessed technically under Section 2 will also be included in the military testing under this Section 9, as appropriate.

9.5.1.2 Test Procedures The procedures outlined provide general guidance for the conduct of tests. Detailed specific procedures are dependent on the characteristics of the grenade-launching system being tested and the stated criteria in applicable requirements documents. The various systems for launching area target ammunition known or in service should be used for comparison and control purposes. Both for accuracy and dispersion firing at a known distance (9.5.2) and tactical fire (9.5.3), firings should be included under varying conditions of visibility (dawn, dusk, flares, smoke, dust, fog, ... etc.) and of target obscuration.

9.5.2 Accuracy and Dispersion Firing at a Known Distance

9.5.2.1 Object

To determine the man/system accuracy and dispersion of the test item when employed against targets at known distances, both for firing with no change of aim and also, because of the importance, in practice, of the firer using his first shot(s) for "ranging" purposes, for firing with correction of aim.

9.5.2.2 Method of Firing with no Chance of Aim

(a) Sample sizes, the number of repetitions of each exercise and the number of rounds per shot group should be determine through a study of applicable requirements documents.

(b) Prior to the conduct of the test exercise, all test and control grenade-launching systems should be zeroed in accordance with the procedures prescribed in the appropriate field manual or test item publication. If the other sub-system in a dual-weapon system is a rifle, then the test and control rifle sub-systems should also be zeroed. The zero of each man/system should be recorded and, thereafter, sight adjustments made by setting the sight scale, or other devices, at the appropriate graduation for each range. Any deviation from the appropriate graduation setting required to hit a target should be recorded.

(c) Ranges for the grenade-launching firing exercises should vary from the minimum safe range to ranges beyond the stated maximum effective range of the launching system being tested. Sight configurations and ammunition types will influence maximum and minimum ranges. Requirements documents should be carefully reviewed for specified targets, ranges and accuracy characteristics.

(d) Well-defined and easily identified targets, both horizontal and vertical, should be set up for each firer at ranges known to him. Each test soldier should then fire a shot pattern of the size determined in (a) above at each target. The centre of Impact, extreme spread, and range and deflection probable error of each shot pattern should be determined. This procedure should be repeated using all sighting devices and/or techniques available with both the test and control items. The firing positions used should be those compatible with the weapon system being fired.

(e) Using the zeroed rifle and/or grenade-launching system, each test soldier should carry out a confirmation of zero firing. This firing for the rifle should be carried out without the grenade-launching system mounted, if appropriate; with the grenade-launching system mounted and not loaded; and again with the grenade-launching system mounted and loaded, depending on the firing should be carried out before, weapon system. This during and after the exercises described in (c) above to determine what effect, if any, attachment and detachment of the grenade-launching system has on the zero of the rifle and on the zero of the grenade-launching system. Data relevant to the interacting effects of firing impulses on the rifle zero and the grenade-launching system zero should be recorded

(f) A series of firings will be carried out in order to determine what influences, if any, the attachment of the launcher, loaded or unloaded, to the carrier weapon has on the latter's accuracy in single shot, semi-automatic and automatic fire.

9.5.2.3 Method for Firing with Correction of Aim

Firings as for 9.5.2.2 above but with the firer correcting his aim after each shot to achieve maximum target effect.

9.5.2.4 Results to be Recorded

(a) Grenade-launching system:

(1) The individual zero of each grenade-launching system sub-system;

(2) Any difficulties experienced during the zero exercises, to include the amount of ammunition required to zero;

(3) Any deviation from the appropriate sight graduation setting required to hit the target;

(4) The meteorological conditions during testing;

(5) The x and y co-ordinates in relation to the target of all ground or vertical target impacts within each shot pattern by type of launching system, range sight configuration and/or technique, type ammunition and firing position;

(6) The lot number of all ammunition used during testing;

(7) Any change in the grenade-launching system zero attributable to its attachment, or detachment from, the rifle, if appropriate;

(8) Any change in the grenade-launching system zero attributable to the interacting effect of firing impulses of the rifle;

(9) Comments by test soldiers and observations by test supervisory personnel as to the difficulty of using the grenade-launching system and sights, including correction of aim (9.5.2.3) Particular note should be made of any target obscuration effects for the grenade-launching systems and sights and any restrictions to field of view caused by the rifle.

(b) Rifle (if rifle sub-system is included):

(1) The individual zero of each man/rifle system, as appropriate;

(2) Any difficulties experienced during the zeroing exercises, to include the amount of ammunition required to zero;

(3) Depending on the weapon system, any change in the rifle zero attributable to attachment/detachment of the grenade-launching system loaded and unloaded;

(4) Any change in the rifle zero attributable to the interacting effects of firing impulses of the grenade-launching system;

(5) The effect on accuracy, for single shot, semi-automatic or automatic fire, of mounting the launching system (loaded or unloaded);

(6) The comments made by the test soldiers and the observations of the test supervisory personnel as to the difficulty of using the rifle and sights, including correction of aim (9.5.2.3). Particular note should be made of any target obscuration effects for the rifle and sights and of any restrictions to field of view caused by the grenade-launching system.

9.5.2.5 Assessment

a. Grenade-launching system:

(1) Data relevant to the ease of establishing and retaining zero should be analysed to determine if the established requirements have been met;

(2) The centre of impact, mean radius and extreme spread should be computed for each shot group. The mean centre of impact, average mean radius and average extreme spread for the test and control weapons should be calculated and an appropriate lower confidence limit determined for each. An analysis of variance may then be performed to determine whether a significant difference exists between the test and control systems for these measures of accuracy and dispersion;

(3) The range standard deviation and deflection standard deviation should be computed for each shot group. The mean range standard deviation and mean deflection standard deviation for the test and control weapons should be calculated and an appropriate lower confidence limit determined for each. An appropriate statistical test may then be performed to determine whether a significant difference exists between the mean range standard deviations for the test and control systems as well as between the mean deflection standard deviations of the test and control systems;

(4) The comments of the test soldiers and observations of the test supervisory personnel should be evaluated to determine if the test weapon demonstrates a significant difference in ease of use.

b. Rifle (if rifle sub-system is included).Date relevant to the ease and retention of zero should be analysed to determine what effects, if any, the attachment and detachment of the grenade-launching system and the grenade firing impulses have on rifle zero.

9.5.3 Tactical Fire

9.5.3.1 Object To determine the man/weapon system accuracy against both point and area targets in a tactical environment.

9.5.3.2 Method

a. Prior to conducting the test exercises, all test and control grenade-launching systems should be zeroed in accordance with the procedures prescribed in the appropriate field manual or test weapon publication. The zero of each weapon/man/system should be recorded and, thereafter, sight adjustment made by setting the sight scale, or other device, at the appropriate graduation for each range. Any deviation from the appropriate graduation setting required to hit the target should be recorded.

b. Firing exercises for the grenade-launching system should include firing the test and control weapon systems from different tactical positions at stationary, moving and point type targets at varying ranges which are unknown to the firers. Sight configurations and ammunition types will influence maximum and minimum ranges. Target arrays should be set up as individual and multiple targets in tactical dispositions and should contain both personnel and material-type targets. Some of these targets should be in defilade. Firing positions should be representative of those expected to be used in combat. Selected exercises should ensure:

(1) Shifts in both range and deflection from one target to one or more successive targets;

(2) The collection of adequate data to determine the accuracy of the man/system test and control weapons in a rapid reaction role;

(3) The collection of adequate data to determine the ease with which the test soldiers can change the mode of fire from grenade-launching fire to rifle fire and back to grenade-launching fire;

(4) The collection of adequate data to determine and compare the average tactical rate of fire and hit probability of the test and control launching systems.

c. Firing exercises for the rifle should include firing the rifle at appropriate tactical targets, depending on the weapon system, with launching system detached (if applicable); with the launching system attached, but unloaded; and with the launching system attached and loaded to determine if any changes in rifle hit probability are caused by the attachment and/or detachment of the grenade-launching system or the impulses of grenade-launching system fire. Firing exercises should include firing at targets with short exposure times and at quick fire type targets in random presentations. Firing should be conducted in both the semi-automatic and automatic modes of fire, with the grenade-launching system attached and unloaded and with the grenade-launching system attached and loaded, depending on the weapon system.

9.5.3.3 Results to be Recorded

a. Grenade-launching system:

(1) Time to fire first round by type of launching system, range target, type of sight, firing position, type of ammunition and mode of fire;

(2) Time to first target hit by type of launching system, range, target, type of sight, firing position, type of ammunition and mode of fire;

(3) Time to shift fire, by type of launching system, range, target, type of sight, firing position, type of ammunition and mode of fire;

(4) Total targets hit by range, type of target, type of sight, firing position, type of ammunition and mode of fire;

(5) Total rounds fired by type of launching system,range, target, type of sight, firing position,
type of ammunition and mode of fire;

(6) A record of required sight adjustments fromoriginal zero.

(b) Rifle:

(1) Total number of hits per round fired by type of rifle, range, target, type of sight, firing position and mode of fire;

(2) Total targets hit by type of rifle, range, type of target, type of sight, firing position and mode of fire;

(3) Total target hits by type of rifle, range, type of target, type of sight, firing position and mode of fire;

(4) Time to fire first round by type of rifle, range, type of target, type of sight, firing position and mode of fire;

(5) Time to first hit by type of rifle, range, type of target, type of sight, firing position and mode of fire;

(6) Time to shift fire by type of rifle, type of target, type of sight, firing position and mode of fire;

(7) Number of hits on a group of targets by type of rifle, type of target, type of sight, firing position and mode of fire;

9.5.3.4 Assessment Grenade-Launching System. The mean time to first hit, mean time to fire and mean time to shift fire for each: condition expressed in 9.5.3.2(b) and (c) should be computed and submitted to an appropriate statistical test to determine if significant differences exist between the test and control items for these measures of effectiveness. Hit probabilities by type of weapon, range, firing position and mode of fire should be submitted to appropriate statistical analysis to determine if a significant difference exists between the test and control items.

BASIS OF CLIMATIC TESTING

A.1 The climatic extremes of temperature stated in STANAG 2895 form the basis for the test temperatures used throughout the document except where otherwise defined. Should the requirement for a particular weapon system specifically demand other, different climatic extremes of temperature, then the temperature in the test should be adjusted accordingly. For both point target and area target weapon systems the ammunition should be tested in the UNPACKAGED condition to two levels of climatic extremes of temperature:

a. Together with the weapons in the Weapon Systems Tests (Sections 2 and 7) to the less extreme "operational use" level.

b. In the purely ammunition tests (Sections 3,4 5 and 6) at more extreme levels to demonstrate, in a relatively short test period, the basic ability of the ammunition to withstand the full NATO "storage" levels for long periods required of packaged ammunition. The tests then agree with those used for "in-service" NATO small arms ammunition, eliminate the variable factor of different types of packaging and allow a reasonable extrapolation of performance from short-term periods unpackaged to long-term storage when packaged.

A.2 Rough handling tests of ammunition (3.19) which include testing at the upper and lower "operational use" temperatures will, however, be with packaged ammunition.

A.3 In addition, for area target ammunition, some fuze testing under special conditions is required.

A.4 Military testing should also include testing at operational levels as suggested in Section 9.1.1.

SPECIAL MOUNTINGS FOR SUPPORT WEAPONS

For support weapons required for firing from particular mounts (vehicle mountings, anti-aircraft mountings) both technical and military tests must be extended to cover firings from these mountings under both normal conditions and most adverse conditions stated in the relevant NATO requirements. Tests should include firings from specific vehicles in which the support weapon would be mounted. Assessment of the following aspects may then require particular emphasis:

- maximum/minimum elevation/tilt (combinations of support weapon relative to vehicle and vehicle relative to horizontal);
- overheating;
- toxicity;
- feed;
- ejection;
- loading/unloading;
- ammunition storage;
- sighting arrangements;
- firing from moving vehicle;
- ease of maintenance;
- ease of clearing stoppages.

EXPERIENCE FROM 1977-79 NATO SMALL ARMS TEST AND EVALUATION PROGRAMME

1. Full details of the 1977-79 NATO Small Arms Test and Evaluation Programme can be found in the:

(a) Memorandum of Understanding (MOU)-(AC/225-D/440) AC1225(Panel III)D/130 of 2nd June 1976);

(b) NSMATCC Standing Instructions;

(c) Test Reports:
- Rank 1 - Raw data
- Rank 2 - Data summary
- Rank 3 - Data assessed/analysed
- Rank 5 - NSMATCC Final Report

(Rank 4 were working papers on the Main Factors: Probability of hit, Probability of incapacitation given a hit, Reliability, Suitability for use, Manufacturing considerations);

(d) Records of meetings of:

- Groups of Experts/Specialist Panels;
- NSMATCC;
- Co-ordinating Panel.

(Note: records of groups of experts are attached as annexes to the records of NSMATCC meetings);

(e) Executive reports from Test Centres (Cold Meece, Meppen, Hammelburg) and Chairmen of Groups of Experts Specialist panels (Hit probability, Results analysis);

(f) Co-ordinating Panel Final Report to NAAG, including After-action Report covering certain important aspects of the tests;

(g) History of the 1977-79 NATO Small Arms Tests.

Note: "NSMATCC" - "NATO Small Arms Test Control Commission

TERMS OF REFERENCE FOR SCORING

MALFUNCTIONS USED FOR 1977-79 NATO

SMALL ARMS TESTS

For the purpose of reliability evaluation, manipulations will be scored under the same criteria as live firing.

1. WEAPON SYSTEM DEFINITION (Box 1 on Flow Chart at Appendix 1 to Annex D).

For the purpose of scoring malfunctions and evaluating reliability characteristics a weapon system shall be defined as the basic weapon (including: sight, sight mount and bipod when used) its ammunition and feed system (e.g.: magazine, belt). The weapon system does not include ancillary equipment not integral to weapon system functioning.

2. HUMAN ERROR (Box 2 on Flow Chart)

The exclusion of the human element for reliability evaluation purposes allows for a more definitive assessment and comparison for hardware performance.

3. SAFETY HAZARD (Box 3 on Flow Chart)

Malfunctions affecting the safety of the firer will not be considered in the reliability analysis.

4. RELIABILITY CHARGEABLE MALFUNCTIONS (Box 4 on Flow Chart)

- For purposes of assessing reliability, a chargeable malfunction shall be defined as any malfunction which actually causes or would cause one or more of the following:

(a) cessation of weapon operation requiring corrective action;

(b) the inability to commence or cease a mode of operation. All malfunctions whether scored as chargeable or not, will be recorded.

5. AMPLIFICATION OF NON-CHARGEABLE MALFUNCTIONS

(a) A malfunction resulting from not following prescribed maintenance procedures or maintenance schedules dictated by equipment manuals or instructions.

e.g. Malfunctions such as improper loading of a magazine or belt or the misassembly of components.

(b) A malfunction resulting from abuse or an accident unless such is a direct result of a malfunction of the weapon system.

e.g. Damage to a barrel caused by dropping the weapon.

(c) (i) In the event of a technical inspection preceding a test, actual or incipient malfunctions detected and/or corrected.

(ii) Actual or incipient malfunctions detected and/or corrected during final technical inspection after each test. When detected, however, there should be reasonable assurance that the incipient malfunction had not contributed directly to any preceding malfunction.

e.g. Evidence of unusual wear on locking surfaces, a hair line crack on a component, loosening of screws, etc.

NOTE: An incipient malfunction is one which, if not corrected when detected, potentially could cause a reliability chargeable malfunction.

(d) In the case of repetitive malfunctions of the same type, for which the reason has been clearly identified at a later stage, subsequent malfunctions to the first are not chargeable.

e.g. A weak or broken ejector spring.

6. AMPLIFICATION OF CHARGEABLE MALFUNCTIONS

(a) A malfunction resulting in a system stoppage and/or requiring corrective action. Provided that the conditions in 4 do not apply.

NOTE: A stoppage is defined as an inadvertent interruption in the firing cycle.

(b) A malfunction which does or would prevent the system operating in any of its required operational modes.

e.g. A selector switch which will not move from "safe" or will not change from "automatic" or "single shot".

(c) An incipient malfunction which is corrected during preventative maintenance. In the performance of scheduled preventative maintenance, adjustments or the replacement of a component due to the discovery of an incipient malfunction shall be chargeable.

e.g. Insufficient firing pin protrusion.

(d) Broken components detected and replaced during scheduled preventative maintenance that had not caused a malfunction shall be chargeable.

e.g. A broken spring which continued to function because it was retained but was found brokem during the preventative maintenance.

(e) In the case of repetitive malfunctions for which the reason has been clearly identified and corrected at a later stage, these malfunctions are to be charged as a single malfunction.

(f) In the case of a repetitive malfunction recurring after corrective action has been taken which can be identified as a design deficiency, then all malfunctions of this nature are chargeable. A stoppage is defined as inadvertent interruption in the firing cycle.

7. DEFINITION OF MINOR. MAJOR AND CRITICAL CLASSIFICATION

(a) Minor (Boxes 6 and 1 on Flow Chart)

Those malfunctions which can be rectified by the firer by simple methods restricted to the employment of Immediate Action Drills (IAs).

e.g. The replacement of a magazine/belt. Adjustment of the gas regulator. Removal of trapped cases or dislodged rounds.

(b) Major (Boxes 8 and 9 on Flow Chart)

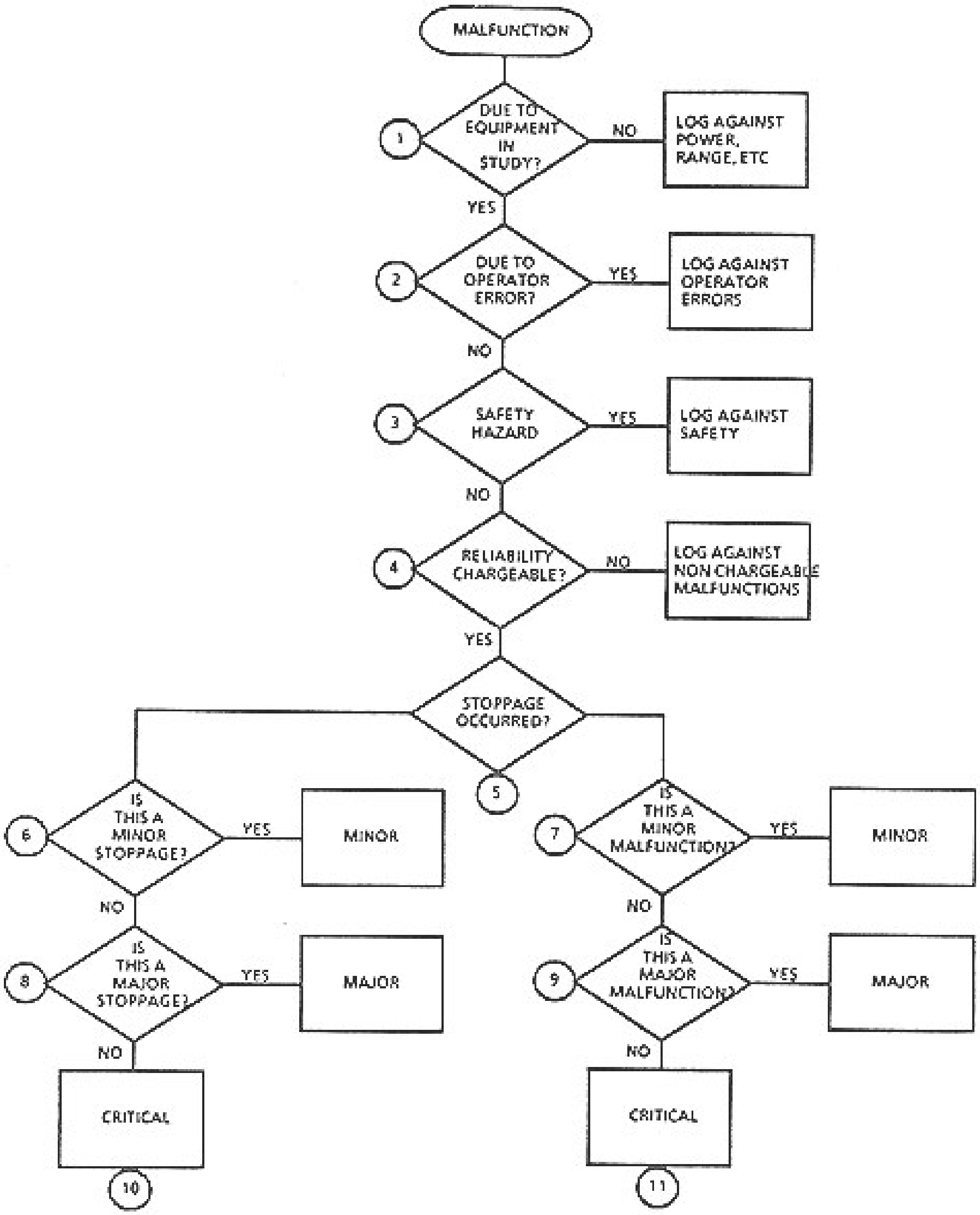
Those malfunctions which are beyond the classification of minor malfunctions, but can be rectified by the firer.

e.g. Malfunctions involving the disassembly of a weapon andlor the use of cleaning and adjusting tools as issued to the firer for that weapon.

(c) Critical (Boxes 10 and 11 on Flow Chart)

Any malfunction which cannot be classified as either Minor or Major.

Any malfunction which cannot be classified as either Minor or Major.



SCORING PANEL DECISION FLOW CHART

MANUFACTURING CONSIDERATIONS

1. Considerations will not normally be undertaken by a Technical Test Centre, but possibly separately by the Test Control organization: they are therefore dealt with separately here.

2 The requirements and methods to be used for Manufacturing Considerations were considered carefully by the Test Control Commission in the 1977-79 NATO Tests. It was decided however to tackle the Ammunition only as:

- Within the Weapon System the ammunition is the essential element for standardization;
- In the Whole Life Cost of a Small Arms System the ammunition is far the most costly element;
- Any consideration of weapon manufacture details would be very complex indeed;
- There were then severe limitations on TCC time, budget and expertise.

3. A simple format was sent to the national manufacturers requiring them to enter the percentage difference from the NATO 7.62 mm Control they considered appropriate for each Test ammunition (for which sufficient drawings were provided). Accompanying instructions explained that packaging and amortization costs, etc., were to be disregarded.

4. The Test Detail used in the 1977-79 NATO Tests is given in this Annex.

MANUFACTURING CONSIDERATIONS - AMMUNITION - TEST DETAIL USED IN 1977-79 NATO TESTS

1. The aim of Test 2.2.4.1 is to provide comparative production cost data for the different rounds. These data -will be obtained by the NSMATCC from the manufacturers in the participating countries.

2. The round for comparison are:

5.56	mm	SS 109 Ball	ca
(BE)		L 110 Tracer	cb
5.56	mm	M 193 Ball	da
(US)		M 196 Tracer	db
5.56	mm	XM 777 Ball	ea
(US)		XM 778 Tracer	eb
5.56	mm	Ball (Brass)	fa

(FR)		Tracer (Brass)	fb
5.56	mm	Ball (Steel)	ga
(FR)		Tracer (Steel)	gb
4.85	mm	Ball	ba
(UK)		Tracer	bb

The rounds which will be used as a base-line for this comparison are respectively the 7.62 mm NATO Ball (ha) for the Ball ammunition and the 7.62 mm NATO Tracer (hb) for the Tracer ammunition.

3. The manufacturers must have available for each round~documents with sufficient details to allow this comparative evaluation to be made. NSMATCC will provide them with these documents.

4. Each manufacturer will complete a comparative table with the cost differences relative to the base-line ammunition expressed in percentage in accordance with the examples given in Appendices 1 and 2.

5. These differences (percentages) must be established on the basis of:

(a) The FACTORY price: without taking into account the amortization of installations and marketing conditions;

(b) A specific quantity (less packaging and links).

90 million Ball
10 million Tracer.

These figures represent the annual production over a period of 3 years.

6. Each manufacturer will briefly mention the elements which allowed him to make his own estimation:

- The technology which according to his own views would be utilised;
- Particular difficulties for the realisation of certain operations or in the producibility of certain components;
- Availability of raw materials;

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MANUFACTURING CONSIDERATIONS - COMPARISON OF ESTIMATES OF PRODUCTION COST RELATIVE TO 7.62 mm NATO ROUND TAKEN AS BASE-LINE (7.62 BALL ha)

BALL ROUNDS

	5.56					4.85
	SS 109	Ml93	XM 777	Brass	Steel	Ball
% of cost	(ca)	(da)	(ea)	(fa)	(ga)	(ba)
More than 30%						
30%						
25%						
20%						
15%						
10%						
5%						
0%						
-5%						
-10%						
-15%						
-20%						
-25%						

The Manufacturers will enter in, using a cross ("X"), for the different rounds the percentage increase or decrease in comparison with the control round.

MANUFACTURING CONSIDERATIONS - COMPARISON OF ESTIMATES OF PRODUCTION COST RELATIVE TO 7.62 mm NATO ROUND TAKEN AS BASE-LINE (7.62 Tracer hb)

TRACER ROUNDS

	5.56					4.85
	L 110	Ml96	XM 778	Brass	Steel	Tracer
% of cost	(cd)	(db)	(eb)	(fb)	(gb)	(bb)
More than 30%						
30%						
25%						
20%						
15%						
10%						
5%						
0%						
-5%						
-10%						
-15%						
-20%						
-25%						
-30%						
-35%						
-40%						
-45%						
-50%						
Less than 50%						

The Manufacturers will enter in, using a cross ("X"), for the different rounds the percentage increase or decrease in comparison with the control round.

DIAGRAMS SHOWING TYPICAL FIRING RANGES

(as examples)

Instinctive fire range	Figure F1
Day defence range	Figure F2
Night defence range	Figure F3
Day attack range	Figure F4
Night assault range	Figure F5

Range for medium and heavy support weapons Figure F6 (with explanatory notes)

EXPLANATORY NOTES

Figure F6 shows some typical locations for firing positions which may be used as follows:

(1) Line A-B: positions for conducting long-range firing for defence operations and to ensure the volume of intensive fire required in combined "fire and movement" actions.

(2) Line C-D: positions for conducting firing as required by a prepared or improvised defence and also for combined "fire and movement" actions.

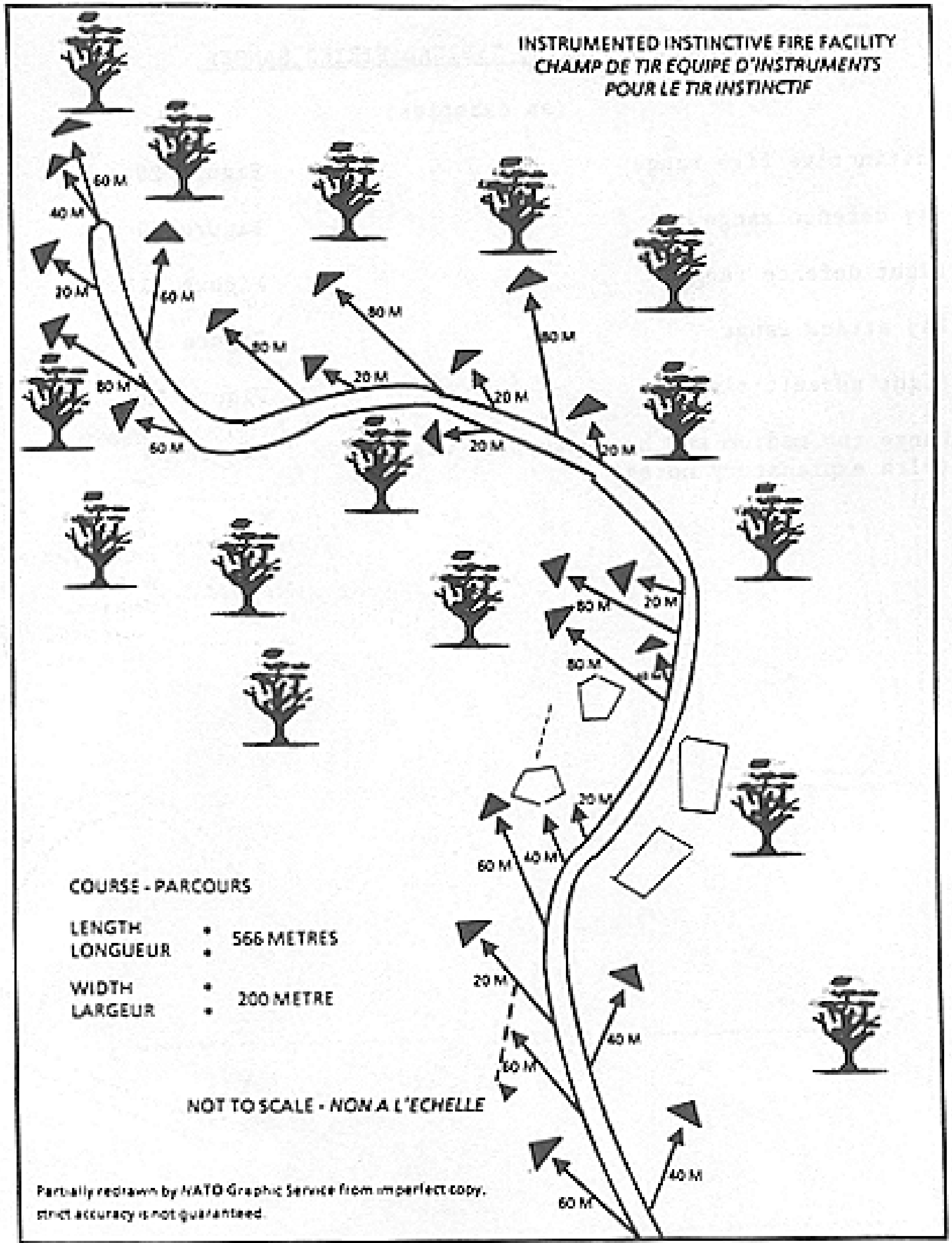
(3) Line E-F. C-H. I-J and K-L: positions for carrying out combined "fire and movement" operations, retarding actions, improvised defence and for establishing contact.

(4) Line M-N: positions intended to serve as an initial point in the support weapon attack role.

(5) Line O-P: positions intended for enfilade fire.

(6) Quick fire testing of support weapons may be conducted by placing appropriate targets in the vicinity of the firing positions in lines E-F, C-H, K-L and O-P.

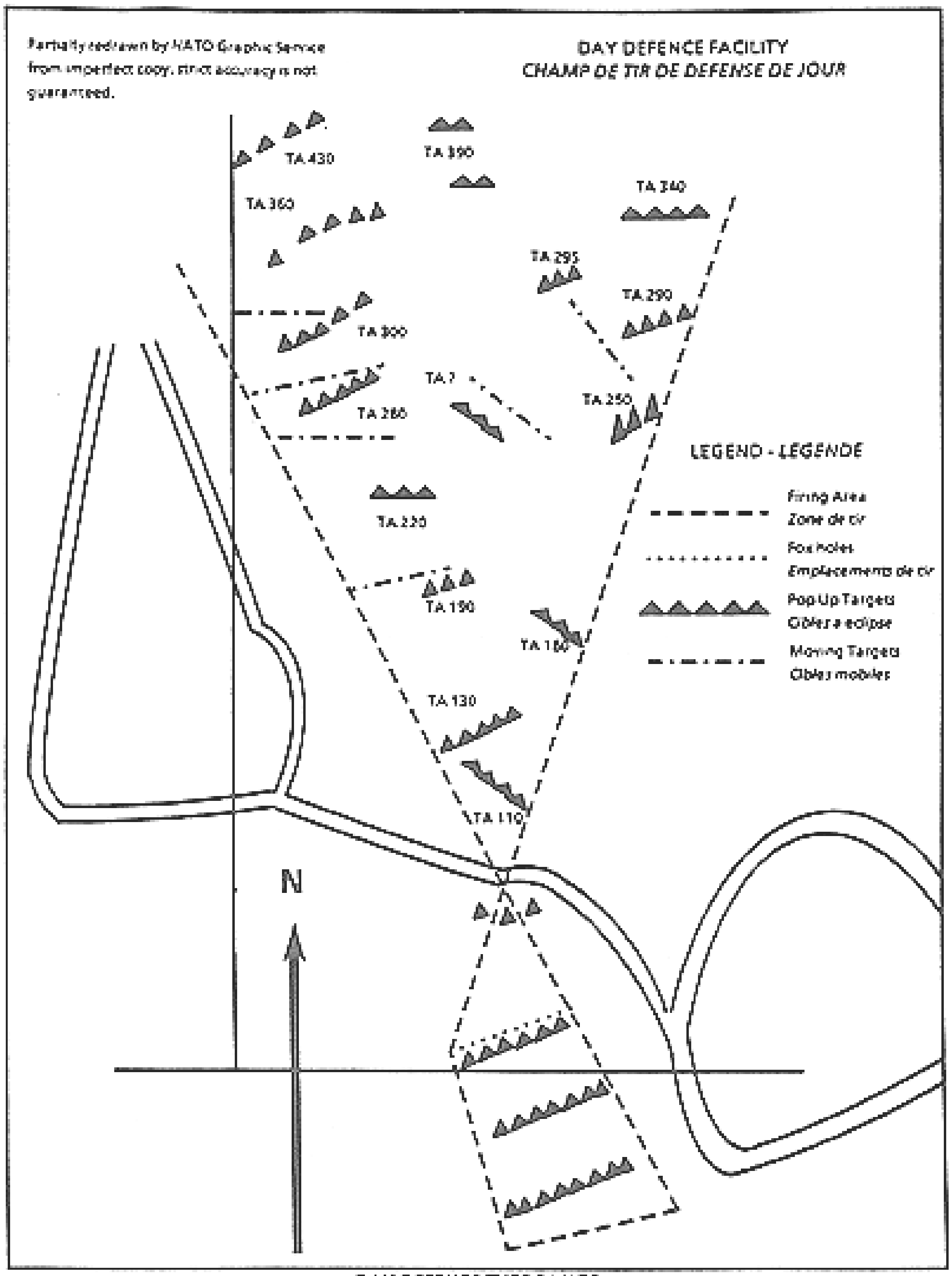
(7) The locations reserved for moving targets are indicated by lines MTP (moving target, personnel) and MTV (moving target, vehicle).



INSTINCTIVE FIRE TYPE RANGE
CHAMP DE TIR TYPE POUR TIR INSTINCTIF

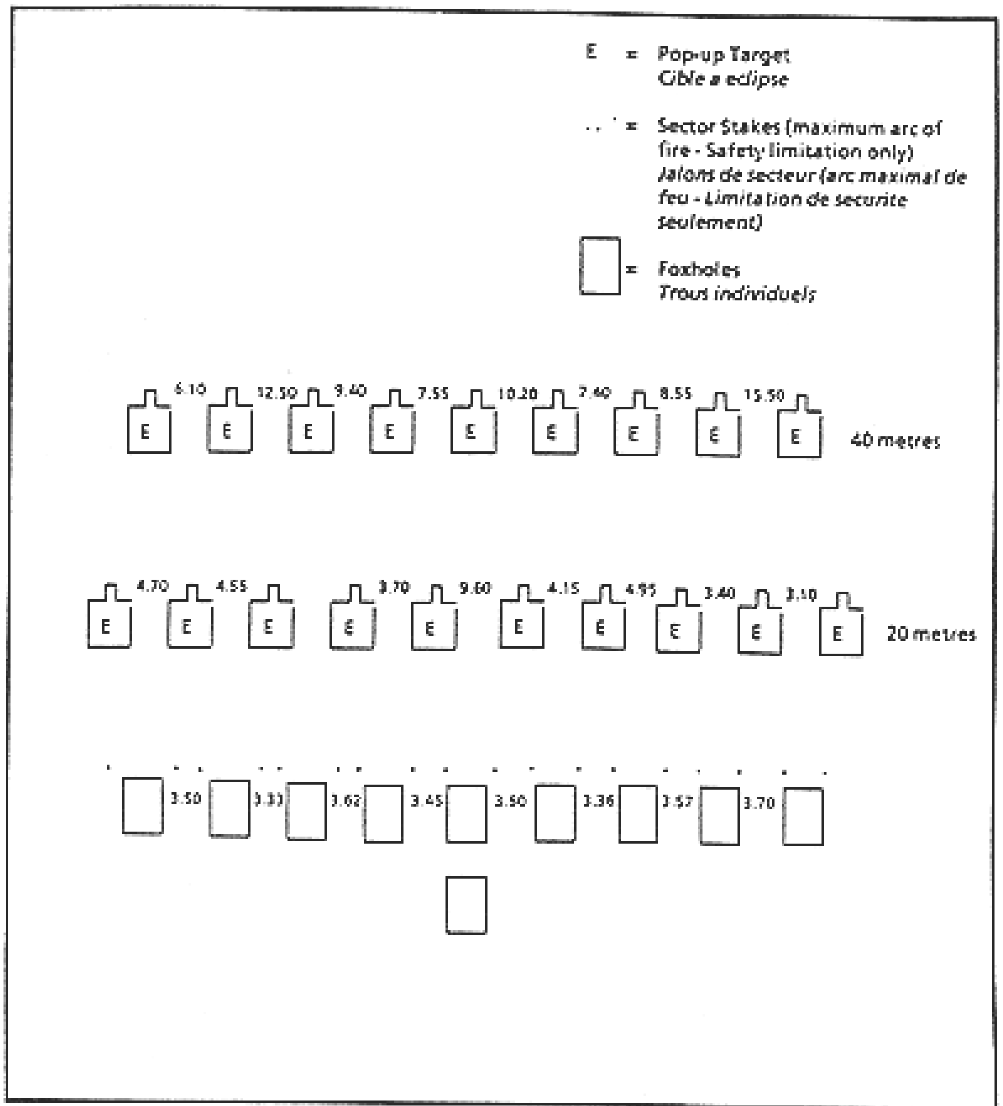
Figur

e F1



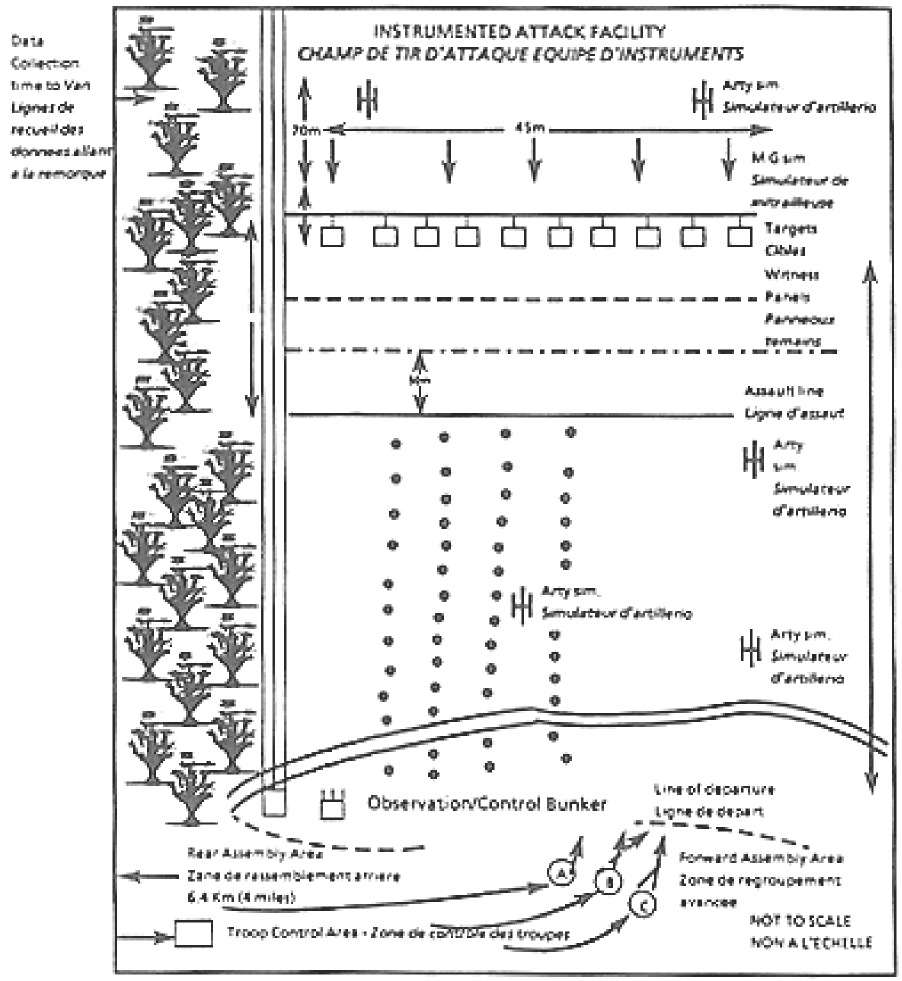
DAY DEFENCE TYPE RANGE
CHAMP DE TIR - TYPE DE DEFENSE DE JOUR

Figure F2



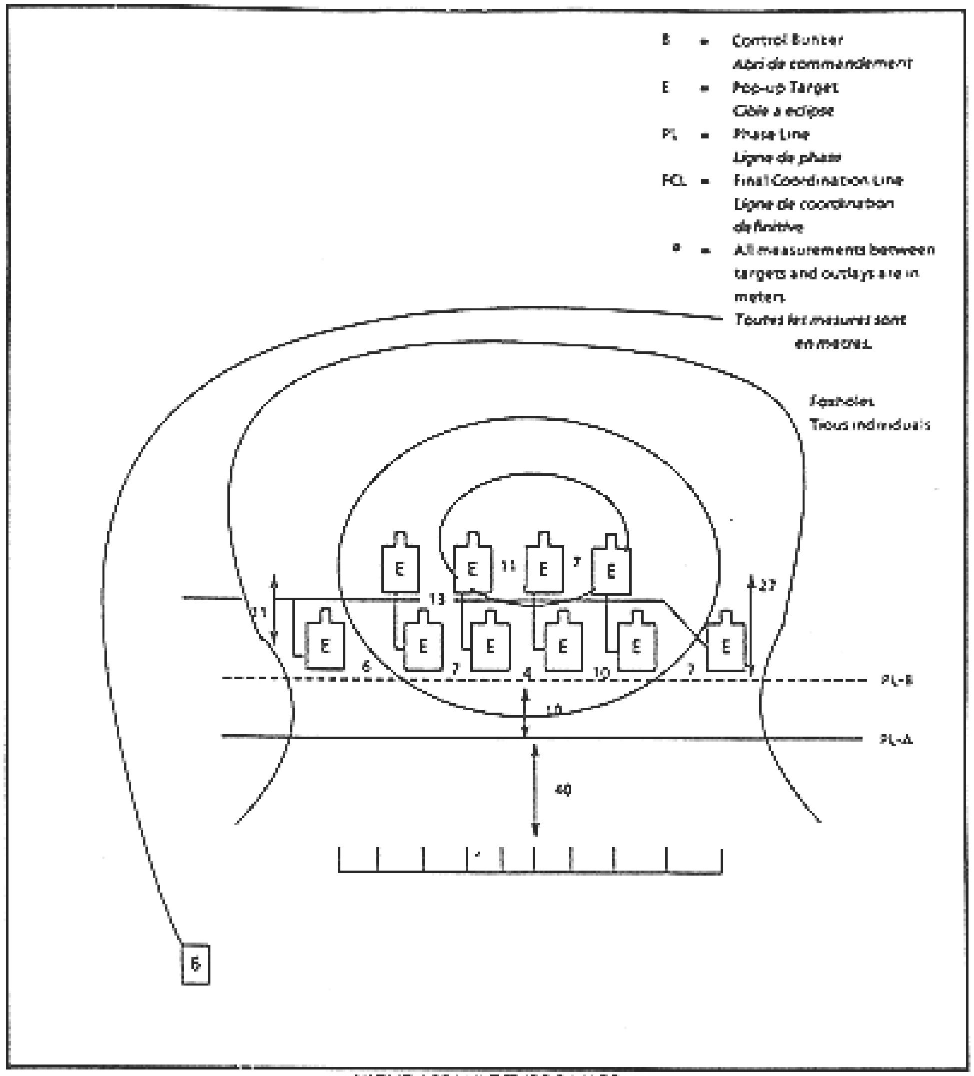
NIGHT DEFENCE TYPE RANGE
CHAMP DE TIR - TYPE DE DEFENSE DE NUIT

Figure F3



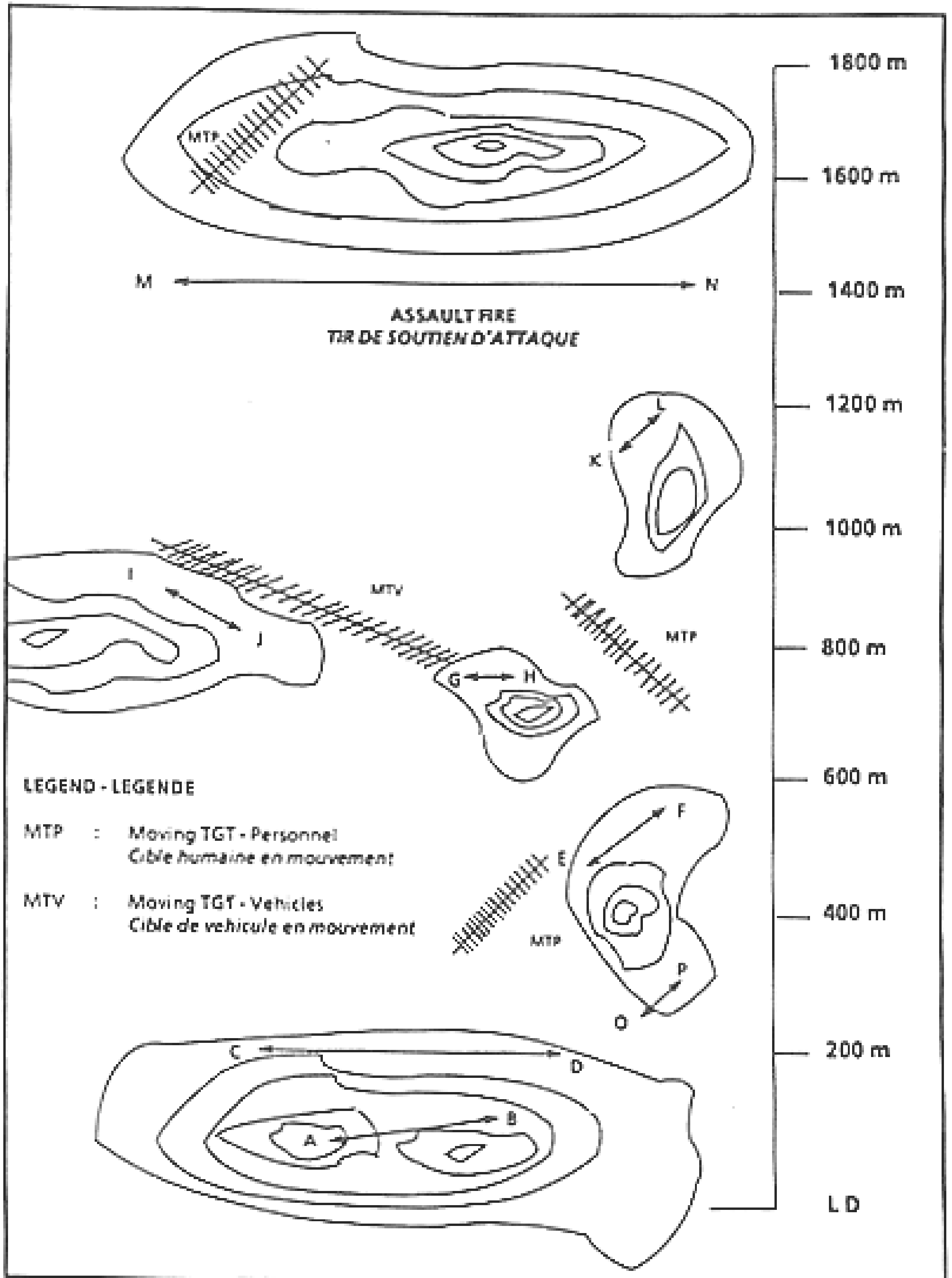
DAY ATTACK TYPE COURSE
PARCOURS TYPE D'ATTAQUE DE JOUR

Figure F4



NIGHT ASSAULT TYPE RANGE
CHAMP DE TIR TYPE POUR ASSAUT DE NUIT

Figure F 5



TYPE OF FIRING RANGE FOR MEDIUM AND HEAVY SUPPORT WEAPONS
SCHEMA DE CHAMP DE TIR TYPE POUR ARMES D'APPUI MOYEN ET LOURD

Figure F6

DETERRENT EFFECT - GENERAL GUIDELINES TESTING SUGGESTED

1. To provide data against which the "deterrent" effect can be evaluated it is necessary to carry out tests to establish to what extent the pilot:

   a. Can observe tracer from the small arms weapon systems being tested under normal flying conditions;

   b. Can distinguish the general range and calibre characteristics of the small arms weapon systems by which he is being engaged - and if he had a fair idea of the actual effects on his aircraft of a hit from a projectile of that general calibre and at that approximate range, how this would affect his judgement;

   c. Could be "distracted" (from, say, observation of an area or guided missile control) either directly or as a result of taking action consciously or not to avoid the small arms fire.

2. It is suggested such tests might be carried out as follows:

   a. Tracer observation: tests should be carried out with tracer fired from small arms weapon systems being tested to the flank of an experienced pilot wearing flying helmet and clothing and carrying out tasks representative of normal flying conditions. Tracer fire should be at varying angles, trajectories, ranges and under different terrain, climatic and visibility conditions. Then, providing the tracer can be observed, testing should continue

b. Range/calibre consideration: tests, either combined with (a) above or separate, should be carried out with tracer fired from a number of different small arms weapons, both those immediately under test and others of a variety of calibres up to and including 20 mm. Test conditioning should be generally as for above. Pilots should be required to:

(1) Identify any differences in tracer appearance which might indicate different calibre or range;

(2) State which tracer fire appears more menacing.

c. Distraction: Because of the inherent difficulties in formulating adequately realistic test conditions, this test will probably have to be confined to an assessment of the likely "distraction" effect based on the results of tests (a) and (b) above.

3. For all such tests, a representative cross-section of experienced service pilots, possibly from several NATO armies/air forces, should be used, in order to give as wide a spectrum of reaction as possible. Pilot reactions should be monitored throughout by trained observers (possibly including service psychologists) and instrumentation may also be used. Photography should be used as an additional means of recording appearance of tracer (although it should be borne in mind that tracer obvious on a photograph may not, or hardly, have been seen by the pilot).

4. Data to be obtained from such testing should include:

- Test system used
- Exact test conditions
- Type of aircraft/simulated cockpit
- Pilot details
- Visibility/climatic/terrain conditions (real/simulated)
- Tracer observation by pilot
- Ability of pilot to:
  - Distinguish between different tracer fire/ranges
  - Access difference in risk to aircraft from such different tracer fire/ranges
  - Locate the weapon firing the tracer
- Real/simulated flying combat tasks
- Effects on pilot of "distraction" while performing real/simulated flying/combat tasks
- Comments from pilot, firer, observers (including psychologists) on "deterrent" effects

- Monitoring of:
    - Pilot reactions
    - Effects on flying/combat tasks
- Equipment readings
- Photographs (particularly of "tracer" appearance from pilot's viewpoint)
- Comments of firer and observers on possible morale effect on "own troops" of shooting at aircraft - including importance of tracer in this and whether knowledge of low chance of hit or damage at other than short-range is a significant factor or not.

5. Assessment of the "deterrent" effect, including the "distraction" aspects, on pilots of weapon system fire at specific ranges, one of which must be the maximum range stated as a requirement; also assessment of possible morale effect on own troops.

TEST RANGE FOR US EVALUATION OF ADVANCED COMBAT RIFLE (ACR)

1. The US converted the Buckner Range at Fort Benning to a highly instrumented test facility to compare the performance of- four ACR concept weapons against the US military's standard Ml6A2 rifle in 1990.

2. The range was designed to stress the firer and replicate the aiming errors -experienced in combat. There were two lanes of equipment and-instrumentation which were run independently by a computer controlled test system consisting of instrumented fixed and moving target mechanisms and range control data acquisition hardware and software for the acquisition, storage, processing and display of firing data from user programmable scenarios.

3. The system collected data such as-target hits, time of all events, target miss locations and even soldier heart rates. Hit sensitive targets, both stationary and moving, were placed in natural terrain from 25 m to 600 m. Miss Distance Indicator (MDI) systems were located with 14 of the 35 targets out to 300 m. Not only did these systems have a high accuracy, large window size and an ability to detect high velocity projectiles like flechettes, but also this capability applied to moving targets. At the firing point sounds were provided to stimulate returning enemy small arms fire and there were heart rate sensors to monitor each firer throughout the test. The range target array is shown in Figure H1.

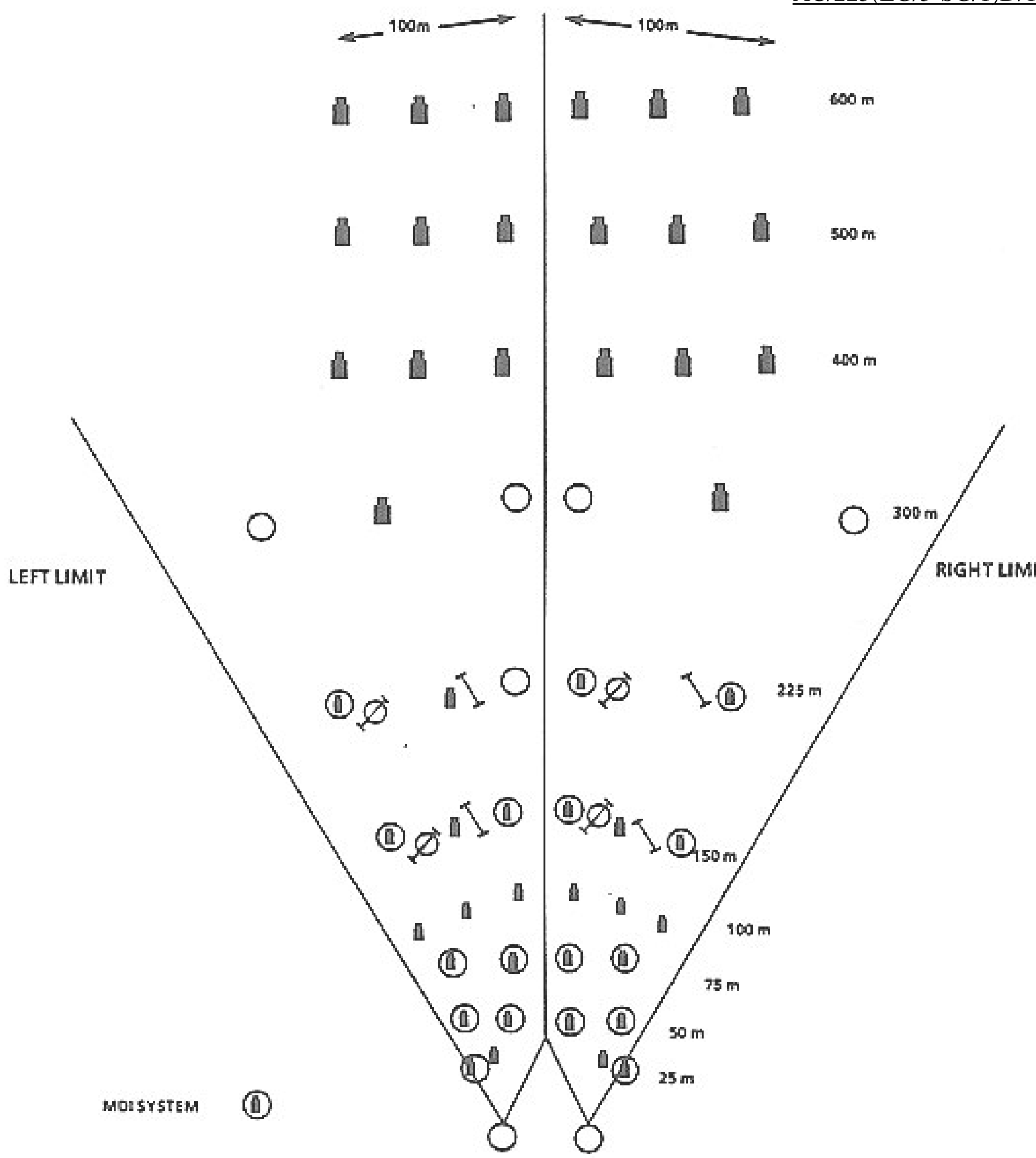


FIGURE 35: BUCKNER RANGE TARGET ARRAY

Figure H1

4. Technical details of the Buckner Range were as follows:

- Number of firing lanes: 2
- Stationary pop-up targets per lane: three at 25, 50, 75, 100, 150, 225, 300, 500 and 600 metres.
- Moving targets per lane: one at 75; two at 150, and two at 225 metres.
- Data timing resolution: 1.0 milliseconds.
- Moving target speeds:
  - 1.8 m/s (to simulate walking target).
  - 3.6 m/s (to simulate running target).
- Target size: half-man size (man crouching).
- MDI maximum window size: 4.5 m radius from centre of target.
- MDI accuracy (Difference between where projectile actually penetrates target area and where MDI records where the projectile penetrated):
  - Minimum (window centre): 12.5 mm.
  - Maximum (window extreme): 250 mm.

CONE PENETROMETER TESTS

1. Equipment and Adjustment

a. One commonly used method of determining the hardness of a soil is by actual contact tests made on the soil in place with a cone penetrometer. It consists of a 30 degree right circular cone (base area 1/2 square inch) mounted on one end of a graduated staff or rod with a measuring device attached to the other end. When the cone is forced slowly into the soil, the measuring device records the amount of force required to move the cone. This penetrating force is considered to be an index of the shearing resistance and is called the cone index of the soil. The cone index refers to some given plane of reference such as the soil surface or some given distance below the soil surface. For drop tests, readings are taken when the top of the cone is just even with the soil surface.

b. Apparatus: The cone penetrometer uses two 18 inch extension rods (to provide either an 18 or 36 inch length), a proving ring, a dial gauge, and a handle. In use, the dial is mounted inside the proving ring. The amount of force applied to move the cone into the soil is indicated on the dial which has a range from 0 to 300 pounds per square inch (0-75 kg). Maintenance and adjustment are as follows:

(1) The penetrometer needs little care beyond keeping it clean and well oiled, keeping the joints tight, and checking the calibration.

(2) Particular care should be taken to see that no grit is caught between the extensometer arm of the dial gauge and the lower mounting block.

(3) If either or both mounting blocks loosen and become movable, they should be positioned to lie on a diameter of the ring and then re-tightened. If this happens, the proving ring calibration should be checked before using the instrument.

(4) The point of the cone may become rounded through use. This may affect the accuracy of the instrument, hence an excessively worn or deformed cone should be replace.

(5) The proving ring should not be subjected to overstressing, deformation, hard knocks, or extreme changes in temperature. If treated properly, the proving ring will hold its calibration for the life of the instrument.

(6) The micrometer dial gauge is a sensitive instrument which must be protected against rough usage. It should never be immersed in water, and if used in rainy weather, should be wiped dry as soon as possible. When transporting the instrument, the dial should be cushioned by wrapping it in a cloth or paper.

c. Adjustment: The proving ring supplied with the cone penetrometer is calibrated by the manufacturer. This calibration should be accurate throughout the life of the instrument, unless the ring receives a severe jolt, the dial gauge is abused, an excessive load is applied to the ring, or the ring is overstressed in some other way. If recalibration is necessary, the procedure given below may be used.

(1) Remove the handle and rod.

(2) Place the lower mounting block of the ring assembly on a smooth, horizontal surface.

(3) Check the mounting block alignment. Both blocks should be on a diameter ring. A drafting triangle or a carpenter's square may be used in this operation.

(4) Seat the extensometer arm of the dial firmly on the lower block with sufficient travel of the arm available for the full range (approximately 0.1 inch deflection) of the proving ring. The dial can be moved up or down by adjusting the two nuts on the threaded stud which holds the gauge in position. Both nuts should be tight when in final position.

(5) Zero the dial by rotating the face so the "0" is aligned with the needle.

(6) Add load in ~ 4.5 kg increments up to 75 kg, marking or noting the position of each load increment. Any of the following methods may be used.

(a) Dead weights may be added to the top of the ring assembly. If a plate is used to hold the weights, its weight should be considered in the first ~ 4.5 kg load.

(b) Any of the load machines commonly used in laboratory work may be used to apply the load.

(c) The ring assembly may be placed on a set of platform scales and the load increments applied by a jack and measured with platform scales.

(7) Remove load in ~ 4.5 kg increments, noting the position of the needle after the removal of each increment.

(8) The load run should be made at least twice, using the average of the needle position for each increment as the final point.

(9) Some variation in the needle position will occur, but will not be significant.

(10) When ~ 4.5 kg increments have been established on the dial, they may be marked,

up to ~ 136 kg and then subdivided into four subintervals. Each interval should be subdivided separately, since the scale arcs of the various ~ 4.5 kg intervals are not necessarily the same.

2. Test Procedure

The step-by-step procedure in using the cone penetrometer is as follows:

a. The penetrometer must be inspected before use to make sure that all nuts, bolts, and joints are tight and that the dial gauge stem contacts the proving ring bearing block.

b. Allow the penetrometer to hang vertically from its handle. It should read zero, and when a ~ 68 kg load is applied, it should read 6.

c. Place the hands over each other on the handle in order to minimize eccentric loading of the proving ring and to help keep the rod vertical. Force is applied by pressing the chest against the hands until slow, steady, downward movement occurs.

d. Take a dial reading just as the base of the cone is flush with the ground surface. An assistant should be provided to record the readings taken by the operator.

e. The following precautions should be observed in the use of the cone penetrometer:

(1) The instrument must be kept vertical.

(2) Readings higher than the ~ 68 kg capacity of the dial should not be attempted, since this might overstress the proving ring.

(3) If the dial capacity is exceeded at less than full cone penetration, the operator should assure himself that the cone is not striking an isolated rock fragment by making another penetration nearby.

(4) The instrument should never be withdrawn by the ring but always by the rod of the handle.

f. A data sheet should be prepared in advance showing location of observations, date, weather conditions, names of operator and observer and the value of the readings.

RELIABILITY, AVAILABILITY, MAINTAINABILITY (RAM) DATA

1. Test Data

a. The purpose of recording data is to establish an accurate, complete historic profile of the items being evaluated. For some tests, the definitions listed, below are, sufficient to explain what has occurred; in other tests, failure definitions and scoring criteria specified by the customer take precedence whenever these criteria conflict.

b. The advent of increased data computerization from input through completed analysis may change the format and content of the information presented here. Therefore, this information is mainly for use as a guide in planning the appropriate data-collection and analysis portion of the test plan.

c. The cycle of operation of most small and medium calibre weapons, either single-shot or autoloading, is broken down into six parameters: feeding, chambering, locking, firing, extracting, and ejecting (in that order). Within these six parameters, malfunctions may occur which can adversely influence one or more segments of RAM. In recent years, the trend has been to include malfunctions under maintenance category, since a malfunction or a stoppage requires some action in order to correct the problem.

d. Data collection for large, complex development programmes may be controlled by a RAM-D Failure Definition and Scoring Criteria manual published jointly by the material and combat developers (see attached example). Since the RAM-D Failure Definition and Scoring Criteria address analysis of the collected data, rather than specific nomenclature of the stoppages and other malfunctions, the definitions following are used as the basis for describing what has occurred. The definitions shown in the RAM-D Failure Definition and Scoring Criteria are then applied.

e. When test programmes do not use a RAM-D Failure Definition and Scoring Criteria list, data collection and analysis should be tailored to meet the specific needs of the programme. The basic concepts previously discussed should still be used. In this manner, if a scoring conference should be necessary to clarify disputed data, a concise, presentable format will have already been prepared and used.

f. In testing weapons, the primary method of reporting where an incident occurs is by using round counts. Several types are used, including cumulative total rounds on the weapon receiver or frame. Within this end item, major components can require their own round counts (e.g., quick change barrels, multidirectional feed mechanisms, and magazines). Attachments to the end item, as well as parts rendered unserviceable or damaged/worn due to use, may also require separate round tallies.

g. After establishing an appropriate format for recording round counts, provide the other types of data collected and reported on the data sheet. These include identification of the test item, ammunition used, project engineer's I.D, subtest title test phase and/or firing cycle, mode of fire, number of rounds loaded in the belt, clip, magazine, etc., number of rounds fired from that load complement, and the total cumulative rounds fired to date from that weapon.

h. Data obtained during performance tests should be used when feasible in the maintenance evaluation of an item, but it is essential that the determination of malfunction cause(s) not be compromised in these tests to concurrently obtain data for the maintenance evaluation.

i. When a malfunction occurs, the mode of fire (if different from that specified in the firing schedule) is noted, along with the type of malfunction. If more information is needed to clarify a "non-standard" type of malfunction, use the narrative form and write it immediately following the basic malfunction assessment. Since RAM data must be obtained concurrently during testing (in most cases), this information is also noted in the firing data log and supplemented by a separate maintenance log when necessary.

2. Definitions

a. For operational RAM scoring and assessment purposes, the weapon system may consist of the basic weapon magazine, ammunition, operator, maintainer, and any ancillary equipment required for mission success.

b. An operational mission failure is defined as any malfunction that results in any one or a combination of the following:

(1) Cessation of weapon operation requiring corrective active.

(2) Inability to begin or cease a mode of operation.

(3) A critical or catastrophic safety hazard as defined in Section 2.3.

c. A malfunction is a faulty action of the ammunition, launcher, or supporting equipment. Malfunctions are subdivided into two categories: those that cause stoppages (unintended interruptions of firing) and those that cause failures. Examples of malfunctions that cause stoppages are weapon failure to feed, extract, or eject. Examples of malfunctions that cause failures are damaged weapon sear or solenoid components that cause uncontrolled fire, loss of weapon flash suppressor or loosening and shifting of a sight.

d. In performance tests, attempts are made to determine the cause of each malfunction and whether the fault is attributable to the gun, magazine, or ammunition belt (link), ammunition, installation (supporting equipment). Malfunctions attributable to otherwise improper personnel action such as faulty component assembly or improper loading of ammunition are charged to personnel. Consequently, when practical, the magazine or link lot numbers, when more than one type is used, should be assigned an identifying code. The magazine number or link lot should be recorded throughout testing so that malfunctions attributable to bad magazines or a bad lot of links can be scored properly.

e If no RAM Failure Definition and Scoring Criteria are available for use in determining the classification of malfunctions, develop a time-based classification from available operational performance requirements documents, or use the following definitions:

Class I. Clearable stoppages. A stoppage that can be cleared by the weapon operator within 10 seconds.

Class II. Operator-correctable stoppages/failures. One that cannot be cleared by the operator within 10 seconds but which can be corrected at the operator level using only equipment immediately available to the operator.

Class III. System Failures. A failure that is not correctable at the operator level and requires a higher level of maintenance.

f. Repetitive Stoppage. A series of clearable stoppages that are attributable to a single malfunction are classified as repetitive stoppages. For reliability scoring purposes, if the repetitive stoppages are positively traceable to that particular malfunction, only the first stoppage in the series is charged as an independent clearable stoppage and operational failure. Subsequent stoppages of that series are separately charged as repetitive stoppages. Only those stoppages that occurred within the last 200 rounds before the detection of a malfunction will be considered for classification as repetitive stoppages attributable to that malfunction. The malfunction/failure that caused the series of stoppages will be charged as a hardware system failure and an operational failure.

g. For maintainability assessment purposes, the following parameters are defined:

(1) Scheduled maintenance action. A maintenance action that is pre-programmed to occur at specific intervals, or when predetermined conditions or measurable criteria are met as prescribed in the operator or maintenance manuals.

(2) Unscheduled maintenance actions. A maintenance action that occurs as

the result of a failure or other incident that requires corrective action.

(3) Active maintenance time. The time required to perform a maintenance action (either scheduled or unscheduled).

(4) Classification of the maintenance level at which a specific maintenance action is performed is one of the following:

(a) Operator level (Individual soldier).

(b) Organizational level (Company armour).

(c) Direct support level (Division weapons repair).

(d) Depot level.

h. Generally, parts are not replaced solely because they appear to have wear or have cracks/chipping in noncritical areas, unless there is a possibility of a safety hazard or other catastrophic weapon failure. Once a functional failure occurs that is attributable to such a part or broken part is discovered during scheduled maintenance, the part is replaced. Therefore, during each scheduled maintenance period, each test sample may require complete disassembly. The limits of disassembly are guided by the results of the initial inspection by the test agency and the recommendations of the manufacturer, in that order.

There is generally no scheduled parts replacement during development or technical feasibility tests. After a weapon has been accepted and initial production accomplished, follow-on production tests may have parts replacement schedules to conform with the proven maintenance requirements. Requests for parts replacement with a re-designed part should be approved by the test sponsor. Each time a part is replaced in the weapon, a complete history is obtained, including the part name and number, reason for replacement, description of functional failure mode and total number of rounds fired from the part and weapon. The time required to replace the part is also recorded.

This time span covers disassembly to the area of concern, insertion of part, reassembly and any lubrication or measurements required. It does not include the time to retrieve the replacement part from supply.

i. Durability. The service life of the weapon will be determined based on when the weapon shows signs of imminent failure, cracks, or excessive wear in the frame, high increase in the malfunction rate, safety hazards, or other conditions that preclude further operation. Such conditions must be of such consequence that the weapon must be replaced/rebuilt. Evidence of cracks is usually gained through use of nondestructive test (NDT) methods such as dye penetrant or magnetic particles.

j. The basic stoppages encountered during function tests are as follows. The explanations may require adjustment for a particular weapon type. The list of stoppage types may be expanded as the intricacies of a particular weapon system become known.

(l) Failure to feed (FFD). Feeding is defined as the appropriate action required to properly position each succeeding round in position so that the weapons's bolt can strip the round from the magazine/belt. The feeding portion of the cycle of operation stops once the round leaves control of the magazine and receives control by other weapons components (e.g., bolt or barrel chamber). If a round leaves control of the magazine and a stoppage occurs before the round is controlled by other weapon components, the stoppage is assessed as a feeding failure.

(2) Failure to chamber (FTC). Chambering is defined as the placement of a round of ammunition in the barrel chamber of the weapon. Chambering starts after completion of feeding, and is completed upon full insertion of the round in the chamber. In some weapons, the projectile nose enters the breech end of the chamber before the feeding portion of the cycle has been completed by release of the round from the magazine's feed lips. If a stoppage occurs at that location, the stoppage is charged as an FFD, not an FTC. Other causes that can prevent chambering are: insufficient counter recoil force; barrel chamber damage; obstructions in the chamber and bore such as dirt, mud, ice and ruptured cartridge cases; and broken/deformed parts that prevent or restrict forward movement of the breeching components.

(3) Failure to lock (FTL). Locking is defined as the securing of the weapon's breeching components to prevent opening during high pressure generation at the time of firing. For hand-held weapons, locking may be affected by manual closure of the breech. The use of advanced primer ignition as the bolt is moving forward is not uncommon with automatic weapons operating on the blowback principle.

Locking begins with the completion of chambering and terminates upon full engagement of the lock components with their mating surfaces. Some weapons additionally required a small amount of forward free travel in the locked position before firing can occur. This complete return to battery is the terminus point of counter recoil. It is sometimes difficult to differentiate between an FTL and an FFR (failure to fire) because of this additional movement of components after full locking has occurred. One indicator of the failure to lock under this situation is a light or non-existent firing pin indent in the cartridge primer. If a judgemental call is necessary, provide enough narrative to describe the occurrence so that later analysis can possibly reveal the true classification and cause.

(4) Failure to fire (FFR). Firing is defined as the action created by release of the striker/hammer which causes the striker/firing pin to function the cartridge primer. The primer then ignites the propellant which then builds up enough pressure to propel a projectile through and out the barrel bore. The firing sequence starts upon completion of locking and is terminated upon expulsion of the projectile from the barrel. Failures to fire are caused by two basic problems: defective ammunition or defective weapon. Within each of these two problem areas are several causes. With ammunition, they are: primer defect, propellant defect, or cartridge case defect. With the weapon, they are: defective parts or dimensional mismatches (i.e., bolt bounce to the rear at the time of firing which prevents firing due to being unlocked). Since the symptoms of light/non-existent firing pin indent of the primer are the same if the gun either fails to lock or is unlocked at the instant of firing pin/striker release, other signs of the cause must be noted. Such things as deformtion of the headspacing shoulder (case mouth on straight walled cases), rifling engraving marks on the projectile and case body marks may give additional evidence about the location of breeching components at the time of actual incident. Although there may be some overlapping of causes in the determination of FFRs, the result will not be adversely compromised.

(5) Failure to unlock (FUL). Unlocking is defined as the action taken either manually or automatically by the weapon when fired$_1$ to release the breeching components so that extraction can take place. Unlocking begins with the completion of firing (or manual retraction of the bolt/slide from the battery position) and is completed upon rearward movement of the bolt, at the point of separation of the bolt from the barrel (in instances when the barrel and breeching components recoil together in a locked position for a short distance before separation).

(6) Failure to extract (FXT). Extraction is defined as the removal of the fired case or unfired round from the chamber of the weapon. Extraction begins with the completion of unlocking and is terminated when the case of complete round is in a position to be ejected. This ejection position varies with the weapon design (fixed or spring-loaded ejector). Determination of extraction failures is complicated by short recoil of the breeching components. Extraction failures that masquerade as other problems due to short recoil are: soft cartridge case, rough chamber wall, broken parts, and external contamination such as dirt, mud, snow, ice, and corrosion that prevent most of the recoil movement after firing, but allow the breeching components to return to battery. Dimensional problems with the case rim thickness and angle, and chamber pressure also contribute to extraction problems.

(7) Failure to eject (FEJ). Ejection is defined as the complete removal of a fired case or unfired round from contact with the weapon. Ejection starts after extraction and is completed upon expulsion from the weapon. Extraction and ejection are closely related since one follows the other. Failure of the extractor and breech face to control the fired case or complete round until ejection occurs may cause an ejection failure. In order to differentiate between the two stoppages, inspect cartridge cases for signs of ejection marks on the base and extractor marks on the rim. A change in the usual marks may signify that loss of control occurred before ejection. Case sidewall indentation will also help identify ejection failures. If the case or complete round is caught by the bolt in a position other than 0 degrees (in line with the longitudinal bore axis), the stoppage is very likely an ejection failure. Residual gas pressure, acting upon the fired case and breeching components, may be enough to allow case extraction when the weapon has a broken extractor, but not ejection. The correct assessment of the malfunction type will be an FXT, not an FEJ. When short recoil is coupled with fixed ejector design, the fired case may be returned to the chamber. This would first appear to be a failure to unlock or extract. If the fired case can be manually extracted and ejected, the stoppage should be classified as an ejection failure if there are no other indicators of the type of stoppage and its cause. If this condition persists, high speed photography may be necessary to isolate the cause of the problem.

(8) Failure of the bolt to remain rearward (FBR). After the last round is fired from the weapon (or manual retraction with an empty weapon), weapons may be designed so that the bolt is locked back until either manually or automatically released, upon insertion of another loaded magazine/belt. In rare instances, weapons equipped with separate bolt stops may prematurely engage the stop before firing the last round. This type of stoppage will be reported under the heading OTHER and appropriately described in narrative form.

EXAMPLE

RAM FAILURE DEFINITION

AND

SCORING CRITERIA

1. PURPOSE

This document sets forth the applicable definitions, procedures and criteria for providing a consistent classification of reliability, availability, maintainability and durability related test results to be utilized for quantitative evaluation of the RAM-D characteristics.

2. SCOPE

This document provides the Failure Definition and Scoring Criteria to be utilized by all elements of the developer and user agencies for RAM evaluation.

3. PROCEDURES

a. A scoring conference will be established to score all test results using this document. The scoring conference will be composed of representatives from the material and combat developer and test/evaluation agencies. The test agency will document and make a preliminary classification of all test incidents which will be presented to the scoring conference for scoring.

b. Based on failure analysis, each stoppage and failure will be categorized as chargeable to one of the following categories:

(1) Basic weapon
(2) Magazine
(3) Ammunition
(4) Operator
(5) Maintenance personnel
(6) Manuals
(7) Support equipment

4. TEST INCIDENT CLASSIFICATION

(a) All test incidents shall be classified under the following categories:

(1) No Test (NOT)
(2) Scheduled Maintenance (SMA)

(3) Unscheduled Maintenance (UMA)
(4) Reliability Failure (RF)
(5) Repetitive Stoppage (RS)
(6) Clearable Stoppage (CS)
(7) Operator Correctable Stoppage (OCS)
(8) System Failure (SF)

(b) The following incidents are classified as No Test:

(1) Actual or incipient malfunctions detected and/or corrected during initial or final technical inspection. Reliability performance will encompass round one to the final round fired, excluding pre-test and post-test examinations. The information obtained during pre-test and post-test inspections will, however, give insight into the possible necessity for additional QA inspections during acceptance as well as wear conditions of the system for depot overhaul consideration. An incipient malfunction is one which, if not corrected when detected, potentially would cause a failure. When detected, however, there is reasonable assurance that it had not contributed directly to any preceding incidents and was detected only because of maintenance/inspection for other purposes. Examples would be high wear on a locking surface, hairline crack on a part, loosening of parts, etc. The key criteria is that these incidents did not necessitate an unscheduled maintenance action.

(2) A malfunction resulting from test item abuse, accident or unrealistic operating conditions.

(3) A kit installation, authorized modification, engineering evaluation or manual/maintenance evaluation.

(4) A malfunction induced by test instrumentation or facilities.

(5) An incident which does not affect weapon operation or safety and requires no corrective action.

c. The following incidents are classified as scheduled maintenance:

(1) Inspections, cleaning, lubrication, adjustments and other servicing specified in the manuals or test procedures.

(2) Scheduled replacement of parts provided that specified criteria and techniques integral to the weapon are established to indicate when the maintenance point has arrived. However, replacement of an item or component prior to reaching its stated durability level will be charged as an unscheduled maintenance action (UMA).

d. The following incidents are classified as unscheduled maintenance actions that are not reliability failures:

(1) A malfunction resulting from the abnormal conditions caused by the occurrence of a previous chargeable failure.

(2) An incipient malfunction detected and corrected during authorized scheduled maintenance or during corrective maintenance provided the corrective maintenance is authorized at that same maintenance level. The logistics implications shall be addressed separately, but the key element is that these actions occurred while the system was down for other reasons.

(3) Incidents resulting from not following prescribed operational or maintenance procedures and schedules.

(4) Incidents resulting from maintenance personnel error or operator error not attributable to equipment or design deficiencies.

(5) Incidents caused by the ammunition.

Note: Active maintenance time and maintenance manhours shall be recorded for each action to include the maintenance level.

e. The following incidents are classified as mission reliability failures:

(1) An incident resulting in a system stoppage and/or requiring correction provided that conditions above do not apply. A stoppage is defined as any unplanned cessation in firing or the inability to commence firing.

(2) Inability to commence or cease a mode of operation and/or a critical or catastrophic safety hazard. Examples would include the inability to remove/install the magazine, failure to positively sear (doubling or runaway), etc.

(3) Multiple replacement of parts to restore the system to operation shall be charged as one mission failure. For example, a unscheduled maintenance action to remedy a series of Failures to Extract (FXs) which to correct involved the replacement of the extractor and extractor spring would be counted as a single chargeable failure.

f. Repetitious stoppages attributable to a specific cause are charged as repetitive stoppages if positively traceable to that cause and corrective maintenance is performed and confirmed by testing.

5. RAM PARAMETERS

a. Mean Rounds Between Mission Failures (MRBMF). The mission reliability will be determined by dividing the total test data base rounds by the total number of chargeable operational failures.

b. Mean Rounds Between Stoppages (MRBS), Mean Rounds Between Operator Correctable Failures (MRBOCF) and Mean Round Between System Failures (MRBSF). The reliability for each of the three classes of failures (as defined in paragraph 4(c)) will be determined by dividing the total test data base rounds by the number of chargeable stoppages or failures in each of the three classes.

c. Only ambient endurance firing shall be considered as the data base for assessing reliability. Other subtests (e.g., mud, extreme temperature, etc.) shall be individually assessed and relative performance among contenders assessed.

d. Mean Time to Repair/Organizational and Direct Support Level (MTTR) All unscheduled maintenance actions shall be considered. A record of Active Corrective Maintenance times shall be kept for each level of maintenance in the firing log to be maintained for each weapon tested. The MTTR at the organizational level and direct support level each shall be computed, using appropriate statistical methods.

e. Maximum Time to Repair/Operator Level (MAX TTR). Using all the unscheduled maintenance actions (including immediately clearable Class I incidents) occurring at the operator level, the 95th percentile shall be computed, using appropriate statistical methods.

f. Other Maintainability Indices. Maintenance times shall be collected to allow computation of a Maintenance Ratio, and Mean Active Preventive (Scheduled) Maintenance Time (at each maintenance level).

g. Repetitive Stoppages. The number of occurrences of repetitive stoppages will be recorded and the occurrence rate of repetitive stoppages calculated to provide an additional basis for evaluation of the candidate weapons.

CLASSIFICATION CODES

NOT	-	No Test
SMA	-	Scheduled Maintenance Action
UMA	-	Unscheduled Maintenance Action
MF	-	Mission Failure
RS	-	Repetitive Stoppage
CS	-	Clearable Stoppage
OCS	-	Operator Correctable Stoppage
SF	-	System Failure

EXAMPLE OF PROCEDURE FOR CONDUCTING

THE STATIC DETONATION FRAGMENTATION TEST

Note DGA/ETBS n° 5 / E – GRE – 002

ANTI-PERSONAL EFFICIENCY OF HAND GRENADES

MINISTERE DE LA DEFENSE

DGA

DIRECTION DES ARMEMENTS TERRESTRES

ETABLISSEMENT TECHNIQUE DE BOURGES

BOURGES, le 21 FEVRIER 1992

CENTRE D'ESSAIS

DIVISION ESSAIS DES SYSTEMES D'ARMES

DEPARTEMENT MOYENS CALIBRES INFANTERIE

N° NT : 5 **Question :** E-GRE-002 **Tome :** 1/1

TITRE :

ANTI-PERSONAL EFFICIENCY OF HAND GRENADES

Classification : NC		

Contenu : Définition des méthodes et moyens utilisés

Référence : note n° 246 CT/AL du 27.09.1991

Lancement : Nombre de pages : **10**

INDEXAGE :

SIGNATURES :

Le rédacteur, **J.P. BRUNET**	Le chef de département, **P. SADET** p.i. **P.MARCHANDIN**	Le chef de division, **J. PICOT**

DIFFUSION :

- C.A.A. CHATELLERAULT
- CT/CdS/AL
- DMS/MMB
- DEA/MCI – 2 ex.

SUMMARY OF AUTHOR

This note aims to define a method allowing to determine the efficiency of a hand grenade.

This method was the object of the report of experimentation of which tests are summarized in this document.

Two successive tests allow to characterize the fragments :

- A static shot in box allowing to define spatial distribution and the classification in weight of the sheaf of fragments;

- A static shot with X-rays and flash of lighting allowing to define the speed and the mass of the fragments following directions given.

Following these two attempts, programs of calculation allow to calculate the global probability of stake outside fight in function :

- of the visible surface of the target placed on the ground of unpredictable way on a circle of 5 m of radius around the point of explosion (targets in annex 1);

- of the angle of fall of the grenade;

- of the height of functioning the grenade;

1 - STATIC SHOT IN BOX TO DETERMINE THE SPATIAL DISTRIBUTION OF THE FRAGMENTS

METHOD :

Static shot of a grenade inside a box of which walls intercept the sheaf of fragments. The fragments are got back so there identifying their impact point, their depth of penetration and their mass.

PHASE SHOT :

The test consists in putting on a grenade inside a box of witch the walls are filled with 10 patches of soft isorel 10 mm of thickness each to intercept the sheaf of fragments
(Internal dimensions: 800 x 800 x 800 mm).

See plandrawing of the installation of the patches of isorel (ANNEX 2)

PHASE PERUSAL :

Consist in tracking down on every patch of isorel the coordinates of impact, the number of crossed patches as well as the mass of the considered fragment.

SYNOPTIC TABLE OF THE OPERATIONS :

Placing the grenade
In the centre of the box

↓

Firing the grenade by BA
of origin modified (electric variant)

↓

Interception of the sheaf of fragments.
in soft isorel walls

↓

Perusal
blocks of isorel

↓

Raised coordinates
of impacts and masses of fragments

↓

Determination of the spatial distribution
of the sheaf of fragments

2 - STATIC SHOT WITH X-RAYS - ECLAIR TO DETERMINE THE SPEED AND THE MASS OF THE FRAGMENTS ACCORDING TO GIVEN DIRECTIONS

METHOD :

Static shot with radiography-flash of lighting giving the position in the space of the same fragment at the different moments, that allows of calculate the speed of the fragment as well as the theoretical position of its impact point on the target in which it is got back to be weighted.

It is necessary to realize the test following 5 axis min with 3 shots by axis.

PHASE SHOT :

The test consists in X-raying, at the two different moments, one part of the sheaf of fragments resulting from a grenade and to intercept it in a block (formed by 10 patches of soft isorel juxtaposed, 10 mm of thickness each).
The sources Rx are commanded with a delay given by one screen contact placed on the trajectory of the sheaf. 2 X-ray are made where the fragments will be seen under 2 different angles.

See drawing of the installation (ANNEX 3).

PHASE PERUSAL :

It is necessary to track down on the X-rays the same fragment in the two moments. The crossed distance and the separating time between the two X-rays allow to know the speed. The position in the space of the fragment at the two moments as well as its origin, allow to define a theoretical trajectory as well as a theoretical point of impact in the block.

The perusal of the blocks consists in recovering on every patch of soft isorel, for every fragment, its coordinates of impact, its mass and the number of crossed patches. It is then necessary to compare a raised impact on the placed box in front of the block with the theoretical impact point given by the perusal of X-ray to associate mass and speed.

See synoptic table page 7.

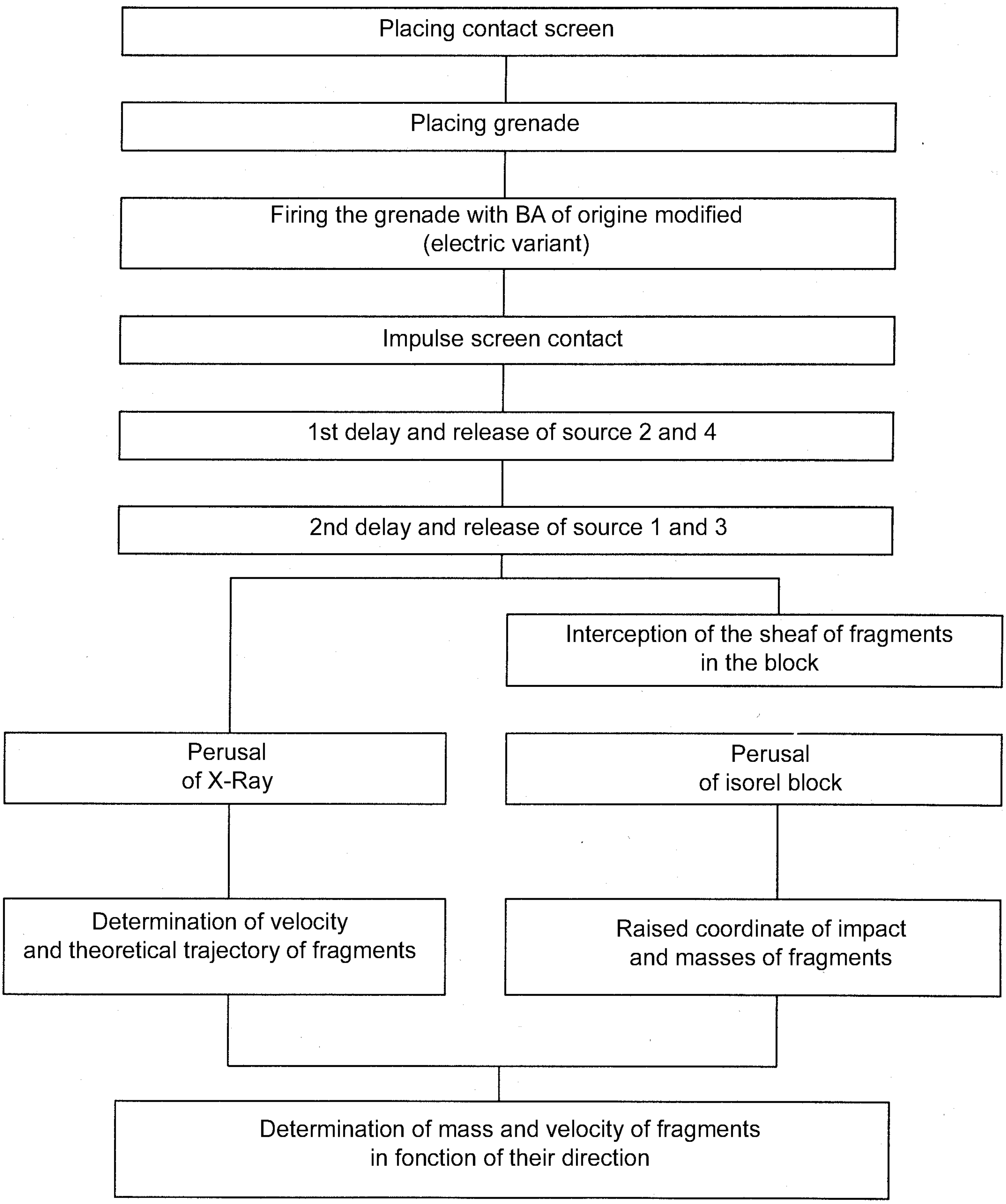
PRELIMINARY REGULATIONS OF THE INSTALLATION

The axis supporting the centres of the broadcasts of X-rays must be perfectly parallel with the plan film.

2 metal crosses are arranged on the patch of polyéthylène supporting the films to impress the films and give reference. These crosses realize the orthogonal projections of the presumed centres of the sources and must be placed with the maximum of preciseness (topographic account of the installation).

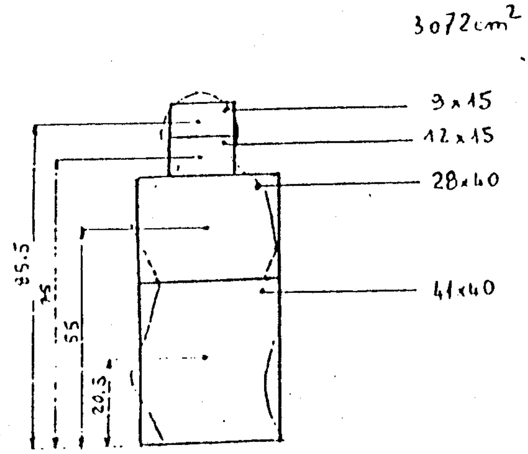
All the quotations of the installation have to be carefully raised at the beginning and at the end of the test.

Synoptic table of operations



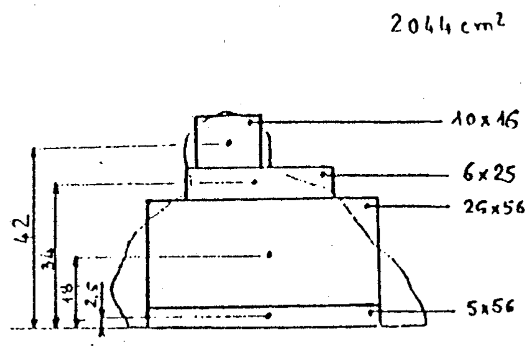
ANNEX 1

TARGETS



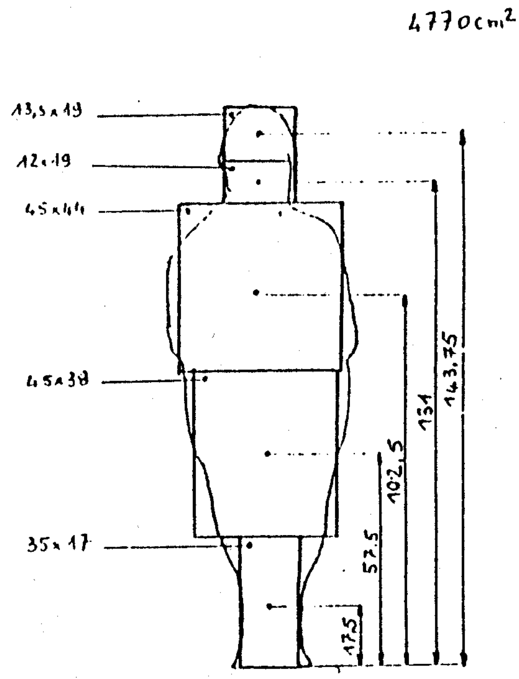
(kneeling man)

Sc2



(prone man)

Sc1

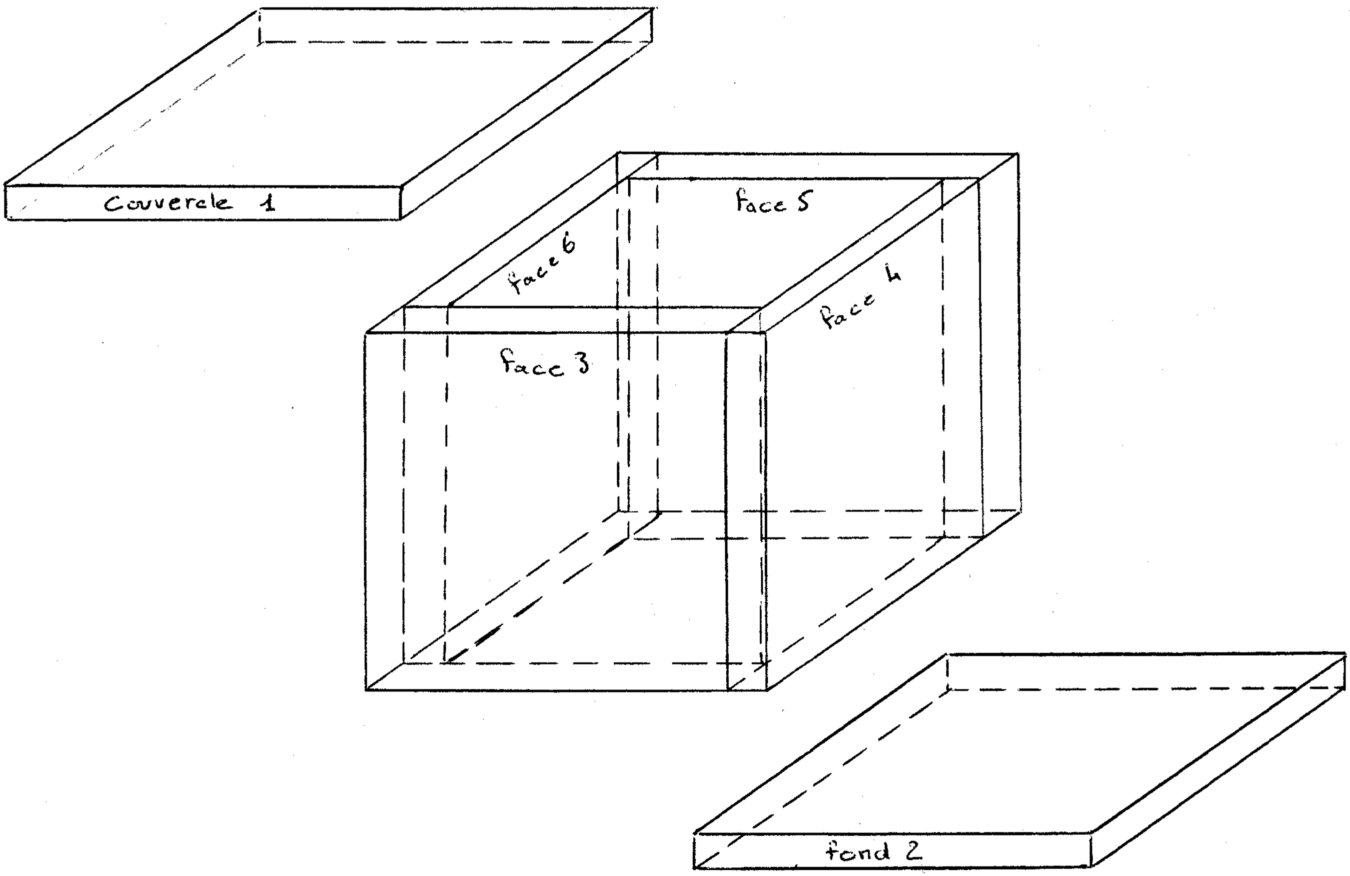


(standing man)

Sc3

ANNEX 2

DRAWING TO PUT IN PLACE SOFT ISOREL IN THE BOX
IMPLANTATION DRAWING

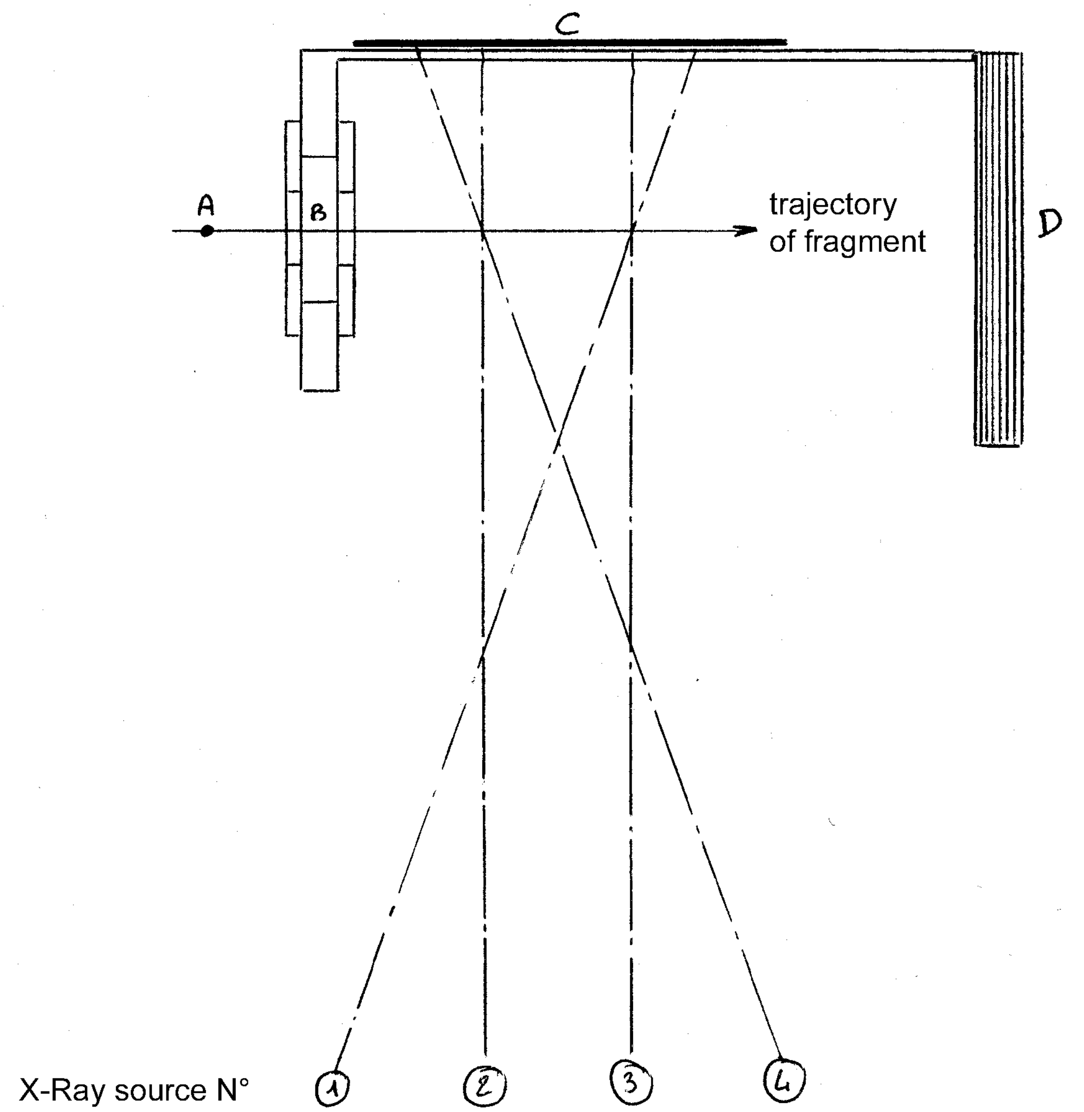


Each face, composed by 10 patches of soft isorel
is fixed with plastic hooping

ANNEX 3

IMPLANTATION DRAWING

A : grenade
B : window for selection of fragments
C : film
D : block



EXAMPLE "NOISE" TEST DETAIL USED FOR 1977 -79 NATO TESTS POTENTIALLY HAZARDOUS EFFECTS - NOISE

1. **Weapons**: One weapon from each weapon system.

2. **Firing Range**: Open country, level cropped grass surface. Care should be taken that there are no sound reflecting obstructions within a distance of 10m from the weapon.

3. **Firing Position**: The weapon is to be fired from a suitable mounting, which means a mounting which avoids reflective surfaces. An example of a suitable mounting is the Meppen mount, made of angle iron of a section not exceeding 4cm. For all weapons the muzzle (including flash hider) should, as near as is practicable, be in the same point in space relative to the mount. The mounting plate of the weapon fixture should be covered with a 2cm thick sound dampening material (such as rock wool matting). The barrel must be horizontal and placed 1m above the ground. For each weapon system under test the details of the weapon fixture on the mounting are to be given in the test results.

4. **Measuring Equipment**: The following measuring equipment is to be used. Care should be taken that background noise and electrical interference in the measurement system is at least 25dB below the peak level being measured. A block diagram of the measuring system is given at Table M.1.

Table M.1 **EXAMPLES OF SUITABLE NOISE EQUIPMENT**

Number Required	Equipment	Maker	Type
4	Condenser microphone with grid, 1/8 inch	Bruel & Kjoer	4138
4	Pre-amplifier	Bruel & Kjoer	2618 / 2619
4	Amplifier	Bruel & Kjoer	2606
1	Low pass filter, 22.4 kHz, 12dB/octave, Bessel characteristics (for standard measuring position only)	H.M.Muller	AF170
4	Peak value indicators	Kistler	538 - AY 039
1	Pistonphone	Bruel & Kjoer	4220
2	Cathode ray oscilloscope	Teletronix	551 / 502
1	Oscilloscope camera	Polaroid	-
1	Trigger microphone	Massa	M 141
1	Trigger amplifier	General Radio	1551
1	FM magnetic tape recorder with a frequency response from 0 to at least 40kHz (transient mode to be used, if available)	-	-

5. **Layout of Measuring Equipment**: Figure M1 depicts the equipment details. The measuring position "M1" represents the position of the firer's ear and is located 20cm to the left of the centre point of the butt plate of the weapon. The standard measuring position "SMP" (to be used for FRG - French assessment purposes) is located at 225^{o} (thus to the left rear of the muzzle) at a distance of 50 x weapon calibre. The other measuring positions are fixed in relation to the muzzle, as shown in Figure M2. With the exception of "M1" all measuring positions are to be at a height of 1m above the ground. The microphones at all measurement points (except "M1") are to be upright in the "grazing measuring" position. For all microphones the plane of the sensing surface is to pass through the centre line of the barrel.

6. **Meteorological Conditions**: Test firings are to be carried out in rainless, comparatively still conditions, with the wind velocity not exceeding 5 m/s.

7. **Method**: Sufficient rounds are to be fired remotely from each weapon, in single shot fire, to give at least 5 measured values or 3 times the range of peak values in dB at each measuring position, whichever is the greater. Novel weapons, because of their characteristics, may require this procedure to be modified, for example by firing short bursts of 3 rounds. The test is to be carried out twice, once using Ball ammunition conditioned for 12 hours at +21^{o}C, the other with the Ball ammunition conditioned for 12 hours at +52^{o}C. Firings are to take place 30 +/- 5 seconds after removal from the thermal container. A warming round is to be fired 1 min before the test round. The test is to be repeated with Tracer ammunition, but at an ammunition temperature +21^{o}C only.

8. **Results**:

a. **Raw Data**

(1) Peak pressure (millibars) and peak pressure levels (dB) for each round at all measuring positions.

(2) Oscilloscope photographs for each round at all measuring positions.

b. **Derived Data**

(1) Duration for each round at all measuring positions (according to Pfander [1])

(2) Fourrier frequency analysis of amplitude density spectrum for one round of Ball ammunition for each weapon at ambient temperature, at measuring position "M1".

c. **Derived Data (by Panel of Experts)**

Duration according to CHABA [2] for each round at all measuring positions. The testing authority are to make available oscilloscope photographs and magnetic tape recordings at least for each round at measuring position “M1”.

9. **Assessment**: The results are to be presented to the Panel of Experts on Acoustics. The guidelines on which this Panel of Experts will make their assessment are given below:

a. The acoustic assessment will be a comparative one, showing the noise hazards of the contender weapon systems relative to three control weapon systems.

(1) The weapon systems are to be ranked in order of hazard to hearing for single shot firing, according to:

(a) the Pfander criterion
(b) the CHABA criterion

b. This ranking is to be based on measurements taken at the position “M1”, representing the position of the firer’s ear.

(1) Additionally, novel weapons, such as those firing rapid three round bursts, are to be treated as a separate system and included in the ranking at paragraph (1) above.

[1] Das Knalltrauma - by Freidrich Pfander. Springer Verlag, Berlin, Heidelberg, New York, 1975.

[2] CHABA Proposed Damage Risk Criterion for Impulse Noise (Gunfire), Report of WG57, NAS - NRC Committee of Hearing, Bioacoustics and Biomechanics (CHABA), Washington DC, 1968.

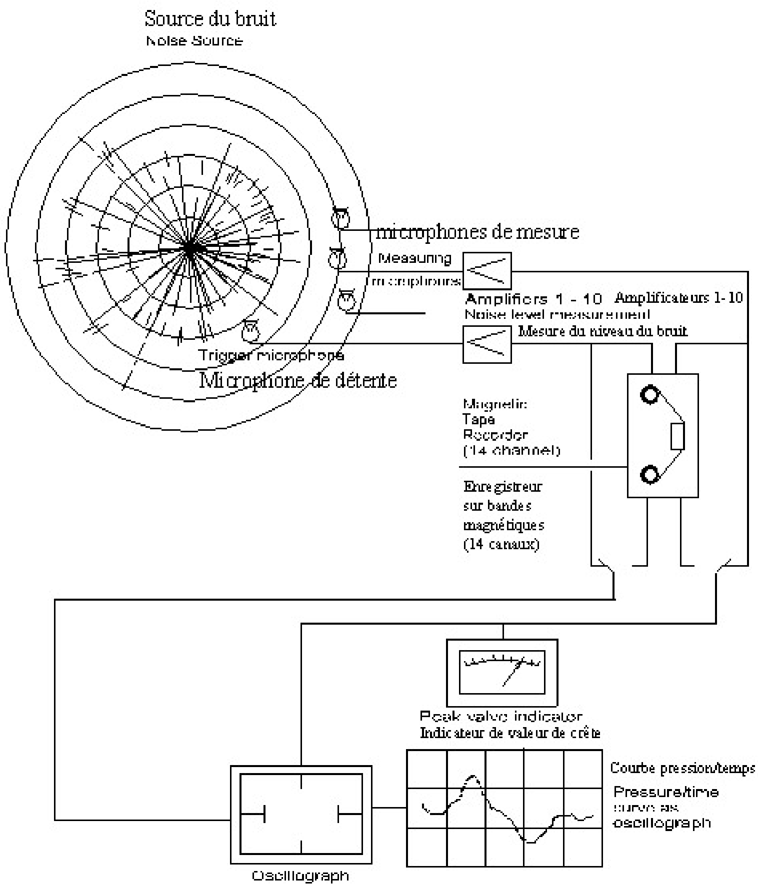


FIGURE M1

GR64163 ISS B (MOD NO. 1/054/98)

LAY-OUT OF MEASUREMENT EQUIPMENT

Dispositif du matériel de mesure

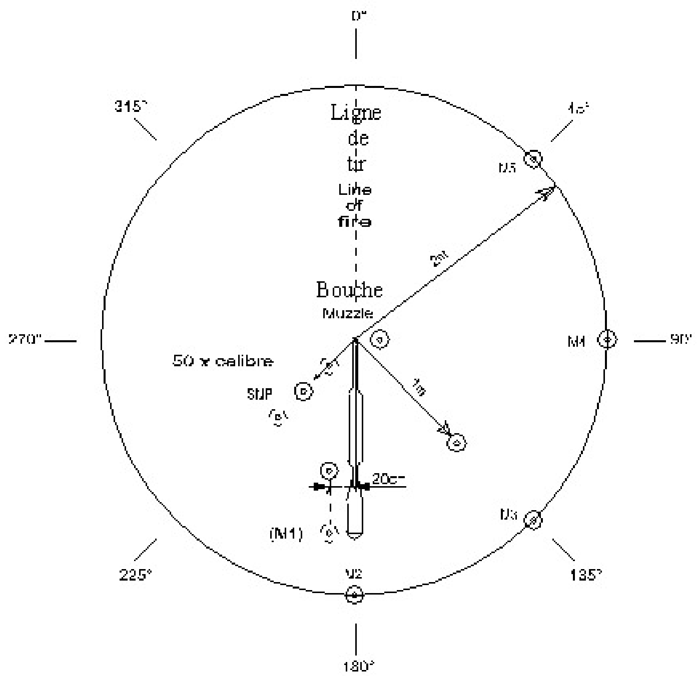


FIGURE M2

M = Measuring microphone position
M1 = Position is dependent on length of weapon
SMP = Standard measuring position (for FRG/FR use)
M = emplacements des microphones pour la mesure
M1 = Sa position dépend de la longueur de l'arme
SMP = Position standard de mesure (pour RFA/FR utilisation)

GR64180 ISS B (MOD NO: 1/054/90

"TOXICITY" TEST DETAIL USED FOR THE 1977-79 NATO TESTS :- POTENTIALLY HAZARDOUS EFFECTS - TOXICITY

Standard Test Chamber Used for the 1977 - 79 NATO Tests

1. Photograph of Test Chamber

2. Description : The standard test chamber has internal dimensions of 1.77m long, 0.87m wide and 0.95m high. The side walls are to be removable and made from a transparent material such as plexi-glass. The chamber should contain a basic frame to take the holding brackets for the weapons under test. Weapons are to be mounted with their muzzles outside the chamber, but with any gas ports (gas operated weapons only) within the test chamber itself. A system, adjustable both horizontally and vertically, to catch fired cases shall be mounted opposite the ejection opening of the weapon under test. Two manipulation openings, fitted with gas-tight sleeves and gloves, are fitted to the left side of the chamber at the correct height to operate the weapons. A fan is to be fitted to achieve overall uniform distribution of the gases within the chamber. Two separate, independent systems are to be used to take toxicity measurements. One system should normally be adequate to determine results, the second being to act as a control and provide confirmation of the results.

3. Measuring Procedure : A block diagram of the apparatus used for the measurements is given in Figure N2. For each independent measuring position a separate measuring system is required. The open end of the connecting pipe of each system is inside the standard test chamber. The remainder of the measuring equipment may be placed some distance from the test chamber. A membrane pump is to be used to maintain a steady flow of gases sucked from the test chamber at a rate of approximately 60 l /hr. The gases are then forced through a measuring filter into the measuring apparatus (URAS). URAS delivers an electrical current, proportional to the CO content, to a compensator recorder, enabling a complete CO concentration / time curve for the test to be established.

MEASURMENT OF CO CONTENT AS
USED FOR 1977-79 NATO TESTS

Mesure de la teneur en CO utilisée
pour les essai OTAN 1977-1979

Schéma d'un système de mesure

Block diagram of one measuring system

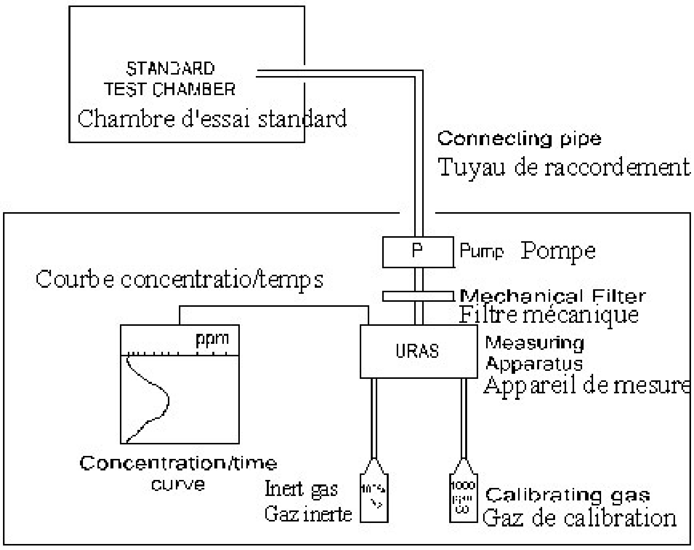


FIGURE N2

GR64171 ISS B (MOD NO: 1 054/99)

4. Measuring Principle of the Infra-Red Gas Analyser (URAS) : URAS 2 T uses the specific radiation absorption of multi-atom gases in the infra-red spectrum area (2.5 to 12 um) for measurement purposes. The absorption is measured by means of a variable light / photometer combination with two parallel radiation directions and a gas-filled radiation absorber with selective effect.

The measuring gas is fed through a tube in the radiation measuring opening. In the comparative tube in the other radiation direction there is to be a gas which will not absorb infra-red radiation. Dependent upon the concentration of the

measuring component in the measuring tube compared to the constant value in the comparative tube a difference of radiation at the exit of the tube can be established.

The difference in radiation results in temperature (warming) differences and alternatively pressure differences in the two associated measuring chambers. The differences will affect a membrane condensor and will be changed into an electrical current.

UK METHODOLOGY FOR FRAGMENT LETHALITY ASSESSMENT

1. Originally, the calibration of the TTCP Witness Pack was used as the basis for theoretical estimation of human vulnerability, related to work within the NATO sponsored CRISAT programme. Since the CRISAT programme, the witness pack has been used as a means of estimating human vulnerability (Probability of Incapacitation given a Hit - P.I.H.) related to a programme of trials associated with the CRISAT targets. The programme has continues and is analysing the effects on personnel of a range of ball and AP bullets and a range of fragments of different shapes, masses and materials.

2. In essence, the use of the witness pack is that it is calibrated for fragments only: ie to estimate human vulnerability, only when the impacting projectile is effectively a fragment. Trials have not been performed using the Witness Pack, with bullets that have impacted on the Witness Pack in their coherent or unfragmented state. Estimation of the effects of bullets in their original unfragmented state on an unprotected man is still best performed using gelatin or a similar body tissue simulant as per D/14.

3. The following is therefore a summary of the types of trials on which the Witness Pack can be used:

For Projectiles:

(1) Unprotected man within a range of CRISAT light vehicles
(2) Protected Man (CRISAT body protection) alone.
(3) Protected Man within a range of CRISAT light vehicles

For Fragments:

(1) All the above. In addition, the existing caliberation of the Witness Pack can indicate the P.I.H. value associated with single fragments impacting on the unprotected man.
(2) The effects of more than one fragment on the Witness Pack, is taken into account by the use of a binomal reduction formula into which the effective number of holes in any plates are inserted. This then sums the total effect to give an overall P.I.H. figure.

4. In conclusion, experience with the Witness Pack indicates that:

(1) The Witness Pack cannot be used to analyse the effects of coherent or unfragmented bullets on the unprotected man.

(2) The Witness Pack is a simple, cost effective methodology for assessing the performance of bullets and fragments, when the related projectilesd are effectively fragments on impact with the pack. No high technology apparatus is required to analyse the pack, i.e. no high-speed photography. Very little expertise is required to analyse the pack, simply counting the number of holes in each layer of the pack. The insertion of the number of holes in each layer and the associated layers vulnerability caliberation, in simple formula will generate an overall P.I.H. figure.

(3) The P.I.H. figures associated with the caliberation of the Witness Pack have been found to be an approximate average of the Assault and Defence 30 second figures obtained using other methodologies (Sperrazza/Kokinakis and Timberwolf software programme) for anti personnel type fragments.

The Witness Pack is probably a more effective method of analysing the effects of a multi-fragment spray then gelatin. This is due to the difficulties associated with analysing a film (relating to a gelatin trial) with a large number of temporary cavities, many of which overlap and mask the overall effect.

U.S. Department of Justice
Office of Justice Programs
National Institute of Justice

National Institute of Justice

Law Enforcement and Corrections Standards and Testing Program

Autoloading Pistols For Police Officers

NIJ Standard-0112.03

ABOUT THE LAW ENFORCEMENT AND CORRECTIONS STANDARDS AND TESTING PROGRAM

The Law Enforcement and Corrections Standards and Testing Program is sponsored by the Office of Science and Technology of the National Institute of Justice (NIJ), U.S. Department of Justice. The program responds to the mandate of the Justice System Improvement Act of 1979, which created NIJ and directed it to encourage research and development to improve the criminal justice system and to disseminate the results to Federal, State, and local agencies.

The Law Enforcement and Corrections Standards and Testing Program is an applied research effort that determines the technological needs of justice system agencies, sets minimum performance standards for specific devices, tests commercially available equipment against those standards, and disseminates the standards and the test results to criminal justice agencies nationally and internationally.

The program operates through:

The *Law Enforcement and Corrections Technology Advisory Council* (LECTAC) consisting of nationally recognized criminal justice practitioners from Federal, State, and local agencies, which assesses technological needs and sets priorities for research programs and items to be evaluated and tested.

The *Office of Law Enforcement Standards* (OLES) at the National Institute of Standards and Technology, which develops voluntary national performance standards for compliance testing to ensure that individual items of equipment are suitable for use by criminal justice agencies. The standards are based upon laboratory testing and evaluation of representative samples of each item of equipment to determine the key attributes, develop test methods, and establish minimum performance requirements for each essential attribute. In addition to the highly technical standards, OLES also produces technical reports and user guidelines that explain in nontechnical terms the capabilities of available equipment.

The *National Law Enforcement and Corrections Technology Center* (NLECTC), operated by a grantee, which supervises a national compliance testing program conducted by independent laboratories. The standards developed by OLES serve as performance benchmarks against which commercial equipment is measured. The facilities, personnel, and testing capabilities of the independent laboratories are evaluated by OLES prior to testing each item of equipment, and OLES helps the NLECTC staff review and analyze data. Test results are published in Equipment Performance Reports designed to help justice system procurement officials make informed purchasing decisions.

Publications are available at no charge from the National Law Enforcement and Corrections Technology Center. Some documents are also available online through the Internet/World Wide Web. To request a document or additional information, call 800-248-2742 or 301-519-5060, or write:

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U.S. Department of Justice
Office of Justice Programs
National Institute of Justice

Autoloading Pistols for Police Officers

NIJ Standard-0112.03

Supersedes NIJ Standard-0112.02 dated January 1995

November 1998

National Institute of Justice

Jeremy Travis
Director

The technical effort to develop the initial issue of this standard was conducted under Interagency Agreement 94-IJ-R-004, Project No. 98-001CTT.

This standard was formulated by the Office of Law Enforcement Standards (OLES) of the National Institute of Standards and Technology (NIST) under the direction of Kathleen M. Higgins, Director of OLES. The technical research was performed by Carter K. Lord, Weapons Technology Manager, of the National Law Enforcement and Corrections Technology Center—Rocky Mountain Region. The preparation of this standard was sponsored by the National Institute of Justice, David G. Boyd, Director, Office of Science and Technology.

This standard has been reviewed and approved by the Weapons and Protective Systems Subcommittee and the Executive Committee of the Law Enforcement and Corrections Technology Advisory Council.

FOREWORD

This document, *NIJ Standard-0112.03, Autoloading Pistols for Police Officers*, is an equipment standard developed by the Office of Law Enforcement Standards of the National Institute of Standards and Technology. It is produced as part of the Law Enforcement and Corrections Standards and Testing Program of the National Institute of Justice. A brief description of the program appears on the inside front cover.

This standard is a technical document that specifies performance and other requirements equipment should meet to satisfy the needs of criminal justice agencies for high quality service. Purchasers can use the test methods described in this standard to determine whether a particular piece of equipment meets the essential requirements, or they may have the tests conducted on their behalf by a qualified testing laboratory. Procurement officials may also refer to this standard in their purchasing documents and require that equipment offered for purchase meet the requirements. Compliance with the requirements of the standard may be attested to by an independent laboratory or guaranteed by the vendor.

Because this NIJ standard is designed as a procurement aid, it provides precise and detailed test methods. For those who seek general guidance concerning the selection and application of law enforcement equipment, user guides have also been published. The guides explain in nontechnical language how to select equipment capable of the performance required by an agency.

NIJ standards are subjected to continuing review. Technical comments and recommended revisions are welcome. Please send suggestions to the Director, Office of Science and Technology, National Institute of Justice, U.S. Department of Justice, 810 7th St., NW, Washington, DC 20531.

Before citing this or any other NIJ standard in a contract document, users should verify that the most recent edition of the standard is used. Write to: Director, Office of Law Enforcement Standards, National Institute of Standards and Technology, Gaithersburg, MD 20899.

David G. Boyd, Director
Office of Science and Technology
National Institute of Justice

NIJ STANDARD
FOR
AUTOLOADING PISTOLS FOR
POLICE OFFICERS

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COMMONLY USED SYMBOLS AND ABBREVIATIONS

A	ampere	H	henry	nm	nanometer
ac	alternating current	h	hour	No.	number
AM	amplitude modulation	hf	high frequency	o.d.	outside diameter
cd	candela	Hz	hertz (c/s)	Ω	ohm
cm	centimeter	i.d.	inside diameter	p.	page
CP	chemically pure	in	inch	Pa	pascal
c/s	cycle per second	ir	infrared	pe	probable error
d	day	J	joule	pp.	pages
dB	decibel	L	lambert	ppm	part per million
dc	direct current	L	liter	qt	quart
°C	degree Celsius	lb	pound	rad	radian
°F	degree Fahrenheit	lbf	pound-force	rf	radio frequency
dia	diameter	lbf·in	pound-force inch	rh	relative humidity
emf	electromotive force	lm	lumen	s	second
eq	equation	ln	logarithm (natural)	SD	standard deviation
F	farad	log	logarithm (common)	sec.	section
fc	footcandle	*M*	molar	SWR	standing wave radio
fig.	figure	m	meter	uhf	ultrahigh frequency
FM	frequency modulation	min	minute	uv	ultraviolet
ft	foot	mm	millimeter	V	volt
ft/s	foot per second	mph	mile per hour	vhf	very high frequency
g	acceleration	m/s	meter per second	W	watt
g	gram	N	newton	λ	wavelength
gr	grain	N·m	newton meter	wt	weight

area=unit^2 (e.g., ft^2, in^2, etc.); volume=unit^3 (e.g., ft^3, m^3, etc.)

PREFIXES

d	deci (10^{-1})	da	deka (10)
c	centi (10^{-2})	h	hecto (10^2)
m	milli (10^{-3})	k	kilo (10^3)
μ	micro (10^{-6})	M	mega (10^6)
n	nano (10^{-9})	G	giga (10^9)
p	pico (10^{-12})	T	tera (10^{12})

COMMON CONVERSIONS
(See ASTM E380)

ft/s×0.3048000=m/s
ft×0.3048=m
ft·lbf×1.355818=J
gr×0.06479891=g
in×2.54=cm
kWh×3600000=J

lb×0.4535924=kg
lbf×4.448222=N
lbf/ft×14.59390=N/m
lbf·in×0.1129848=N·m
lbf/in^2×6894.757=Pa
mph×1.609344=km/h
qt×0.9463529=L

Temperature: $(T_{°F}-32)\times 5/9=T_{°C}$

Temperature: $(T_{°C}\times 9/5)+32=T_{°F}$

NIJ STANDARD
FOR
AUTOLOADING PISTOLS FOR POLICE OFFICERS

1. PURPOSE AND SCOPE

This standard establishes performance requirements and test methods for pistols to be used by law enforcement officers. This standard is a general revision of and supersedes NIJ Standard-0112.02 dated January 1995, and addresses new pistol designs, calibers, revised procedures for verifying headspace, and general revision of the testing procedures. NIJ Standard-0112.02 added the 10 mm and 40 S&W calibers. This revision of the standard deletes the 10 mm and adds the 357 SIG caliber. This standard is intended for use in assessing the acceptability of new or reissue[1] autoloading pistols. It does not address specific safety devices, full or partial magazine release, pistol shot group size, accuracy, or sights, nor does this standard address service life (endurance testing).

2. CLASSIFICATION

The pistols covered by this standard are considered to be those typically carried by law enforcement personnel as their duty weapon.

3. DEFINITIONS

3.1 Barrel Groove Diameter

The diameter of the largest inscribed circle that can be placed inside the barrel.

3.2 Barrel Land Diameter

The diameter of the largest round rod which will fit into the bore of the barrel.

3.3 Double Action

A mode of operation that permits a single pull of the trigger to cock and fire the pistol. (See also **3.16 Single Action** and **3.17 Striker Fire Action**.)

3.4 Firing Malfunction

Failure to feed, fire, or eject a round. This is a subset of a malfunction.

3.5 Grip Safety

A passive safety device that requires an applied force on the grip before the pistol can be fired.

---
[1] All pistols must be examined and reconditioned as necessary by a trained armorer or gunsmith prior to reissue.

3.6 Hammer Spur

Extension of the hammer used to cock the hammer manually.

3.7 Headspace

The distance between the closed breech face of the firearm and the surface of the chamber on which the cartridge case seats.

3.8 Headspace Gage

A device used to facilitate measurement of headspace.

3.9 Magazine Safety

A passive safety device that prevents firing of the pistol unless a magazine is in place.

3.10 Malfunction

Failure to feed, fire, or eject a round or failure to accept or eject a magazine; or failure of the slide to remain open after the last round has been fired.

3.11 Minimum Bore and Groove Area

The minimum allowable open or unrestricted area of the barrel bore as specified by SAAMI[2] Standards.

3.12 Misfire

Failure to fire a round. (See **3.4 Firing Malfunction** and **3.10 Malfunction**).

3.13 Model

The manufacturer's designation which uniquely identifies a specific design of autoloading pistol.

3.14 Model Change

Any change in the design or construction of a model previously tested and found to comply with the NIJ Standard requires a new model designation and testing of the new model to determine compliance with the standard. A **Change in Design or Construction** is defined as any alteration to the basic design or construction of the pistol submitted for testing which, in the concurrent opinion of NIJ, NLECTC, and OLES, has the potential to effect the performance of the pistol in the field or as it relates to the required testing specified in the NIJ Standard.

> Examples which would require retesting under a new and separate model designation include, but are not specifically limited to: Changes in/to: materials of construction (with the exception of the items listed below, and excluding finish); overall size or shape of the weapon; the designated caliber or chambering; the mechanical operation and configuration of the weapon, including safety mechanisms (with the exception of those items listed below); and magazine size or capacity which requires alteration to the grip area.
>
> Examples which would not require retesting under a new and separate model designation include, but are not specifically limited to: Changes in/to: the finish of the pistol; minor variations in materials of construction (i.e., carbon steel vs. stainless steel) or alloys thereof; sights (fixed vs. adjustable); and the location of the safety mechanism (to accommodate left vs. right-handed shooters), as long as the design, configuration and operation of the safety mechanism remains identical to the previously tested and approved model.
>
> Issues not specifically listed above will be reviewed on a case-by-case basis by NIJ, OLES, and NLECTC to determine whether or not a new test will be required.

[2] Sporting Arms and Ammunition Manufacturers Institute, an organization dedicated to establishing and maintaining industry standards for firearms and ammunition.

3.15 Safe Action

Striker fire action. (See **3.17 Striker Fire Action**.)

3.16 Single Action

A mode of operation that uses the trigger to fire the pistol only. (See also **3.3 Double Action**.)

3.17 Striker Fire Action

A pistol design which employs an internal striker mechanism to detonate the primer. In operation, the pistol is normally in a partially cocked condition. Pulling the trigger completes cocking the action, and then releases the striker mechanism to fire the pistol.

3.18 Trigger Pull

The force that must be applied to the trigger to fire the pistol.

4. REQUIREMENTS

4.1 Acceptance Criteria

To satisfy the requirements of this standard, both sample pistols (see Sec. 5.1) must pass all of the requirements and tests specified in this standard.

To be suitable for issue or reissue, a pistol model that has previously met the requirements of this standard must be reconditioned by a trained armorer or gunsmith and as a minimum meet the visual inspection requirements (Sec. 4.3), the dimensional requirements (Sec. 4.4), the functional requirements (Sec. 4.5), and the reissue firing requirement (Sec. 4.6.2).

4.2 User Information

The following minimum information must be supplied in the English language by the manufacturer:

a. Instructions for field disassembly/assembly and diagram(s) identifying all parts.
b. Cleaning instructions.
c. A description of each safety feature designed into the pistol, how each safety feature is intended to function, and for those under shooter control, how the shooter should operate (activate/deactivate) each safety feature.
d. A statement on ammunition known to be beyond the design limits of the pistol (e.g., +P ammunition in a pistol not designed to handle +P ammunition) and/or known not to function in the pistol.
e. A statement identifying how a parts list may be obtained.
f. Certification of compliance with this standard: Manufacturers are prohibited from placing any statement on the pistol itself, the labeling, or accompanying user information that in any way states, infers, or otherwise suggests that the model complies with the requirements of this standard until such time as the model has successfully completed testing at an NIJ-approved testing facility, and a letter of compliance for the model tested has been issued to the manufacturer by NLECTC. At that time, the manufacturer may place the following statement in the required user information:

> *"The manufacturer certifies that this model of autoloading pistol has been tested and found to comply with the requirements of NIJ Standard-0112.03, dated November, 1998."*

Manufacturers may supply any other information that they believe may be needed by the user for proper and safe operation of their handgun.

4.3 Visual Inspection

4.3.1 Hammer Travel

In the single action mode, if present, the hammer shall have sufficient over-travel to assure achievement of the full cocked position.

4.3.2 Particles

There shall be no loose chips, shavings or filings in the pistol.

4.3.3 Surface

The pistol shall have no chips, scratches, or burrs. There shall be no sharp edges or corners that could cut the shooter's hand while firing or during manual cycling of the pistol.

4.4 Dimensional Requirements

4.4.1 Barrel Bore Dimensions

The barrel bore diameter shall be in accordance with SAAMI Standards for the caliber for which the pistol is chambered (see App. A). The barrel shall meet the specifications for either bore and groove diameter or minimum bore and groove area.

4.4.2 Headspace

The headspace shall be in accordance with SAAMI Standards for the caliber for which the pistol is chambered (see App. A).

4.5 Functional Requirements

4.5.1 Action

The slide shall operate smoothly without binding or sticking when operated by hand or during firing tests (see Secs. 5.5.1 and 5.6).

4.5.2 Ejection

The ejection mechanism shall eject cases without hangup and without hitting the shooter during the ejection test (Sec. 5.5.2) or the firing tests (Sec. 5.6), except as provided in Sections 4.6 and 4.8.

4.5.3 Trigger

a. The single action trigger pull force shall be not less than 13 N (3 lbf) nor more than 36 N (8 lbf) when tested in accordance with Section 5.5.3.[3]

b. The double action trigger pull force shall be no more than 80 N (18 lbf) when tested in accordance with Section 5.5.3.[3]

c. For a pistol employing a striker fire mechanism, the trigger pull force shall be not less than 22 N (5 lbf) nor more than 67 N (15 lbf) when tested in accordance with Section 5.5.3.[3]

4.5.4 Hammer

When tested in accordance with Section 5.5.4, the hammer shall operate smoothly without binding and shall not release under an applied load of 46 N $\pm$ 1 N (10 1/4 lbf $\pm$ 1/4 lbf).

[3] N, the metric unit or force, is equal to 0.2248 lbf. For the purpose of this standard all conversions from Newton to pound-force for required values and measurements have been rounded to the nearest 1/4 lbf.

4.5.5 Safety Features

The pistol shall have one or more design features to prevent inadvertent firing. Active (user activated) safety devices, if provided, shall be designed so that the pistol can be made fire-ready by releasing the safety(s) with the shooting hand.

The pistol shall not fire when tested in accordance with Section 5.5.5.

4.5.6 Magazine

The magazine shall have a capacity of six rounds, minimum, and shall be capable of being released without removing the shooting hand from the pistol.

4.6 Firing Requirement

4.6.1 Model Qualification Firing Requirement

When tested in accordance with Section 5.6.1, the pistol shall fire 600 rounds of ammunition with no structural or mechanical failures and no more than five malfunctions. Of the five allowable malfunctions no more than three shall be firing malfunctions not attributable to faulty ammunition (see Sec. 5.6).

4.6.2 Reissue Firing Requirement

The pistol shall function with the ammunition used by the issuing department when tested in accordance with Section 5.6.2. The department is free to increase the number of rounds to be fired. However, the minimum number of rounds that are required is equal to twice the maximum capacity of a magazine times the number of magazines issued with the pistol. For tests of 200 rounds or less, there shall be no more than one malfunction not attributable to faulty ammunition.

4.7 Drop Safety Requirement

The pistol shall not fire during the drop test described in Section 5.7.

4.8 Drop Function Requirement

The pistol shall exhibit no more than three malfunctions when tested as in Section 5.8.

5. TEST METHODS

All firing tests shall be performed with a shooter provided by the manufacturer. Mechanical rests, if desired by the manufacturer, may be used. In addition to the shooter, a manufacturer may have one additional representative present to witness the test. Should any test sample fail a specific test, the data for that test shall be recorded and testing continued, if possible, until all the tests required by this standard are completed.

In the event that a pistol model fails to comply with only one of the requirements of this standard, the manufacturer may elect to resubmit that model to NLECTC for retesting under the same model designation as previously tested. The manufacturer must include a written explanation with the samples submitted for retesting indicating why, in their opinion, the model failed this portion of testing and what steps they have taken to correct the cause of failure. Assuming that the steps taken do not fall under the definition of Model Change (Sec. 3.14), the model will be retested only for that portion of the test which it originally failed, with the exception of the Drop Function Test (Sec. 5.8), where the Drop Safety Test (Sec. 5.7) must also be performed.

A model which passes retesting under this criteria will be considered to be in compliance with the requirements of this standard. A model which fails retesting will have to be submitted under a new model designation.

Samples that fail more than one of the performance tests required by the standard shall be considered as having failed the compliance testing, and may not be resubmitted under the same model designation.

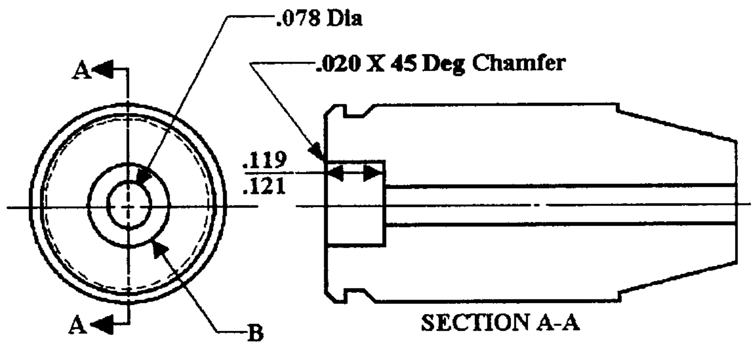
5.1 Sampling

Two representative samples of each pistol model to be tested are required. The samples can be selected at random from the current purchase lot for acceptance testing, recognizing that the two tested pistols probably will not be suitable for field issue after testing. NOTE: The pistols must be examined by a trained armorer or gunsmith after testing and reconditioned as necessary if issue of these two pistols is contemplated. Alternatively, two test pistols can be supplied by the manufacturer for qualification compliance testing separately from the purchase lot, in which case they shall be selected randomly from the current production.

5.2 Special Test Equipment

5.2.1 "Go," "No-Go" Headspace Gages

These headspace gages are commercially available hardened steel gages used to verify the headspace of pistols firing from a locked breech condition. The "Go" gage verifies that the headspace of the pistol is equal to or greater than the SAAMI minimum headspace for the caliber for which the pistol is chambered. The "No-Go" gage verifies that the headspace of the pistol is not greater than the SAAMI maximum headspace for the caliber for which the pistol is chambered. The headspace gages to be used in this testing shall be standard commercial headspace gages, except that they shall be modified to permit the installation of a standard primer (of the appropriate size for the caliber of the gage), as well as a vent of 0.2 cm (0.078 in) dia located on the longitudinal axis of each gage (Fig. 1). Unfired primers will be in place in each headspace gage during the testing, and will be used to verify whether the hammer struck the firing pin with sufficient force to cause the pistol to fire during the headspace testing.



B = 0.4406 cm ± .0013 cm (0.1735 in ± .0005 in) Dia for 9 mm, 357 Sig & 40 S&W; 0.5308 cm ± .0013 cm (0.2090 in ± .0005 in) Dia for 45 ACP.

FIGURE 1. *"Go," "No-Go" headspace gages, modified for NIJ Standard-0112.03 tests.*

5.3 Visual Inspection

Verify that the pistol is unloaded.

5.3.1 Hammer

Cock the external hammer, if one is present, to the single action full-cock position if the weapon will fire single action. Verify that there is perceptible travel past this position.

5.3.2 Particles

Examine the pistol. Note any shavings or filings that should not be inside the pistol.

5.3.3 Surface

Examine the pistol's surfaces. Note any chips, scratches, sharp edges, burrs, or rust spots.

5.4 Dimensional Tests

5.4.1 Barrel Bore Dimensions

The Barrel Bore dimensions shall be verified by either Sec. 5.4.1.1 or 5.4.1.2.

5.4.1.1 Groove and Land Diameters

Measure the diameter of the largest circle that can be inscribed in the bore of the barrel at the muzzle. This shall be the **"Groove Diameter,"** and shall be within the limits defined by SAAMI for the caliber of the pistol (see App. A).

Determine the largest diameter round rod which will fit into the bore of the barrel. This shall be the **"Land Diameter,"** and shall be within the limits defined by SAAMI for the caliber of the pistol (see App. A).

5.4.1.2 Minimum Bore and Groove Area

The **"Minimum Bore and Groove Area"** shall be determined in accordance with the SAAMI Standards, and shall meet or exceed the value specified for that specific caliber (see App. A).

5.4.2 Headspace

CAUTION: In all tests involving a headspace gage, do not force the gages or allow the mechanism to slam shut on a gage, since one or the other may be damaged.

NOTE: In all tests involving a headspace gage, verify that the extractor does not prevent the slide from reaching its forwardmost position—if the extractor does catch on the gage, manipulate the slide until the extractor slides over the rim of the gage, permitting the slide to move to its forwardmost position.

NOTE: In all tests involving a headspace gage with a live primer installed, the primer shall be seated flush with or 0.020 cm (0.008 in) below the base of the gage.

Examine the firing mechanism of the pistol to determine if the slide is physically restrained in a fixed position relative to the barrel when the weapon is ready to fire but without a cartridge in the chamber.

For pistols designed to physically lock the slide to the barrel in the firing position, verify that the headspace of the pistol meets the headspace requirements of this Standard in the following manner:

a) Insert a "Go" headspace gage, with a live primer installed, into the chamber. Release the slide slowly until the slide stops and verify that the slide reached its mechanically locked position, and that the hammer will fall and strike the firing pin with sufficient force to cause the primer to detonate when all safeties are disengaged and the trigger is pulled.

b) Remove the "Go" headspace gage, and install a "No-Go" headspace gage, with a live primer installed, into the chamber. Release the slide slowly until the slide stops and verify that the slide did not reach its mechanically locked position, and that the hammer is restricted from striking the firing pin (either will not fall or is blocked from striking the firing pin) with sufficient force to cause the primer to detonate when all safeties are disengaged and the trigger is pulled.

For pistols designed with slides that are not locked to the barrel in the firing position, verify that the headspace of the pistol meets the headspace requirements of this Standard in the following manner:

a) Determine the location of the slide relative to the barrel at which the hammer will fall when all safeties are disengaged and the trigger is pulled without a round in the chamber.

b) Insert a “Go” headspace gage, with a live primer installed, into the chamber. Release the slide slowly until the slide stops and verify that the slide travelled at least to the location noted in step a) above, and that the hammer will fall and strike the firing pin with sufficient force to cause the primer to detonate when all safeties are disengaged and the trigger is pulled.

c) Insert a “No-Go” headspace gage, with a live primer installed, into the chamber. Release the slide slowly until the slide stops and verify that the slide will not travel to the location noted in step a) above, and that the hammer will not fall and strike the firing pin with sufficient force to cause the primer to detonate when all safeties are disengaged and the trigger is pulled.

5.5 Function Tests

5.5.1 Action

a. Operate the unloaded pistol in all of its action modes.

b. Pull the slide fully to the rear and release it to battery position. In each case note any sticking, binding, grittiness, or hesitation.

5.5.2 Ejection Test

Load the pistol with a full magazine of ammunition and then fire the full load into a bullet trap or other suitable device. Note any failure to eject, if any ejected cases hit the shooter, and whether the slide remains open after the last round.

5.5.3 Trigger Pull Test

With the pistol empty, apply a load to the rearmost part of the front surface of the trigger so that the load is parallel to the barrel to within 5° (Fig. 2). Weights or spring gages may be used to apply the specified load. If weights are used (which is the recommended method), the pistol shall be mounted in a fixture with the barrel vertical, and the muzzle up.

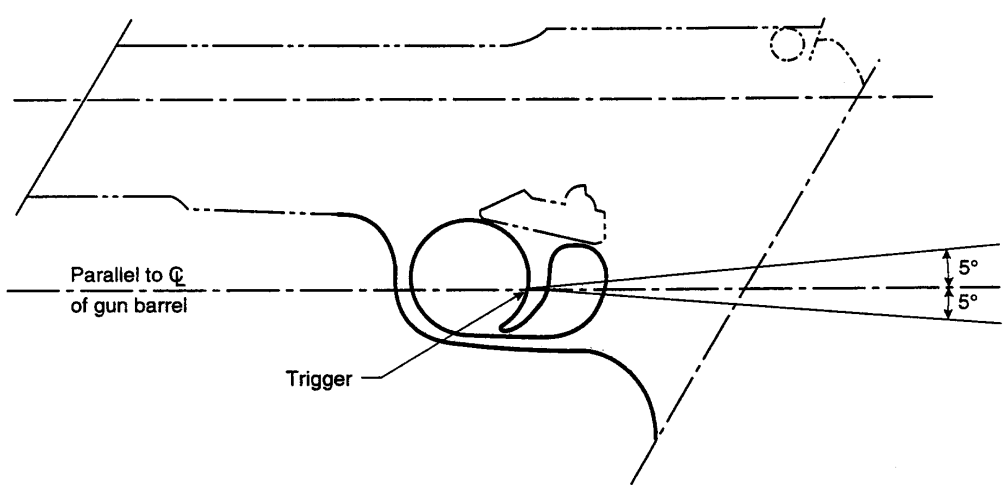


FIGURE 2. *Trigger pull test setup.*

a. Single action. Cock the hammer or striker. Apply a 12 N (2 3/4 lbf) load to the trigger and uniformly increase it in 1 N (1/4 lbf) increments until the load of 36 N (8 lbf) has been applied or until the hammer releases. Record the load.

b. Double action and Striker Fire Action. With the hammer or striker in the normal carry position, apply a 12 N (2 3/4 lbf) load to the trigger and uniformly increase it in 1 N (1/4 lbf) increments until a load of 80 N (18 lbf) has been applied or until the pistol cocks and fires on the empty chamber. Record the load.

5.5.4 Hammer "Push-Off" Test

With the pistol empty, cock the hammer if the weapon will fire single action and release it by pulling the trigger several times to check for smoothness of operation. Fully cock the hammer and load it with a 46 N ± 1 N (10 1/4 lbf ± 1/4 lbf) force applied to the rearmost part of the hammer spur and tangential to hammer's arc (Fig. 3).

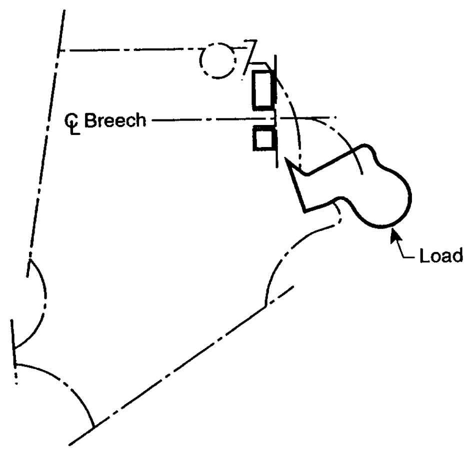


FIGURE 3. *Hammer test setup.*

5.5.5 Safety Features Test

Obtain from the manufacturer a description of the design feature(s) included in the pistol to ensure that the pistol will discharge only through the proper operation of the trigger mechanism, the list of parts that implement the design feature(s), and the manner in which the safety feature(s) operate. Verify that all of the safety parts are present, that they operate in the manufacturer's intended manner, and that the feature(s) perform their intended function. Note: This description should be in the user information supplied by the manufacturer (see Sec. 4.2).

Chamber a primed case (no propellant or projectile) and attempt to fire the pistol, with the safety device engaged, into a bullet trap or other suitable device to determine whether the round discharges. If a pistol has more than one safety device, disengage all but one to conduct the test. Repeat, using the second safety device. Continue in this manner until all safety devices have been tested. In some designs the removal of parts to disable one safety feature may affect the performance of another safety feature. If assistance is needed to test each safety feature independently, consult with the manufacturer.

5.5.6 Magazine Test

Check the ease of insertion and removal of the magazine(s) by inserting each unloaded magazine into the pistol and releasing it in accordance with the manufacturer's instructions. Note any binding or sticking during insertion and release.

5.6 Firing Test

5.6.1 Model Qualification Firing Test

Fire a total of 600 rounds of ammunition as shown by cartridge type in Appendix B. For pistols with both a single and double action mode, fire the first round of each magazine in double action mode. Before firing, examine the pistol for defects such as loose screws, cracks, etc. After every 200 rounds tighten any loose screws, measure trigger pull

(Sec. 5.5.3) and headspace (Sec. 5.4.2), and clean the pistol according to the manufacturer's recommendations in the provided user information. Also, determine from the manufacturer how, without firing the pistol, to lower the hammer when there is a live round in the pistol's chamber. It is necessary for safety reasons to be sure of the correct procedure. Place an empty magazine in the pistol, pull the slide all the way to the rear, and verify that the slide hold-open mechanism operates. Remove the magazine from the pistol and verify that the slide remains open. Load the magazine to maximum capacity, point the pistol at a suitable bullet trap, and insert the loaded magazine into the pistol. Release the slide hold-open mechanism to chamber a round. For double action pistols, lower the hammer so that the first shot can be fired in double action mode. Fire into a bullet trap or other suitable device until the magazine is empty. Fire the first six rounds in 5 s. The firing rate for the remainder of the test must be at least one round every 2 s and no greater than two rounds per second. Increments of 100 rounds must be fired with no delays except to reload or to determine causes of malfunctions. Note all misfires and whether the pistol ejects and feeds properly. Also observe whether the slide remains in the open position after the last round in the magazine has been fired.

After each magazine has been emptied, check the release mechanism for easy removal of the magazine. Check for smooth easy insertion of the reloaded magazine.

If feed or release problems are experienced during the first 50 rounds, replace the magazine with a different one and continue testing to determine whether the problems were caused by a faulty magazine. If a faulty magazine is suspected, note that the magazine was suspect and begin testing again at round zero with the new magazine.

Should three or more misfires occur during the 600 round test sequence, examine the primers in the misfired cartridges. If it is obvious that the misfires are the fault of the pistol (e.g., very shallow or no indentation of the primer), the pistol has failed to meet the requirements of the standard. If it is not obvious that the misfires are the fault of the pistol, repeat the entire firing test as stated above, except that the dimensional measurements (headspace, trigger pull) need not be made. If the pistol passes the second 600 round test, it meets the requirements. If three or more misfires occur during the second 600 rounds, and again it is not clearly the fault of the pistol, the ammunition manufacturer should be consulted to determine the condition of the misfired ammunition.

5.6.2 Reissue Firing Requirement

Perform the firing test of Section 5.6.1 using the department's standard issue ammunition and the magazine(s) that will be issued with the pistol. If there is more than one magazine, each magazine is to be used an equal number of times. The dimensional measurements (headspace, trigger pull) need not be made. Should there be too many malfunctions proceed as in Section 5.6.1 to determine if the ammunition is at fault.

5.7 Drop Safety Test

Pull the slide fully rearward and lock it in the rear position. Insert a primed case (no powder or projectile) into the chamber. Release the slide, allowing it to move forward under the impetus of the recoil spring. Insert a magazine loaded to capacity with dummy ammunition (a standard round with projectile in place, but no primer and no propellant), and place the pistol in a drop fixture capable of dropping the pistol from a drop height of 1.22 m (4 ft) onto a 85 ± 5 Durometer (Shore A) rubber mat, 2.54 cm (1 in) thick, backed by concrete. The mat and concrete shall be large enough so that when the pistol is dropped it will fall and come to rest without interference within the perimeter of the mat. The drop height shall be measured from the surface of the rubber mat to the center of gravity of the firearm. The center of gravity shall be determined to an accuracy of $\pm$ 2.54 cm (1 in) by any recognized method for finding the center of gravity of an irregular object. The pistol shall be cycled and returned to the specified testing condition after each drop, or a separate pistol may be used for each drop.

The pistol shall not be dropped from a hand; a fixture is required. However, the pistol shall be dropped in the condition (i.e., cocked, no manual safety applied, etc.) that the pistol would be in if it were dropped from a hand. If the design of the pistol is such that upon leaving the hand a "safety" is automatically applied by the pistol, this feature shall not be defeated. One fixture found to be suitable consists of a short piece of string with the pistol attached at one end and the other end held in an air vise until the drop is initiated.

The following six drops are required:

1. Normal firing position; barrel horizontal.
2. Upside down; barrel horizontal.
3. On grip; barrel vertical.
4. On muzzle; barrel vertical.
5. On either side; barrel horizontal.
6. If there is an exposed hammer or striker, on the rearmost point of that device; otherwise on the rearmost point of the pistol.

Examine the primer for indentations after each drop. If indentations are present, a fresh primed case must be used for the next drop. Firing of the primer constitutes failure of the test.

5.8 Drop Function Test

After completing the drops specified in the drop safety test (Sec. 5.7), examine the pistols for damage and note any cracks, chips, or other visible damage. For those pistols that passed the drop safety test without structural damage, insert a fully loaded magazine, chamber a round, point the pistol into a bullet trap or other suitable device. Fire until the ammunition has been expended. Release the magazine (note any sticking or binding), reload and repeat until 20 rounds have been fired. Note any misfires or malfunctions. If there are more than three malfunctions, repeat the 20 round firing test. If there are no more than three malfunctions during the repeat firing test, the pistol meets the requirements of this test.

APPENDIX A—REFERENCE DIMENSIONS

TABLE A—*Bore Dimensions**
(dimensions in millimeters (inches))

Caliber	*Land Dia. (min)*	*Groove Dia. (max)*	*Min. Bore & Groove Area, mm^2 (in^2)*
9 mm Luger	8.8 (.346)	9.0 (.355)	2.46 (.0967)
357 Sig	8.8 (.346)	9.0 (.355)	2.46 (.0969)
40 S & W	10.0 (.390)	10.2 (.4005)	3.13 (.1233)
45 ACP	11.2 (.442)	11.4 (.450)	4.0 (.1570)

(dimensions in millimeters)

Caliber	*Land Dia. (min)*	*Groove Dia. (max)*	*Min. Bore & Groove Area, cm^2*
9 mm Luger	8.788	9.017	.6239
357 Sig	8.788	9.017	.6252
40 S & W	9.906	10.173	.7955
45 ACP	11.227	11.430	1.0129

TABLE B—*Headspace Dimensions**
(dimensions in millimeters (inches))

Caliber	*Minimum Headspace*	*Maximum Headspace*
9 mm Luger	19.20 (.754)	19.71 (.776)
357 Sig	21.97 (.865)	22.28 (.877)
40 S & W	21.59 (.850)	21.90 (.862)
45 ACP	22.81 (.898)	23.37 (.920)

(dimensions in millimeters)

Caliber	*Minimum Headspace*	*Maximum Headspace*
9 mm Luger	19.152	19.710
357 Sig	21.971	22.276
40 S & W	21.590	21.895
45 ACP	22.809	23.368

* Presented for reference only—refer to SAAMI Standards.

APPENDIX B—AMMUNITION FOR FIRING TESTS

(Commercial Manufacturer, supplied by Pistol Manufacturer)

Caliber	*200 Rounds*	*400 Rounds*
9 mm Luger	115 g FMJ	124 g JHP
357 Sig	125 g FMJ	125 g JHP
40 S & W	155 g FMJ	180 g JHP
45 ACP	230 g FMJ	185 g JHP

APPENDIX C—TEST REPORT FORM

This Compliance Test Report form shall be used in conjunction with NIJ Standard-0112.03, Autoloading Pistols for Police Officers, and shall become a part of the official records of the compliance testing of pistols submitted. All sections of the form shall be completed.

Verification of the information recorded on the Compliance Test Report form shall be documented by the initials and date in the QA blocks provided of unbiased personnel assigned by NIJ (i.e., not a representative of either the test facility or pistol manufacturer), who will monitor the testing and verify information on this form.

COMPLIANCE TEST REPORT

Autoloading Pistols for Police Officers

Test Number: ______________

5.1 Pistols Submitted for Testing: **Date submitted:** ______________

Manufacturer: ______________________________

Address: ______________________________

____

City, State, Zip: ______________________________

Country: ______________________________

This test is for (check one) **Compliance Testing**: ________ **Reissue:** ________

Pistol #1:

Brand Name: ______________ Model: ______________

Serial Number: ______________ Caliber: ______________

Action type (check one):

Single Action: ___ Double Action: ___ Double Action Only: ___ Striker Fire Action: ___

Magazine Capacity: _______ # Magazines provided with pistol:______

Pistol Finish: ______________________________

Safeties: Active: ______________________________

Passive: ______________________________

User Information Provided with Pistol Acceptable (see Sec. 4.2): (Y or N) ____

QA ______________

Pistol #2:

Brand Name: ______________ Model: ______________

Serial Number: ______________ Caliber: ______________

Action type (check one):

Single Action: ___ Double Action: ___ Double Action Only: ___ Striker Fire Action: ___

Magazine Capacity: _______ # Magazines provided with pistol:_____

Pistol Finish: ______________________________

Safeties: Active: ______________________________

Passive: ______________________________

User Information Provided with Pistol Acceptable (see Sec. 4.2): (Y or N) ____________

QA ______________

Compliance Test Report*—Continued*

5.3 Visual Inspection: Verify that the pistol is unloaded. **QA**____________________

5.3.1 Hammer

Cock the external hammer, if one is present, to the single action full-cock position if the weapon will fire single action. Verify that there is perceptible travel past this position.

QA____________________

5.3.2 Particles

Examine the pistol. Verify that there are no shavings or filings that should not be inside the pistol.

QA____________________

5.3.3 Surface

Examine the pistol's surfaces. Note and record any chips, scratches, sharp edges, burrs, or rust spots.

____

____ **QA**____________________

5.4 Dimensional Tests:

5.4.1 Barrel Bore Dimensions

The Barrel Bore dimensions shall be verified by either 5.4.1.1 or 5.4.1.2.

5.4.1.1 Groove and Land Diameter

Measured Groove Diameter: ______________

Measured Land Diameter: ______________

5.4.1.2 Minimum Bore and Groove Area

Minimum Bore and Groove Area: _____________

Pistol #1 meets the SAAMI Standards for Bore Dimensions (Y or N): ____ **QA**________________

Pistol #2 meets the SAAMI Standards for Bore Dimensions (Y or N): ____ **QA**________________

5.4.2 Headspace

Pistol #1 meets the SAAMI Standards for Headspace (Y or N):___ **QA**____________________

Pistol #2 meets the SAAMI Standards for Headspace (Y or N):___ **QA**____________________

5.5 Function Tests

5.5.1 Action

Pistol #1 Action Function (Pass or Fail):____________________ **QA**____________________

comments:____

Pistol #2 Action Function (Pass or Fail):____________________ **QA**____________________

comments:____

Compliance Test Report*—Continued*

5.5.2 Ejection Test

Pistol #1 Ejection Test (Pass or Fail):__________ **QA**__________________

Pistol #2 Ejection Test (Pass or Fail):__________ **QA**__________________

5.5.3 Trigger Pull Test

Pistol #1 Measured Trigger Pull:______________ **QA**__________________

Pistol #2 Measured Trigger Pull:______________ **QA**__________________

5.5.4 Hammer "Push-Off" Test

Pistol #1 "Push-Off" (Pass or Fail):____________ **QA**__________________

Pistol #2 "Push-Off" (Pass or Fail):____________ **QA**__________________

5.5.5 Safety Features Test

Pistol #1 Safety Features (Pass or Fail):________ **QA**__________________

Pistol #2 Safety Features (Pass or Fail):________ **QA**__________________

5.5.6 Magazine Test

Pistol #1 Magazine Test (Pass or Fail):_________ **QA**__________________

Pistol #2 Magazine Test (Pass or Fail):_________ **QA**__________________

5.6 Firing Test

5.6.1 Model Qualification Firing Test (see Sec. 4.6.1 for number and types of malfunctions allowed)

Pistol #1 Firing Test: # pistol-caused malfunctions:__________
types of malfunction(s)________________________

Pistol #1 Firing Retest: # pistol-caused malfunctions: ________
types of malfunction(s):____

Pistol #1 Firing Test (Pass or Fail):___________ **QA**__________________

Pistol #2 Firing Test: # pistol-caused malfunctions:________
types of malfunction(s):____

Pistol #2 Firing Retest: # pistol-caused malfunctions: ________
types of malfunction(s):____

Pistol #2 Firing Test (Pass or Fail):___________ **QA**__________________

Compliance Test Report*—Continued*

5.6.2 Reissue Firing Requirement (if applicable):

Pistol Serial Number__________________ (Pass or Fail):_______ **QA**______________

5.7 Drop Safety Test:

Pistol #1:

Drop #1: Normal firing position; barrel horizontal. (Pass or Fail):____ **QA**______________

Drop #2: Upside down; barrel horizontal. (Pass or Fail):____ **QA**______________

Drop #3: On grip; barrel vertical. (Pass or Fail):____ **QA**______________

Drop #4: On muzzle; barrel vertical. (Pass or Fail):____ **QA**______________

Drop #5: On either side; barrel horizontal. (Pass or Fail):____ **QA**______________

Drop #6: If there is an exposed hammer or striker, on the rearmost point of that device; otherwise on the rearmost point of the pistol. (Pass or Fail):____ **QA**______________

Pistol #2:

Drop #1: Normal firing position; barrel horizontal. (Pass or Fail):____ **QA**______________

Drop #2: Upside down; barrel horizontal. (Pass or Fail):____ **QA**______________

Drop #3: On grip; barrel vertical. (Pass or Fail):____ **QA**______________

Drop #4: On muzzle; barrel vertical. (Pass or Fail):____ **QA**______________

Drop #5: On either side; barrel horizontal. (Pass or Fail):____ **QA**______________

Drop #6: If there is an exposed hammer or striker, on the rearmost point of that device; otherwise on the rearmost point of the pistol. (Pass or Fail):____ **QA**______________

5.8 Drop Function Test

Pistol #1 after Drop Safety Test:

Cracks, chips, or other visible damage:____

Structural damage (Yes or No): _______ **QA**__________________________

Drop Function test: # malfunctions:_______

Drop Function retest: # malfunctions:_______

Pistol #1 Drop Function Test (Pass or Fail): _________ **QA**__________________________

Pistol #2 after Drop Safety Test:

Cracks, chips, or other visible damage:____

Structural damage (Yes or No): _______ **QA**__________________________

Drop Function test: # malfunctions:_______

Drop Function retest: # malfunctions:_______

Pistol #2 Drop Function Test (Pass or Fail): _________ **QA**__________________________

Compliance Test Report*—Continued*

Test Results

Test Number:______________

Date of Test: _____________

Type of Test: Compliance____ **Reissue**____

Make: ________________ **Model**: ________________ **Caliber**:_________________

Pistol #1 serial number:______________

Pistol #2 serial number:______________

Compliance Test (Pass or Fail): ____________

Reissue Test (Pass or Fail):________________

Test Laboratory____

Test Conductor: _________________________signature:____

Manufacturer:____

Mfg. Representative:______________________signature:____

Shooter (from Mfg.):______________________signature:____

Quality Assurance:_______________________signature:____

This completed Compliance Test Report Form shall be submitted to:

NLECTC
ATTN: Testing Coordinator
2277 Research Blvd.
Rockville, MD 20850

for review and subsequent issuance of official NIJ Certificate of Compliance (if applicable).

MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIRETORIA DE OPERAÇÕES

OFÍCIO Nº 21/2019/PE-405/DIROP

Brasília, 13 de agosto de 2019.

À DIREX
Brasília/DF

Assunto: Padronização do Sistema de armas Glock

Senhor Diretor Executivo,

1. Considerando que a etapa de estudos, pesquisas, testes relativo as armas de porte dentro da PRF foi finalizada ainda em 2017, o que culminou com a substituição integral de todas as armas de porte anteriomente utilizadas pela PRF.

2. Considerando as atribuições inerentes ao Projeto ARM, no que tange a "propor melhorias, otimizações, mudanças, substituições, padronizações e possíveis aquisições com base nos estudos realizados", bem como o que prescreve o artigo 15 da Lei 8666, de 21 de junho de 1993, em seu inciso I, que estabelece que "As compras, sempre que possível, deverão: I - atender ao princípio da padronização, que imponha compatibilidade de especificações técnicas e de desempenho, observadas, quando for o caso, as condições de manutenção, assistência técnica e garantia oferecidas; "

3. Encaminhamos o RTPRF 02.2019 (SEI nº 19991214) que trata sobre sugestão de padronização para as armas de porte da PRF.

Respeitosamente,

FRANCISCO RODRIGUES DE OLIVEIRA NETO
Gerente do Projeto ARM

De acordo,

FABIO ELISSANDRO CASSIMIRO RAMOS
Coordenador do Comando de Operações Especializadas e de Fronteira

De acordo,

JOÃO FRANCISCO RIBEIRO DE OLIVEIRA
Diretor de Operações

Documento assinado eletronicamente por **FRANCISCO RODRIGUES DE OLIVEIRA NETO**, **Policial Rodoviário(a) Federal**, em 13/08/2019, às 11:17, horário oficial de Brasília, com fundamento no art. 10, § 2º, da Medida Provisória nº 2.200-2, de 24 de agosto de 2001, no art. 6º do Decreto nº 8.539, de 8 de outubro de 2015, e no art. 42 da Instrução Normativa nº 116/DG/PRF, de 16 de fevereiro de 2018.

Documento assinado eletronicamente por **FABIO ELISSANDRO CASSIMIRO RAMOS**, **Coordenador(a) de Operações Especializadas e de Fronteiras**, em 13/08/2019, às 15:32, horário oficial de Brasília, com fundamento no art. 10, § 2º, da Medida Provisória nº 2.200-2, de 24 de agosto de 2001, no art. 6º do Decreto nº 8.539, de 8 de outubro de 2015, e no art. 42 da Instrução Normativa nº 116/DG/PRF, de 16 de fevereiro de 2018.

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MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIRETORIA-EXECUTIVA

Despacho nº 277/2019 - DIREX

À COAT

Assunto: Padronização do Sistema de armas Glock

Senhor Coordenador,

1. Trata-se de sugestão de padronização para as armas de porte da PRF, conforme RTPRF 02.2019 (SEI nº 19991214), encaminhado pelo Projeto ARM.

2. Evoluo o presente para que seja preparada minuta de Catálogo de Armamento da PRF, em caráter prioritário, possibilitando pautar as tratativas pertinentes com a Diretoria.

Atenciosamente,

JOSÉ LOPES HOTT JUNIOR
Diretor-Executivo

MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIRETORIA-EXECUTIVA

Despacho nº 71/2019/COAP

Brasília, 09 de dezembro de 2019.

DESTINO(S): **DIRAD**

ASSUNTO: Padronização do Sistema de armas Glock.

1. Trata-se de expediente apresentado pela Diretoria-Executiva - DIREX, nos termos do Despacho nº 277/2019 - DIREX (SEI nº 20706684), por meio do qual solicita elaboração de minuta de Catálogo, contendo padronização para as armas de porte desta Polícia Rodoviária Federal, em atenção ao Relatório Estratégico RTPRF 02.2019 (SEI nº 19991214), elaborado pelo Projeto Estratégico Armamento institucional - PE-405.

2. Nesse contexto, diante da particularidade da temática em comento e considerando as competências reservadas a essa Diretoria e suas respectivas áreas subordinadas a exemplo da DIPAM e DIPRO, envio o presente processo para conhecimento, análise e providências necessárias ao atendimento do pleito, conforme recomendado no supracitado relatório, abaixo replicado:

> (...)
> **RECOMENDAMOS:**
>
> **Padronizar**, no âmbito da Polícia Rodoviária Federal - PRF, como Sistema de Armas de porte da PRF, as pistolas calibre 9 x 19 mm, da fabricante GLOCK Ges.m.b.H;
>
> **Definir** os modelos G17, G17 MOS e G26 e suas versões de treinamento (G17 R, G17 T, G17 Cutaway), como os únicos modelos de arma de porte que devem ser adquiridos para uso ostensivo e dissimulado nas próximas aquisições a serem realizadas pela PRF.
>
> **Definir** como certificações mínimas necessárias para aquisição das referidas armas de porte de uso ostensivo e/ou dissimulado, o atendimento aos seguintes testes pertencentes ao Protocolo OTAN - AC/225 (LG/3-SG/1) D14 (SEI nº 20664052):
>
> - Intercambiabilidade de peças - Método 2.18.3;
> - Inspeção preliminar, características das armas e dos disparos - Método 2.1;
> - Disparo em Seco (Resistência) - Método 2.5.2.2;
> - Verificação da precisão (Precisão e dispersão) - Método 2.4.2;
> - Teste de temperatura extrema e condições agravadas - Método 2.9.1.2 (Teste de frio); Método 2.9.2.2 (Teste de alta temperatura);

Método 2.13.1.2 (Sem lubrificação);

- Teste de temperatura e umidade - Método 2.9.3.2
- Teste de imersão em água salina - Método 2.13.4
- Teste de névoa salina - Método 2.13.3
- Teste de arrasto em areia - Método 2.13.6
- Teste dinâmico de poeira e areia - Método 2.13.5.2.2
- Teste de lama - Método 2.13.7
- Teste de pulverização acelerada com água Método 2.13.2
- Teste de congelamento Método 2.9.4
- Teste de resistência Método 2.5.3
- Teste de queda Método 2.15.3
- Teste de obstrução por projétil Método 2.10.3.2.1, no que for aplicável.

Definir como certificação complementar necessária para aquisição das referidas armas de porte de uso ostensivo, o atendimento ao Protocolo:

- NIJ Standard - 0112.03 (Autoloading Pistols For Police Officers) SEI nº (20664058):

Os referidos testes de ambos os protocolos citados não se aplicam às versões de treinamento, haja vista que as mesmas não são empregadas com munições letais reais, muito menos em situações operacionais, não necessitando portanto de teses de simulem essas situações.

Poderão ser aceitos testes realizados por protocolos diferentes destes elencados, desde que realizem os testes aqui descritos nas mesmas condições ou em condições mais rigorosas.

Respeitosamente,

TIAGO DA CUNHA FERRON
Coordenador de Apoio Processual

Documento assinado eletronicamente por **EDUARDO AMARAL BERTAO**, **Coordenador(a)-Geral de Análise Técnica**, em 19/12/2019, às 16:26, horário oficial de Brasília, com fundamento no art. 10, § 2º, da Medida Provisória nº 2.200-2, de 24 de agosto de 2001, no art. 6º do Decreto nº 8.539, de 8 de outubro de 2015, e no art. 42 da Instrução Normativa nº 116/DG/PRF, de 16 de fevereiro de 2018.

Documento assinado eletronicamente por **TIAGO DA CUNHA FERRON**, **Coordenador(a) de Apoio Processual**, em 19/12/2019, às 17:12, horário oficial de Brasília, com fundamento no art. 10, § 2º, da Medida Provisória nº 2.200-2, de 24 de agosto de 2001, no art. 6º do Decreto nº 8.539, de 8 de outubro de 2015, e no art. 42 da Instrução Normativa nº 116/DG/PRF, de 16 de fevereiro de 2018.

Documento assinado eletronicamente por **JOSE LOPES HOTT JUNIOR**, **Diretor(a)-Executivo(a)**, em 23/12/2019, às 10:26, horário oficial de Brasília, com fundamento no art. 10, § 2º, da Medida Provisória nº 2.200-2, de 24 de agosto de 2001, no art. 6º do Decreto nº 8.539, de 8 de outubro de 2015, e no art. 42 da Instrução Normativa nº 116/DG/PRF, de 16 de fevereiro de 2018.

Referência: Processo nº 08650.014484/2019-40 SEI nº 23118879

MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIRETORIA DE ADMINISTRAÇÃO E LOGÍSTICA

Despacho nº 3262/2019/DIRAD

Brasília, 23 de dezembro de 2019.

DESTINO(S): Coordenação-Geral de Administração - CGA
ASSUNTO:Padronização do Sistema de armas Glock.

Em atenção ao Despacho nº 71/2019/COAP (SEI 23118879), que trata de expediente apresentado pela Diretoria-Executiva - DIREX, nos termos do Despacho nº 277/2019 - DIREX (SEI nº 20706684), por meio do qual solicita elaboração de minuta de Catálogo, contendo padronização para as armas de porte desta Polícia Rodoviária Federal, em atenção ao Relatório Estratégico RTPRF 02.2019 (SEI nº 19991214), elaborado pelo Projeto Estratégico Armamento institucional - PE-405, envio o processo para conhecimento, análise e manifestação.

Atenciosamente,

CIRO VIEIRA FERREIRA
Diretor de Administração

Documento assinado eletronicamente por **CIRO VIEIRA FERREIRA**, **Diretor(a) de Administração e Logística**, em 24/12/2019, às 09:29, horário oficial de Brasília, com fundamento no art. 10, § 2º, da Medida Provisória nº 2.200-2, de 24 de agosto de 2001, no art. 6º do Decreto nº 8.539, de 8 de outubro de 2015, e no art. 42 da Instrução Normativa nº 116/DG/PRF, de 16 de fevereiro de 2018.

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MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIRETORIA DE ADMINISTRAÇÃO E LOGÍSTICA

OFÍCIO Nº 13/2020/CMLOG/CGA/DIRAD

Brasília, 27 de janeiro de 2020.

Ao chefe da DIPRO,

Assunto: Padronização do Sistema de armas Glock.

Senhor chefe,

1. Em atenção ao Despacho nº 71/2019/COAP (SEI 23118879), que trata de expediente apresentado pela Diretoria-Executiva - DIREX, nos termos do Despacho nº 277/2019 - DIREX (SEI nº 20706684), por meio do qual solicita elaboração de minuta de Catálogo, contendo padronização para as armas de porte desta Polícia Rodoviária Federal, a qual se baseou no Relatório do projeto Arm (19991214).

2. Solicito tratativas com as áreas de técnicas destes armamentos, em especial a UniPRF e a DIROP, com vistas a produção de normas técnicas para as armas de porte da PRF. Após a publicação das referidas normas, faz-se necessário a devida catalogação destes materiais.

Atenciosamente,

DIEGO DE LIMA SOUZA
Coordenador de Mobilização e Logística substituto

Documento assinado eletronicamente por **DIEGO DE LIMA SOUZA**, **Coordenador(a) de Mobilização e Logística substituto(a)**, em 27/01/2020, às 11:44, horário oficial de Brasília, com fundamento no art. 10, § 2º, da Medida Provisória nº 2.200-2, de 24 de agosto de 2001, no art. 6º do Decreto nº 8.539, de 8 de outubro de 2015, e no art. 42 da Instrução Normativa nº 116/DG/PRF, de 16 de fevereiro de 2018.

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MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIRETORIA DE ADMINISTRAÇÃO E LOGÍSTICA

OFÍCIO Nº 4/2020/DIPRO/CMLOG/CGA/DIRAD

Brasília, 06 de fevereiro de 2020.

Ao Gerente do Projeto Estratégico de Armamento Institucionais

Assunto: Produção de NTPRF para padronização de equipamentos

Senhor gerente,

1. Considerando o Relatório RTPRF 02.2019 (19991214), o Ofício 21/2019/PE-405/DIROP (20664400) e o Despacho 71/2019/COAP (23118879);

2. Considerando as competências desta Divisão;

3. Solicito a indicação de membros para compor equipe de trabalho para produzir NTPRF que possa embasar a padronização, no âmbito da Polícia Rodoviária Federal - PRF, as pistolas da fabricante GLOCK Ges.m.b.H como Sistema de Armas de porte da PRF.

Atenciosamente,

MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIRETORIA DE OPERAÇÕES

Despacho nº 1/2020/PE-405

Brasília, 12 de fevereiro de 2020.

DESTINO(S): DIPRO - DIRETORIA DE ADMINISTRAÇÃO E LOGÍSTICA
ASSUNTO: Produção de NTPRF para padronização de equipamentos

1. Considerando o Ofício 4 (24136235) que trata sobre a indicação de nomes para compor equipe de trabalho para produzir NTPRF que possa embasar a padronização, no âmbito da Polícia Rodoviária Federal - PRF, as pistolas da fabricante GLOCK Ges.m.b.H como Sistema de Armas de porte da PRF.

2. Considerando as tratativas realizadas com a UniPRF, na pessoa do Inspetor Pierre;

3. Segue abaixo a relação de servidores para compor a referida comissão

   3.1. FRANCISCO RODRIGUES DE OLIVEIRA NETO - Mat. 1371098; SRPRF-RN

   3.2. RODRIGO RAMIRO COSTA ARCOVERDE - Mat. 1503201; SRPRF-PE

   3.3. PAULO R. CUNHA FIGUEIREDO SOUSA - Mat. 1503558; SRPRF-RN

   3.4. HENRIQUE MOURAO CAMARINHA NETO - Mat. 1465760; UniPRF

4. Importante ressaltar que o próprio RTPRF Nº 02.2019 foi confeccionado para atender o que seria a NTPRF. Porém, as informações de como deveria ser confeccionado a NTPRF ficaram nebulosas e confusas. Desta forma, torna-se necessário que haja uma indicação de algum servidor que explique ou que apresente um modelo de como deve ser feito essa normativa, para que desta vez, seja possível a confecção correta da norma.

FRANCISCO RODRIGUES DE OLIVEIRA NETO
Gerente do Projeto ARM - PE-405

Documento assinado eletronicamente por **FRANCISCO RODRIGUES DE OLIVEIRA NETO**, **Policial Rodoviário(a) Federal**, em 12/02/2020, às 17:24, horário oficial de Brasília, com fundamento no art. 10, § 2º, da Medida Provisória nº 2.200-2, de 24 de agosto de 2001, no art. 6º do Decreto nº 8.539, de 8 de outubro de 2015, e no art. 42 da Instrução Normativa nº 116/DG/PRF, de 16 de fevereiro de 2018.

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MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIRETORIA DE ADMINISTRAÇÃO E LOGÍSTICA

NOTA TÉCNICA Nº 5/2020/DIPRO/CMLOG/CGA/DIRAD

PROCESSO Nº 08650.014484/2019-40

INTERESSADO: DIRETORIA DE ADMINISTRAÇÃO E LOGÍSTICA, DIRETORIA-EXECUTIVA, DIREÇÃO-GERAL, DIRETORIA DE OPERAÇÕES

RECOMENDAÇÃO DE PADRONIZAÇÃO DE ARMAS DE PORTE

1. INTRODUÇÃO

Os estudos da Polícia Rodoviária Federal conduzidos pela equipe do projeto ARM - Armamentos Institucionais, foram iniciados ainda no segundo semestre de 2015, tendo com um dos principais objetivos, estabelecer critérios rígidos e bem definidos para a escolha e aprovação de qualquer arma ou munição para o quadro de dotação da PRF, com o objetivo que a instituição, seus servidores e a sociedade brasileira não fossem vítimas de armas de baixa qualidade, segurança e confiança e que o alto investimento realizado fosse corretamente aplicado. Buscando isso, diversos estudos, pesquisas e testes foram realizados ao longo dos anos, que culminou, no final de 2017 com o processo de aquisição do Sistema de Armas Glock.

2. CONTEXTUALIZAÇÃO DA ETAPA DE ESTUDOS TÉCNICOS

No ano de 1996 o Departamento de Polícia Rodoviária Federal foi a primeira força de segurança pública nacional a adquirir pistolas no calibre .40 S&W, calibre este que mais tarde se tornaria um dos mais utilizados pelas forças policiais em todo o mundo.

Com o desgaste natural do armamento adquirido a PRF buscou modernizar seu parque de armamentos, foram adquiridas 3.000 mil unidades de pistolas do modelo PT-840, fabricante TAURUS, entre os anos de 2009 e 2012. Porém, já no ano de 2010 após a compra e distribuição das primeiras armas, várias pistolas passaram a apresentar diversos problemas, que deixavam as armas inoperantes para o uso, expondo ao risco não só os PRF´s mas a sociedade também.

Devido a gravidade do tema, no ano de 2015 a PRF instituiu o Projeto ARM - Armamentos Institucionais para, entre outros objetivos : Realizar pesquisas, levantamentos e estudos sobre segurança, confiabilidade, efetividade, performance, capacidade, precisão, modularidade, ergonomia, durabilidade e empregabilidade dos armamentos empregados pela PRF; Apresentar proposta de normatização do protocolo de registro e controle das panes, quebras, falhas, defeitos e quaisquer outros problemas relacionados às armas de fogo e munições em qualquer que seja a situação no âmbito da PRF; e propor melhorias, otimizações, mudanças, substituições, padronizações e possíveis aquisições com base nos estudos.

Na fase de estudos, somente relacionados aos estudos das armas de porte, foram confeccionados cerca de 10 relatórios técnicos, contendo desde pesquisas junto ao efetivo da PRF e em outras instituições policiais; análises de estudos de outras instituições; realizações de testes de campo entre outros. Uma das principais consequências desses estudos, foi o estabelecimento da necessidade de substituição de 100% das armas antes empregadas pela PRF, devido ao desgaste de suas peças e/ou por falha de projeto que, em ambos os casos deixaram as armas inseguras para a atividade de Policial Rodoviário Federal.

Ademais, **os estudos permitiram à PRF definir as características técnicas necessárias e desejáveis para suas novas armas de porte**, garantindo qualidade, segurança e confiança no emprego dos armamentos. Desta forma, ao final do ano de 2017 a PRF iniciou seu processo de compra de 12.565 unidades de pistolas Glock, o que permitiu a substituição integral de todas as suas antigas armas de porte.

3. DOCUMENTAÇÃO PRODUZIDA

Estabelecidas as atribuições e objetivos do projeto ARM, bem como a definição das prioridades, os especialistas em armamento da PRF passaram a direcionar o estudo para as armas de porte. Diante disso, foram definidos todos os pontos que precisavam ser realizadas amplas pesquisas e estudos.

Somente após finalizados os estudos e pesquisas sobre cada ponto, a equipe responsável apresentava uma conclusão e elaborava o Relatório Técnico RTPRF 02.2019, (SEI nº 19991214), onde foi condensado todo o rol de resultado de pesquisas, testes balísticos, resultado de aplicação de protocolos, dentre outros resultados.

Além do Relatório Técnico RTPRF 02.2019, o qual compilou todo o arcabouço técnico produzido em relação as premissas de padronização de armamento, a equipe do projeto ARM produziu farta documentação sobre o armamento já existente, cumpre ressaltar que a documentação elencada abaixo remonta à data anterior a aquisição do sistema de armas GLOCK, quais sejam:

Análise das armas da PRF

Relatórios sobre o tema:

- RTPRF 04.2016 - Situação atual das armas da PRF - (SEI nº 4081870);
- RTPRF 05.2016 - Panes nas armas da PRF - (SEI nº 4081879) e;
- RTPRF 05.2017 - Análise descritiva dos problemas apresentados nas pistolas PT-840 - (SEI

nº 7748235)

Pesquisa junto aos PRF`s e instrutores de armamento e tiro

Relatórios sobre o tema:

- RTPRF 03.2016 - Pesquisa de satisfação na PRF - (SEI nº 4081867)

Compilação de Panes em armamentos nacionais, na mídia e em outras instituições

Relatórios sobre o tema:

- RTPRF 07.2016 - Panes em armamentos de uso policial divulgadas na mídia - (SEI nº 4081917) e;
- RTPRF 08.2016 - Panes em pistolas de instituições policiais diversas - (SEI nº 4081921)

Requisitos técnicos das Pistolas da PRF

Relatórios sobre o tema:

- RTPRF 01.2016 - Relatório das áreas especializadas da PRF - (SEI nº 4104909) e;
- RTPRF 02.2016 - Indicação da arma de porte da PRF - (SEI nº 4081820)

4. METODOLOGIA EMPREGADA NA ESPECIFICAÇÃO DO SISTEMA DE ARMAS

Logo após constatada pela equipe do Projeto ARM que seria necessária a substituição de todas as armas de porte da PRF, a equipe passou então a buscar a especificação de quais seriam os requisitos técnicos necessários que o armamento de porte deveria possuir para atender as demandas dos mais diversos ambientes operativo da PRF.

Para que isso fosse possível, a equipe do Projeto ARM estabeleceu três linhas de pesquisas:

1. Consultar todas as áreas especializadas de atuação da PRF, para identificar quais as características e requisitos técnicos às áreas entendiam como sendo necessárias e desejáveis para o adequado emprego da arma de porte em cada área, e o porquê de cada uma delas.
2. Consultar diversas instituições de segurança pública no Brasil e no Mundo acerca de quais as características que eles definiram como necessárias para suas armas de porte e o porquê de cada uma delas, a fim de avaliar a viabilidade e adequação com a atividade da PRF;
3. Reunir os especialistas em armamento e tiro da PRF para apresentar as necessidades das áreas especializadas, as informações colhidas de outras instituições de segurança, os resultados das pesquisas com os Policiais e Instrutores da PRF e todos os demais pontos levantados pelo projeto ARM para, a partir desse ponto, unir esses requisitos e com isso definir os requisitos técnicos do novo sistema de armas para a PRF;

5. ELABORAÇÃO DAS CARACTERÍSTICAS TÉCNICAS NECESSÁRIAS

Com as informações produzidas nos relatórios e objetivando garantir que a busca em todo o mercado de armas, nacional e internacional, atendesse as necessidades da PRF, foi elaborada uma relação de características necessárias ao novo armamento, que, transmitissem confiabilidade e segurança ao operador policial. Todo o detalhamento dessas especificações, além de outras, constam nos relatórios técnicos e foram utilizadas para a definição do sistema de armamento.

Com a realização dos estudos, foi possível definir não apenas as características técnicas necessárias para as armas de porte da PRF, mas também aquelas desejáveis, ou seja, que embora não diretamente vinculada à segurança, qualidade ou confiabilidade, trazem benefícios às atividade da PRF, garantindo assim, além destes, sua perfeita adequação às diversas atividades e atribuições da PRF.

Importante destacar que o novo sistema de armas não inclui somente um, dois ou três modelos de armas de porte, mas inclui também a existência de simulacros e armas de simulação de combate, essa integração é essencial para a completa interação do sistema de arma, permitindo que sejam empregados simulacros de mesma plataforma, dimensões e funcionamento, e, considerando que o treinamento é algo constante dentro da atividade policial, o uso de simulacros com mesmas dimensões, mecanismos e formas de funcionamento, mas que são inertes e incapazes de efetuar disparos com munição real, são imprescindíveis, pois garantem a segurança dos treinamento e impossibilita os acidentes e incidentes relacionados ao uso de armas reais durante treinamento simulados.

Passaremos a apresentar todas as características técnicas definidas pela equipe do projeto ARM como **REQUISITOS NECESSÁRIOS** para o novo sistema de armas da PRF de forma a atender as peculiaridades das atividades do órgão.

1. **Tipo de ação: dupla com semi-engatilhamento**

Sistema de percussor lançado, de ação dupla, com semi-engatilhamento do percussor, por apresentar todas as vantagens do sistema de ação dupla e sem suas desvantagens, permitindo que se tenha um sistema que apresente um peso e um curso de gatilho que permita ao policial desistir do acionamento caso seja necessário, e simplifique o treinamento em virtude deste sistema apresentar peso e curso de gatilho constante e relativamente leve.

2. **Sistema de percussão**

Sistema de percussor lançado (striker-fired), com semi-engatilhamento e com travas automáticas passivas por apresentar as seguintes vantagens: menos peças envolvidas no funcionamento, facilitando a manutenção da arma, maior ergonomia por não apresentar recortes e frestas para acomodação de martelo, diminuindo a incidência de acúmulo de sujeira e outros motivos conforme descrito no RTPRF 02/2016, (SEI nº 4081820).

3. **Tipo e comprimento do cano**

O comprimento do cano interfere diretamente na precisão e recuo do armamento, além de interferir na ergonomia do porte, pois influencia no tamanho final da arma. Sendo assim, para a arma de uso ostensivo, que precisa priorizar ao máximo à precisão do disparo, sem prejudicar à ergonomia da empunhadura, o comprimento do cano da versão ostensiva deve ser entre 110mm e 115mm, já para a versão subcompacta, onde seu uso efetivo é destinado apenas para casos extremos de legítima defesa, devendo ser priorizado o conforto e a capacidade de permanecer dissimulada junto ao corpo, sem prejudicar em demasia sua empunhadura, o comprimento do cano deve ser entre 85mm e 90mm.
Além disso, chegou-se à conclusão que o cano deveria ser confeccionado em aço forjado por martelamento a frio, com raiamento de perfil poligonal, com acabamento interno e externo em tenifer ou acabamento que ofereça proteção similar ou superior.

4. **Mínimo de teclas externas**

Considerando os níveis de estresse e adrenalina a que se submete o policial durante um confronto armado, sua arma deve ser a mais simples possível, de forma a possuir o mínimo de obstáculos para a realização de um disparo com segurança, desta forma, para que haja o disparo deve haver apenas o simples pressionar do gatilho. Com isso, a existência de teclas e registros externos deve ser minimizado ao máximo, bem como botões, protuberâncias, saliências e quinas, o que resulta num uso simples e confortável do armamento, reduzindo o risco de acionamentos acidentais durante o confronto, o que pode provocar o travamento ou pane do armamento, deixando tanto o policial quanto a sociedade mais vulneráveis. Uma arma com esta configuração proporciona ainda maior conforto, segurança e estabilidade seja para o uso ostensivo ou uso dissimulado, pois tem a possibilidade mínima de enroscar em vestimentas, vegetação e capas táticas, além de simplificar o processo de ensino aprendizagem, coadunando com a ideia de que arma de uso policial deve ser o mais simples possível.

5. **Tratamento das partes metálicas**

Considerando a grande capilaridade da PRF, bem como a exposição do armamento as mais diversas condições climáticas (regiões com alta umidade e temperatura, regiões litorâneas com alto índice de salinidade, regiões frias e secas etc.), torna-se imperativo que o tratamento das partes metálicas possua a melhor resistência não apenas as intempéries supramencionadas, mas também ao desgaste natural decorrente do uso na atividade policial (quedas, arranhões, exposições a chuva, poeira, fuligem etc.). Sendo assim, é necessário que a arma possua o acabamento externo da superfície do ferrolho e do cano em tenifer ou acabamento que ofereça proteção equivalente ou superior com acabamento preto fosco.

6. **Chassi em polímero com insertos em aço**

A pistola deve possuir chassi fabricado em polímero de alta resistência, sem reforço de fibra de vidro e com insertos de aço que funcionam como trilhos do ferrolho. Os chassis das armas G17 (tamanho padrão) devem ser de polímero de cor coyote e as das G26 (tamanho subcompacto) em polímero preto. As armas destinadas ao ensino da PRF nos modelos G17 e G26 deverão ser com chassi na cor preta.

O chassi de polímero de alta resistência é o mais indicado, por proporcionar a arma um menor peso e ter alta resistência à corrosão, seja por suor, maresia, umidade ou poeira. O polímero também é muito pouco afetado pelas variações de temperatura e tem excelente resistência mecânica (atrito, choque, quedas, tração e pressão), mantendo-se as características físicas inalteradas. É um ser material leve que proporciona conforto em termo de portabilidade e dissimulação em várias situações de trabalho.

7. **Carregadores bifilares em aço com revestimento em polímero e intercambiáveis**

A proteção contra as intempéries climáticas extremas e condições de trabalho com risco de quedas, abrasividades e arranhões não se restringe apenas a arma, mas também ao carregador, que muitas vezes é renegado pelo policial. Os carregadores das pistolas devem bifilares e confeccionados em aço recoberto com polímero para conferir uma maior proteção aos mesmos, e ainda, os carregadores devem ser compatíveis entre armas do mesmo modelo e entre as do modelo ostensivo para dissimulado, proporcionando maior mobilidade e apoio tático em situações de emergência das unidades que trabalham à "paisana". Os carregadores das armas subcompactas (G26), devem ser compatíveis com a utilização de prolongadores anatômicos na base do carregador que permite o apoio do dedo mínimo da mão forte na empunhadura, aumentando capacidade de munição e melhorando a empunhadura da arma.

8. **Retém do carregador ambidestro ou reversível**

As pistolas armas G17 e G26 devem ter retém do carregador ambidestro ou reversível visando a fácil utilização das armas por policiais destros e sinistros.

9. **Intercambiabilidade de peças**

A fim de facilitar a aquisição de peças de reposição e a manutenção das pistolas a equipe do Projeto decidiu que as armas G17 e G26 devem ser de mesma plataforma de funcionamento e apresentar um índice de intercambiabilidade de peças de no mínimo 60%.

10. **Empunhadura ajustável**

As pistolas G17 e G26 devem possuir ao menos a porção anterior da empunhadura (backstrap) em pelo menos 3 tamanhos distintos (P, M e G) para atender as demandas referentes às diferentes compleições físicas dos policiais da PRF, devendo a troca dessas peças ser de forma simples e rápida.

11. Sistemas de segurança

A exposição a quedas está presente nos mais variados ambientes, seja durante uma perseguição a pé, no embarque/desembarque da viatura (duas ou quatro rodas) ou aeronave, durante a transposição de obstáculos (Muretas de contenção, muros, barrancos etc.) entre outros casos. Desta forma, as armas devem prover essa segurança e confiança sem dificultar ou aumentar a complexidade do uso de uma arma de fogo.

Considerando a doutrina de uso da arma na PRF, bem como a dinâmica dos confrontos policiais, onde o nível de estresse/adrenalina reduz consideravelmente a coordenação motora fina, nessas situações, deve-se exigir do policial o mínimo de movimento para que ele possa empregar o seu armamento com segurança. Sendo assim, o armamento deve permitir o disparo com o simples pressionamento do gatilho, sem a necessidade do acionamento de outras teclas, seja para o início dos disparos, seja para o retorno ao coldre.

As pistolas devem ter ao menos 3 travas distintas em seu sistema de segurança, que funcionam de forma passiva e automática, sendo estes: trava de percussor, trava inercial do gatilho e trava de queda e as pistolas devem ser capazes de resistir a quedas em piso rígido (concreto, aço etc.) de alturas de 1,5m em qualquer posição, e, após as quedas, mesmo que alguma peça não estrutural da arma venha quebrar, as armas devem ser capazes de efetuar disparos com segurança.

12. Sistema de funcionamento

As pistolas G17 e G26 devem operar pelo princípio de funcionamento de ação direta dos gases com trancamento com curto recuo do cano, através do sistema conhecido por Colt-Browning modificado, por ser um sistema simples, confiável e amplamente utilizado pela grande maioria dos fabricantes de pistolas.

13. Trilho para acessórios

Considerando a vantagem tática fornecida pelo uso de equipamentos e acessórios (lanternas, miras laser e miras infravermelhas), a arma deve possuir um trilho compatível com os acessórios que utilizem o padrão picatinny na parte frontal da armação, mas que tenha os cantos arredondados e mais suaves ao manuseio, a fim de evitar abrasões ou lesões ao operador.

Existência de armas com tamanhos distintos (standard e subcompacta) com mesma plataforma.

Dentro de qualquer instituição policial, o investimento de tempo e recursos no treinamento é substancial. Além de necessário, é obrigatório o treinamento para a habilitação e renovação anual da habilitação em todo tipo de arma de fogo, conforme preceitua as diretrizes da Portaria Interministerial nº 4.226/2010.

Dessa forma o uso de armas de plataformas diferentes enseja a necessidade de treinamentos também diferentes, muitas vezes dobrando os custos com instrução. Sendo assim, considerando o emprego de armamentos em tamanhos distintos, para as mais diversas aplicações na PRF, torna-se necessário que esses modelos de armas, embora com tamanho distintos, possuam mesma plataforma, ou seja, mesmo tipo funcionamento, teclas de operação e manejo, de forma a reduzir os custos com reposição de peças, manutenção e treinamento/capacitação.

14. Possibilidade de uso de aparelho óptico.

Considerando o avanço tecnológico no setor de armamentos, que passou a trazer o uso de miras ópticas para as pistolas e revólveres, as chamadas Miras Mini Reflex - MRS. Com isso, o enquadramento dos alvos precisa de apenas um ponto de foco em vez de uma massa e uma alça de mira, trazendo muito mais velocidade dos disparos.

Desta forma, o modelo ostensivo precisa dispor de uma variação com a possibilidade de utilização de miras MRS. Essas armas devem possibilitar o uso das principais miras mini reflex - MRS disponíveis no mercado internacional, bastando para isso a substituição de peças originais no modelo de serviço ostensivo além de possuir a disponibilidade de coldre ostensivo com no mínimo 1 grau de retenção e que possua o sistema modular QLS.

15. Existência de versões para treinamento

Com a finalidade de realizar treinamentos minimizando riscos tanto aos instrutores quanto aos instruendos, a PRF necessita de armas específicas para essa finalidade. O uso de simulacros com mesmas dimensões, mecanismos e formas de funcionamento, que são inertes e incapazes de efetuar disparos com munição real são extremamente úteis, pois garantem a segurança dos treinamento e minimiza os acidentes e confusões que podem ser gerados com o uso de armas reais durante treinamento simulados.

O sistema de armas deve possuir modelos semelhantes ao modelo operacional padrão, idênticos em funcionamento, mas na cor vermelha, mas que sejam capazes de se realizar treinamento em seco, que realizem de forma automática o reset do gatilho, que mesmo se colocando munição real a arma seja incapaz de realizar disparos, mas que tenham o cano aberto para que seja possível a colocação de sistemas de treinamento a laser. Devem também possuir modelos semelhantes e funcionais na cor azul que permitam a utilização de munição de treinamento (projéteis marcadores com tinta). Por fim, devem possuir ainda um modelo semelhante, com cortes para visualização do funcionamento do mecanismo, também impossibilitada de realizar disparos com munição real. Esses modelos de treinamento devem manter dimensões, peso e funcionalidades (peso e curso do gatilho, carregador, teclas externas ...) similares ao modelo operacional padrão.

16. **Peso e curso do gatilho**

A fim de propiciar o treinamento do policial em um menor espaço de tempo, gerando economia de tempo e investimento além de minimizar um dos motivos que mais ensejam erros nos direcionamentos dos disparos durante os confrontos armados (pesos e cursos diferentes do gatilho quando em ação simples ou dupla), as pistolas devem possuir um peso e um curso constante do gatilho. Esse peso não pode ser demasiado grande e nem o curso muito longo, o que geraria uma dificuldade excessiva aos policiais do sexo feminino e/ou com menores compleições físicas, nem demasiado leve e com curso muito curto como em ação simples, o que poderia gerar a ocorrência de disparos acidentais provocados pelos próprios policiais devido à alta carga de estresse e adrenalina durante os confrontos armados, devendo então possuir o peso com variação entre 2,5 a 3,5 Kg.

17. **Raiamento poligonal**

O tipo de raiamento do cano irá definir, entre outras coisas a durabilidade do mesmo e à precisão dos disparos. Confeccionado em aço forjado por martelamento a frio, polido internamente com raiamento de perfil poligonal, possibilitará uma maior durabilidade, menos arrasto, maior velocidade do projétil e maior facilidade de limpeza. Esse tipo de raiamento proporciona uma melhor vedação dos gases em torno do projétil, isso repercute em velocidades ligeiramente maiores e mais consistentes. Há também ganho na menor deformação de projétil, resultando em arrasto reduzido, o que ajuda a aumentar a velocidade do projétil. Isso redunda na redução do acúmulo de cobre ou chumbo dentro do cano, o que resulta em características de manutenção mais fáceis. Todas essas características acabam por representar uma menor sensibilidade à falha e por conseguinte, o prolongamento de sua vida útil do cano.

18. **Possibilidade de fixação do fiel**

Por solicitação unânime de todas as unidades especializadas da PRF, devido a atuação em cenários e missões específicas (operações aéreas, Operações com cães, Motopoliciamento, adentramento em regiões de mata etc), que muitas vezes fogem do cotidiano da maioria dos policiais, o uso do "fiel" para impedir a perda do armamento e caso de queda torna-se imprescindível.

Sendo assim, a arma deve possuir zarelho ou orifício para fixação de fiel na base da empunhadura.

19. **Existência de sistema de identificação por rádio frequência**

Buscando garantir um controle real sobre os armamentos institucionais e a garantia da possibilidade de rastrear e identificar armamentos eventualmente extraviados ou roubados, os armamentos devem ser dotados de RFid - "Radio-Frequency IDentification", ou seja, identificação por rádio frequência, em Conformidade com a norma EPCglobal ISO 18000-63, numa frequência entre 860 MHz - 960 MHz Type C. Que utilizem marcadores passivos, que respondem a um sinal enviado por uma unidade transmissora/leitora, colocados em local discreto, de forma a dificultar/impossibilitar sua retirada por terceiros, e de modo que não alterem o funcionamento e/ou sua aparência/anatomia externa, devendo os marcadores estarem injetados no polímero.

20. **Assistência técnica no brasil**

A fabricante deve possuir unidade próprio ou empresa representante no Brasil, capaz de garantir a reposição de peças por período mínimo de 10 anos, com capacidade de honrar a garantia de fábrica e possibilidade de prestar assistência técnica em todo território nacional quando solicitado.

21. **Aparelho de pontaria**

Tendo em vista que a PRF se envolve em muitas ações noturnas e de baixa luminosidade, as pistolas devem possuir aparelho de pontaria metálico de 3 pontos com insertos auto luminescentes em Trítio, afixados de maneira a garantir sua devida inamovibilidade durante o uso policial.

22. **Da confiabilidade - maturidade do projeto - histórico de utilização**

Os dicionários geralmente definem o termo “confiabilidade" como algo que é seguro, fidedigno, consistente e genuíno. Quando falamos na confiabilidade de uma arma de fogo, esperamos que esses adjetivos se apliquem. Sendo assim, o termo confiabilidade assume um caráter mais definitivo: a confiabilidade é definida como a probabilidade de um determinado dispositivo desempenhar a função pretendida por um período especificado sob condições estabelecidas. O "desempenho em condições estabelecidas" refere-se às condições operacionais e ambientais, ou estresses, que o equipamento pode experimentar durante a sua vida útil.

As pistolas devem possuir a comprovação de utilização, sem ocorrências de graves problemas, há pelo menos 03 anos, por 5 (cinco) órgãos policiais e/ou militares, em 3 países distintos e em dois continentes diferentes. Conforme restou provado durante os estudos e pesquisas, inclusive na consulta realizada a vários órgãos de segurança pública, a aprovação em protocolos de teste e resistência, por mais completos que sejam, são impossíveis de conter a gama de variedade de situações as quais a rotina operativa de um policial está submetida. Sendo assim, essa exigência de maturidade e tempo de exposição se torna imprescindível para reduzir a probabilidade do projeto em apresentar falhas, zelando pela vida da sociedade e dos próprios policiais.

O próprio TCU - Tribunal de Contas da União, durante uma auditoria alertou a PRF sobre o fato de adquirirmos essas armas de forma pioneira, se expondo a riscos advindo com o desconhecido.

Assim, a comprovação de emprego do armamento por outras instituições policiais no Brasil e no mundo tem por finalidade evitar que a Administração Pública seja utilizada como cobaia para testes de um equipamento que pode expor a risco a vida desses servidores e da sociedade, trazendo dissabores e prejuízos futuros, que podem estender-se para além das questões financeiras e comprometer a vida, a saúde e integridade física dos policiais e de terceiros.

23. **Da confiabilidade - aprovação em protocolos internacionais**

Seguindo a mesma linha de raciocínio sobre a confiabilidade aplicada ao histórico de batalha, é premente que a confiabilidade possa ser determinada, computada, testada e comprovada. Portanto, faz-se necessário o emprego de protocolos consolidados para que seja possível testar, sob diferentes condições operacionais, os complexos sistemas das armas de fogo.

Diante dos diversos problemas enfrentados pela PRF e por diversas outras instituições policiais nacionais e de fora e, seguindo ainda a orientação do próprio órgão de controle de produtos controlados do Exército Brasileiro, em que sugeriu que as instituições de polícia deveriam adotar protocolos de testes adequados a suas atividades, os técnico da PRF estabeleceram como parâmetro base dois protocolos de testes internacionalmente conhecidos, sendo publicada a portaria 104 de 30 de março de 2017 do Diretor Geral da PRF, estabelecendo a exigência das certificações nos seguintes testes:

- OTAN - AC/225 (LG/3-SG/1) D14 e
- NIJ Standard - 0112.03 (*Autoloading Pistols for Police Officers*)

A fim de evitar possíveis erros de interpretação, deixamos claro que, conforme consta no próprio Sumário Executivo do Protocolo NIJ Standard - 0112.03 (*Autoloading Pistols for Police Officers*), os requerimentos de performance e os métodos ali estabelecidos são designados para pistolas utilizadas por Oficiais de segurança pública como sua **"arma de serviço."**

> "Recognizing that the vast majority of law enforcement agencies today use autoloading pistols as their issued **duty weapon**, the National Institute of Justice (NIJ), through its National Law Enforcement and Corrections Technology Center (NLECTC) system, recently performed a series of tests for autoloading pistols."

"Reconhecendo que a vasta maioria das Agências de Aplicação da Lei atualmente utilizam pistolas semiautomáticas como **Armas de Serviço** padronizadas, o Instituto Nacional de Justiça (NIJ), através de sistemática do seu Centro Tecnológico Nacional de Aplicação da Lei e Correção (NLECTC), recentemente realizou uma série de testes para pistolas semiautomáticas."(tradução nossa)

O conceito de "duty weapon" ou "Arma de serviço", empregado pelo próprio Protocolo são os modelos que descrevemos como arma destinada ao serviço ostensivo, que citamos acima.

Desta forma, o Protocolo da NIJ Standard - 0112.03 (*Autoloading Pistols for Police Officers*) se aplica tão somente ao modelo G17, haja vista ser a G26 uma arma de uso dissimulado, não ostensivo.

Destacamos ainda que esses testes, também não se aplicam às versões de treinamento, haja vista que as mesmas não são empregadas com munições letais reais, muito menos em situações operacionais, não necessitando, portanto de teses de simulam essas situações.

Podem ser aceitos testes de outros protocolos diferentes, desde que realizem os mesmos testes aqui descritos nas mesmas condições ou em condições mais rigorosas.

As certificações mínimas necessárias para aquisição das referidas armas de porte de uso ostensivo e/ou dissimulado, dentre os testes pertencentes ao Protocolo OTAN - AC/225 (LG/3-SG/1) D14 (SEI nº 20664052) são:

- Intercambiabilidade de peças - Método 2.18.3;
- Inspeção preliminar, características das armas e dos disparos - Método 2.1;
- Disparo em Seco (Resistência) - Método 2.5.2.2;
- Verificação da precisão (Precisão e dispersão) - Método 2.4.2;
- Teste de temperatura extrema e condições agravadas - Método 2.9.1.2 (Teste de frio); Método 2.9.2.2 (Teste de alta temperatura); Método 2.13.1.2 (Sem lubrificação);
- Teste de temperatura e umidade - Método 2.9.3.2
- Teste de imersão em água salina - Método 2.13.4
- Teste de névoa salina - Método 2.13.3
- Teste de arrasto em areia - Método 2.13.6
- Teste dinâmico de poeira e areia - Método 2.13.5.2.2
- Teste de lama - Método 2.13.7
- Teste de pulverização acelerada com água Método 2.13.2
- Teste de congelamento Método 2.9.4
- Teste de resistência Método 2.5.3
- Teste de queda Método 2.15.3
- Teste de obstrução por projétil Método 2.10.3.2.1, no que for aplicável.

De maneira complementar, para aquisição das referidas armas de porte de uso ostensivo, é necessária a certificação do atendimento ao Protocolo:

- NIJ Standard - 0112.03 (Autoloading Pistols For Police Officers) SEI nº (20664058):

6. SUBSTITUIÇÃO DAS ARMAS DE PORTE

Com a definição dos requisitos necessários ao novo armamento, validação das pesquisas efetuadas, e aplicação dos protocolos internacionais vigentes, a equipe do projeto ARM elaborou o Projeto Básico PE-405 (9093847), insculpido no bojo do processo de aquisição do armamento (08650.003489/2017-85). Referido projeto básico foi o resultado de todo o trabalho de pesquisa da equipe, onde culminou com as especificações das características necessárias ao novo sistema de armas da PRF.

O armamento foi adquirido por inexigibilidade, com a fundamentação, trazida à época:

> *Nos casos de inexigibilidade, como o presente, não há possibilidade de competição, porque só existe um objeto que atenda às necessidades da Administração; a licitação é, portanto, inviável.*
>
> *Ademais, quanto à inexigibilidade de licitação, a própria redação do artigo 25 tem implícita a possibilidade de ampliação, vejamos:*
>
> *"Art. 25. É inexigível a licitação quando houver inviabilidade de competição, em especial:*
>
> *I – para aquisição de materiais, equipamentos, ou gêneros que só possam ser fornecidos por produtor, empresa ou representante comercial exclusivo, vedada a preferência de marca, devendo a comprovação de exclusividade ser feita através de atestado fornecido pelo órgão de registro do comércio do local em que se realizaria a licitação ou a obra ou o serviço, pelo Sindicato, Federação ou Confederação Patronal, ou, ainda, pelas entidades equivalentes;"*
>
> *Com efeito, a inexigibilidade é decorrência da inviabilidade de competição; o próprio dispositivo prevê algumas hipóteses, o que não impede que outras surjam na prática. Se a competição inexiste, não há que se falar em licitação.*
>
> *Relevante sopesar a lição de Hely Lopes Meirelles (1996:257), que distingue a exclusividade industrial da exclusividade comercial, para dizer que aquela é a do produtor privativo no país e esta é a dos vendedores e representantes da praça. Acrescenta que, "quando se trata de produtor, não há dúvida possível: se só ele produz um determinado material, equipamento ou gênero, só dele a Administração pode adquirir tais coisas."*
>
> *Destarte, somente nos últimos dois anos, pelo menos 07 instituições de segurança pública (Polícias Militares do Paraná, Rio de Janeiro, Mato-Grosso, Polícia Civil do Rio de Janeiro e Sergipe, Polícia Legislativa do DF, Secretaria de Segurança Pública e Departamento de Polícia Federal) adquiriram o mesmo armamento especificado pela PRF, sendo que todos os processos foram instruídos para contratação via inexigibilidade de licitação com amparo legal no artigo 25, inciso I da Lei n° 8.666, de 1993, conforme publicações anexas (Anexo 17 - Publicações de Extratos de Inexigibilidade - 9081160).*

A quantidade adquirida, por item/modelo, foi:

Item	Descrição	Elemento de despesa	Unidade	Quantidade
1	GLOCK 17, Gen4 'Safe Action' pistola semi-automática	44.90.52.14	Unidade	11.200
2	GLOCK 26, Gen4 'Safe Action' pistola semi-automática	44.90.52.14	Unidade	615
3	GLOCK 17P, 'Safe Action' pistola semi-automática	44.90.52.14	Unidade	570
4	GLOCK 17T Gen4, 'Safe Action' pistola semi-automática	44.90.52.14	Unidade	50
5	GLOCK 17 Cutway Gen4, 'Safe Action' pistola semi-automática	44.90.52.14	Unidade	30
6	GLOCK 17, Gen4 MOS 'Safe Action' pistola semi-automática	44.90.52.14	Unidade	100

O contrato foi celebrado em 20 de novembro de 2017 (Contrato n° 29/2017 - 9123992), e o recebimento definitivo dos armamentos ocorreu no dia 30 de agosto de 2018, conforme Termo de Recebimento Definitivo PE-405 (14167003)

7. HABILITAÇÃO DE TODO O EFETIVO

7.1. Após a aquisição do sistemas de armas Glock, foi realizado habilitação do efetivo para utilização do novo armamento. Dentre os Policiais Rodoviários Federais na ativa foram habilitados 8.615 policias. Também já foram habilitados no uso do sistema 1.156 alunos do Curso de Formação Policial - CFP - 2019, hoje já no quadro funcional da PRF. Além desses, estima-se que outros 600 alunos sejam capacitados no uso do sistema de armas adquirido no CFP 2020.

7.2. A habilitação realizada no sistema de armas adquirido foi composto de instrução teórica, via EAD, com carga horária de 20 horas-aula e instrução prática de mais 10 horas-aula. Na fase prática cada policial realizou 100 disparos, ao custo aproximado de R$ 2,50 por munição, além de outros insumos, como alvos e produtos para a limpeza das armas. Caso houvesse troca do sistemas de armas adquiridos pela PRF seria necessário habilitar mais de dez mil PRFs no novo armamento, esta habilitação demandaria investimento superior a NOVE MILHÕES DE REAIS, além de demandar um período superior a doze meses para ser concluída.

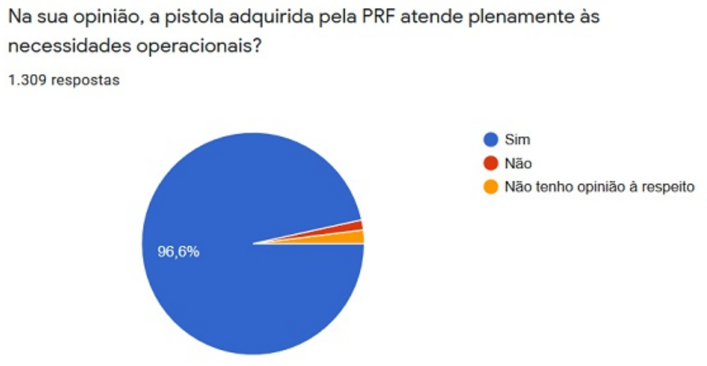
7.3. Deve ser observado ainda, que tanto a capacitação quanto a habilitação realizadas, foram feitas apenas no modelo G17, porém, pelo funcionamento idêntico de todos os modelos de armas do sistema, não é necessário realizar a habilitação nos outros modelos. No caso do Policiais a serviço da inteligência e corregedoria, que utilizam o modelo G26, não foi necessário realizar outra habilitação no armamento. Em armas que não são agrupadas em sistemas por usarem mecanismos distintos e não possuírem intercambiabilidade de peças, os custos de habilitação seriam multiplicados pela quantidade de modelos. O sistema adquirido também possui modelos específicos para treinamento, o que aumenta a qualidade do treinamento de novos policiais.

8. AVALIAÇÃO DOS MODELOS ATUALMENTE ADOTADOS

8.1. Durante o processo de habilitação dos policiais e durante todo o CFP foram realizados aproximadamente 1,5 milhão de disparos e não foi registrada nenhuma pane no armamento. As panes registradas se deram por conta da munição ou por falha na empunhadura do atirador, conforme Ofício 110/2020/EFAP/UniPRF/DIREX (26353867)

8.2. Também foi realizada pesquisa junto ao efetivo sobre a adequação do novo equipamento para as atividades da PRF, entre outros aspectos. Os resultados da pesquisa podem ser vistos no link: https://docs.google.com/forms/d/1iPbPX1SL2gcvzq_ci43qWBZkANBtLbE8YdxsZJMidW4/viewanalytics e foram anexados ao processo, sob o documento Formulário Pesquisa de Satisfação Glock G17 - Resultados (26990296).

8.3. Dentre as questões mais relevantes destaca-se que 96,6% dos respondentes consideram que a pistola adquirida pela PRF atende plenamente às necessidades operacionais. Retirando os respondentes que declaram não ter opinião à respeito (2%) e recalculando os totais, esse valor sobre para 98,5%. Também destaca-se que 99,3% dos respondentes se declara Satisfeito ou Muito Satisfeito com o fornecimento da Glock G17 para as atividades operacionais da PRF. Apenas 3 respondentes se declararam insatisfeitos com o fornecimento da Glock G17.



9. COMPATIBILIDADE DO PROJETO COM A NORMA TÉCNICA Nº 001/2019/SENASP/MJ

9.1. Em análise ao processo de aquisição que culminou com a substituição de todas as armas de porte da Polícia Rodoviária Federal foi publicada o Acórdão Nº 4369/2019 - TCU - 2ª Câmara (26135371), sobre o qual o Ministério da Justiça se posicionou conforme Nota Técnica Nº 6/2020/CQE/CGISP-DPSP/DPSP/SENASP/MJ (26134616).

9.2. O Acórdão aponta, no item 1.8.3.2 a ausência da certificação NIJ *Standard* 0112.03 para o modelo G26, porém essa certificação só se aplica a armamentos ostensivos, no caso, apenas à G17.

9.3. Também foi publicada pela SENASP a Norma Técnica Nº 001/2019/SENASP (26134763) juntamente ao Guia de Aplicação da Norma Técnica Nº 001/2019/SENASP (26134025).

9.4. Do citado acórdão emana a deliberação:

> "1.8.2. determinar ao Departamento de Polícia Rodoviária Federal que:
> 1.8.2.1. a partir dos requisitos mínimos (doutrinas) que serão estabelecidos pelo Ministério da Justiça e Segurança Pública em atenção ao item 1.8.1.1. desta deliberação, reavalie a
> exigibilidade de processo licitatório para as próximas aquisições de armas, adotando, inclusive, se for
> o caso, a licitação internacional prevista no art. 42 da Lei 8.666/1993;"

9.5. Em análise à Norma Técnica Nº 001/2019/SENASP/MJ juntamente ao Guia de Aplicação da Norma Técnica Nº 001/2019/SENASP/MJ, existem apenas dois requisitos elecandos na norma SENASP que não são exigências do projeto ARM, e ambos não são requisitos básicos de segurança e desempenho. Desta maneira, resta claro que não há incompatibilidades entre o Projeto, o Acórdão e a Norma Técnica.

9.6. Quadro comparativo entre as normas

REQUISITOS CONSTANTES NOS DOCUMENTOS	RTPRF 02.2019	NT Nº 001/2019/SENASP	OBSERVAÇÕES	STATUS	CONCLUSÃO
Tipo de ação: dupla com semi-engatilhamento	POSSUI	POSSUI		CONCORDAM	Sistema de armas Glock atende plenamente
Sistema de percussão	POSSUI	POSSUI	Norma da Senasp possui escopo ampliado definindo mais hipóteses de acionamento	CONCORDAM	Sistema de armas Glock atende plenamente
Tipo e comprimento do cano	POSSUI	POSSUI	A norma PRF exige apenas o cano de perfil poligonal e definiu o comprimento do cano, **a norma Senasp não definiu o comprimento do cano** e ampliou a possibilidade	CONCORDAM	Sistema de armas Glock atende plenamente

			para cano com sulcos tradicionais, não poligonais		
Mínimo de teclas externas	POSSUI	NÃO POSSUI		NORMA SENASP SILENTE	Sistema de armas Glock atende plenamente
Tratamento das partes metálicas (resistência à intempéries)	POSSUI	POSSUI	Norma da PRF exige o material Tenifer ou similar, ao passo que a norma da Senasp não menciona o material Tenifer, no entanto exige que o material seja resistente à uma lista predeterminada de componentes químicos	CONCORDAM	Sistema de armas Glock atende plenamente
Chassi em polímero com insertos em aço	POSSUI	NÃO POSSUI	Norma da PRF exige chassi (frame) em polímero, exigiu as cores, norma da Senasp não exige polímero e tampouco definiu cores, ademais a norma da Senasp exige que seja antiderrapante e antirrefletivo	CONCORDAM	Sistema de armas Glock atende plenamente
Carregadores bifilares em aço com revestimento em polímero e intercambiáveis	POSSUI	NÃO POSSUI		NORMA SENASP SILENTE	Sistema de armas Glock atende plenamente
Retém do carregador ambidestro ou reversível	POSSUI	POSSUI	Norma Senasp com escopo ampliado, definindo sentido de acionamento do retém e textura	CONCORDAM	Sistema de armas Glock atende plenamente
Intercambiabilidade de peças	POSSUI	NÃO POSSUI		NORMA SENASP SILENTE	Sistema de armas Glock atende plenamente
Empunhadura ajustável	POSSUI	POSSUI		CONCORDAM	Sistema de armas Glock atende plenamente
Sistemas de segurança (ao menos 3 travas distintas)	POSSUI	POSSUI	As duas normas exigem trava do percussor, trava do gatilho e trava de queda	CONCORDAM	Sistema de armas Glock atende plenamente
Sistema de funcionamento	POSSUI	NÃO POSSUI		NORMA SENASP SILENTE	Sistema de armas Glock atende plenamente
Trilho para acessórios	POSSUI	NÃO POSSUI		NORMA SENASP SILENTE	Sistema de armas Glock atende plenamente
Possibilidade de uso de aparelho óptico.	POSSUI	NÃO POSSUI		NORMA SENASP SILENTE	Sistema de armas Glock atende plenamente
Existência de versões para treinamento	POSSUI	NÃO POSSUI		NORMA SENASP SILENTE	Sistema de armas Glock atende plenamente
Peso e curso do	POSSUI	POSSUI		CONCORDAM	Sistema de armas Glock

gatilho	POSSUI	POSSUI		CONCORDAM	atende plenamente
Raiamento poligonal	POSSUI	POSSUI		CONCORDAM	Sistema de armas Glock atende plenamente
Possibilidade de fixação do fiel	POSSUI	NÃO POSSUI		NORMA SENASP SILENTE	Sistema de armas Glock atende plenamente
Existência de sistema de identificação por rádio frequência	POSSUI	NÃO POSSUI		NORMA SENASP SILENTE	Sistema de armas Glock atende plenamente
Assistência técnica no brasil	POSSUI	NÃO POSSUI		NORMA SENASP SILENTE	Sistema de armas Glock atende plenamente
Aparelho de pontaria (em trítio)	POSSUI	NÃO POSSUI		NORMA SENASP SILENTE	Sistema de armas Glock atende plenamente
Maturidade do projeto - histórico de utilização	POSSUI	NÃO POSSUI		NORMA SENASP SILENTE	Sistema de armas Glock atende plenamente
Aprovação em protocolos internacionais	POSSUI	NÃO POSSUI		NORMA SENASP SILENTE	Sistema de armas Glock atende plenamente
Aptidão para munições nacionais e importadas	NÃO POSSUI	POSSUI	O RTPRF 02.2019 não menciona expressamente a necessidade de aptidão para munições nacionais e importadas, tampouco especifica peso e velocidade de projétil. No entanto o sistema de armas Glock, adotado por agências de polícia ao redor do mundo, está apto à utilizar munições nacionais e importadas, com projéteis em diferentes pesos e dimensões	NORMA PRF SILENTE	Sistema de armas Glock atende plenamente
Acabamento em primeira linha	POSSUI	POSSUI		CONCORDAM	Sistema de armas Glock atende plenamente
Manutenção de 1° escalão de fácil realização	NÃO POSSUI	POSSUI		NÃO CONFLITANTE	Sistema de armas Glock atende plenamente
Indicador de munição na câmara	NÃO POSSUI	POSSUI	O RTPRF 02.2019 não menciona expressamente a necessidade de indicador de munição na câmara, no entanto, o sistema de armas Glock, possui referido mecanismo embutido nas suas pistolas.	NORMA PRF SILENTE	Sistema de armas Glock atende plenamente
Não produzir tiro			A norma SENASP exige expressamente este requisito, no		Sistema de

Não produzir tiro em uma queda de 2m com munição na câmara	NÃO POSSUI	POSSUI	entanto pode-se inferir que a exigência de trava de queda contida na norma PRF atenda ao requisito	NÃO CONFLITANTE	Sistema de armas Glock atende plenamente
Câmara	NÃO POSSUI	POSSUI		NÃO CONFLITANTE	Sistema de armas Glock atende plenamente
Trancamento	POSSUI	POSSUI		CONCORDAM	Sistema de armas Glock atende plenamente
Retém do ferrolho	NÃO POSSUI	POSSUI		NÃO CONFLITANTE	Sistema de armas Glock atende plenamente
Capacidade de operação e disparos	NÃO POSSUI	POSSUI	A norma Senasp exige capacidade de operação e disparos após intercambialidade total de peças	NÃO CONFLITANTE	Sistema de armas Glock atende plenamente
Ferrolho	NÃO POSSUI	POSSUI	A norma Senasp define as características necessárias ao ferrolho	NÃO CONFLITANTE	Sistema de armas Glock atende plenamente

9.7. Os ensaios, definidos no item 6 da referido Norma Técnica, serão realizados no lote recebido, como parte dos procedimentos de recebimento definitivo. Sugerimos que o custo dos testes, bem como as unidades que serão destruídas nos ensaios, sejam custeados pela empresa vencedora dos futuros certames.

10. PADRONIZAÇÃO

Procurou-se também manter uma padronização do armamento utilizado pelas forças federais de segurança, considerando que a PRF participa ativamente de operações com intercâmbio entre instituições, além de ceder policiais para a segurança presidencial e de ministros de estado. Tendo em vista que a Brigada de Forças Especiais do Exercito Brasileiro, o Batalhão de Guarda Presidencial e o Departamento de Polícia Federal utilizam o armamento aqui especificado, buscamos uma racionalização de recursos, considerando a possibilidade de integração logística de partes e peças do armamento além de uma racionalização das capacitações e alinhamento de doutrinas e procedimentos.

Nesse sentido vale citar a lição Marcal Justen Filho, em seu "Comentários a Lei de Licitações e Contratos Administrativos", 12ª edição:

> "A padronização será promovida pela Administração como pressuposto de futuras contratações. Influirá sobre o conteúdo da atividade administrativa futura, inclusive a possibilidade de resultar em contratações diretas. É perfeitamente possível que a padronização conclua pela seleção de objeto que pode ser prestado por um único fornecedor, tornando-se inviável a competição. Nenhum vício ocorrerá nessa hipótese, desde que a padronização tenha sido conduzida de modo adequado, com observância das formalidades cabíveis e respeitados os princípios fundamentais"

Também nessa direção vale citar **Decisão nº 1.196/2002, Plenário, do Tribunal de Contas a União:**

> "A indicação de marca na especificação de produtos de informática pode se aceita frente ao princípio da padronização previsto no art. 15, inciso I, da Lei nº 8.666/1993, desde que a decisão administrativa que venha a identificar o produto pela marca seja circunstanciadamente motivada e demonstre se essa a opção, em termos técnicos e econômicos, mais vantajosos para a Administração." (Acórdão nº 2.376/2006, Plenário, Rel. Min. Marcos Vinícius Vilaça)

É importante ressaltar que a padronização é regra, eis que tratada como um princípio da Lei de Licitações (artigo 15, inciso I). No caso de armamentos, que são equipamentos altamente específicos e dos quais se exige (para proteger a vida do policial e de terceiros) alta performance, ainda mais necessária sua aplicação, vejamos:

> "Art. 15. As compras, sempre que possível, deverão:
>
> I - atender ao princípio da padronização, que imponha compatibilidade de especificações técnicas e de desempenho, observadas, quando for o caso, as condições de manutenção, assistência técnica e garantia oferecidas;"

Por esse motivo o Departamento de Polícia Federal padronizou, por meio da Portaria n° 458/07-DG/DPF, publicada no Diário Oficial da União n° 208, de 29/10/07, os modelos G17, G19 e G26 das pistolas Glock, como armamento leve de porte no âmbito da Polícia Federal (ANEXO 22).

Considerando todos os estudos realizados pela Polícia Rodoviária Federal e demais instituições pesquisadas ao longo dos anos de 2015 a 2018, bem como o excelente resultado alcançado ao longo das centenas de instruções de habilitações com o novo sistema de armas Glock, que realizou a substituição integral de todas as pistolas anteriormente empregadas pela PRF, pelas novas pistolas Glock, onde não foi registrado nenhum incidente, pane ou problema com o treinamento de quase 10.000 mil PRFs.

Restou claro que as especificações técnicas definidas pela equipe de técnicos da PRF atendem perfeitamente às necessidades da PRF, garantindo não apenas a qualidade, segurança e confiança dos armamentos, mas atendendo também aquelas características desejáveis, ou seja, que embora não diretamente vinculada à segurança, qualidade ou confiabilidade, trazem vários benefícios extremamente vantajosos para a atividade da PRF, garantindo assim, sua perfeita adequação às diversas atividades e atribuições da PRF, atendendo desde o efetivo ordinário, as áreas especializadas e o ensino.

Com a finalização do completo estudo técnico realizado, que culminou na substituição integral das armas de porte da PRF pelo Sistema de armas da fabricante Glock, onde inclui não apenas os três modelos operacionais, mas ainda 03 versões exclusivas para treinamento, totalizando 06 modelos de pistolas compatíveis entre si, e que, devido a essa padronização, permitiram uma redução significativa de custos com instrução e treinamento, além de evitar a possibilidade de erros de execução devido a confusão com os procedimentos de operação de um modelo com outro, torna-se premente que esse sistema de armas seja padronizado para o emprego do efetivo da Polícia Rodoviária Federal em todo o território nacional.

Considerando ainda que dentro de qualquer instituição policial, o investimento de tempo e recursos no treinamento é substancial, sendo além de necessário, obrigatório, em decorrência de disposição legal, conforme preceitua as diretrizes da portaria interministerial nº 4226/2010, destacadas abaixo:

> "16. Deverão ser elaborados procedimentos de habilitação para o uso de cada tipo de arma de fogo e instrumento de menor potencial ofensivo que incluam avaliação técnica, psicológica, física e treinamento específico, com previsão de revisão periódica mínima.
>
> 17. Nenhum agente de segurança pública deverá portar armas de fogo ou instrumento de menor potencial ofensivo para o qual não esteja devidamente habilitado e sempre que um novo tipo de arma ou instrumento de menor potencial ofensivo for introduzido na instituição deverá ser estabelecido um módulo de treinamento específico com vistas à habilitação do agente.
>
> 18. A renovação da habilitação para uso de armas de fogo em serviço deve ser feita com periodicidade mínima de 1 (um) ano."

Nesta senda, o uso de armas com mesma plataforma, funcionamento e teclas de operação faz com que os recursos com as instruções caiam significativamente, especialmente quando comparados a instruções com armas de plataformas diferentes, que ensejam necessidades de treinamentos também diferentes, muitas vezes dobrando os investimentos com instrução.

Esse aumento com custos de instrução e treinamento devido ao emprego de armas com plataformas diferentes é algo que a PRF conhece muito bem, pois viveu esse problema até o final do ano de 2018, quando empregava 03 modelos de armas diferentes, onde cada modelo necessitava de um processo de habilitação diferente, podendo portanto compará-lo quando da mudança para o atual sistema de armas da Glock.

Ademais, para ratificar a necessidade de aquisição de um sistema completo de armas, tem-se o fato que na PRF os policiais que necessitam utilizar armas subcompactas são os lotados nos serviços de inteligência, corregedoria, operações especiais e cargos com função comissionada, sendo que essas armas se destinam a outra dinâmica de atuação e são usadas seletivamente a depender da atuação, ou seja, esses policiais precisam ter a sua disposição armas de tamanho "Standard" e "subcompacta". Além disso, devido ao desgaste natural provocado pelas atividades desses setores, a rotatividade dos policiais nessas áreas é considerável. Sendo assim o uso de armas com mesma plataforma ajuda a otimizar os investimentos com as instruções, facilitando a capacitação/habilitação do policial no manuseio (montagem, desmontagem, teclas de operação, sistema de funcionamento etc.) de ambos os modelos de pistolas (Standard e subcompacta). De outra forma, toda vez que um servidor fosse lotado em um setor onde o uso de outra arma fosse necessário a PRF teria um novo gasto com instrução.

Além disso, considerando que subsidiariamente à aquisição das armas, a PRF adquiriu um conjunto de "spare parts" (peças de reposição), que garantirá a manutenção de todo esse armamento adquirido pelos próximos 20 anos, no mínimo. E como as armas utilizam a mesma plataforma, torna a manutenção de segundo escalão, a cargo de servidores especializados, será mais facilitada e com custos reduzidos, haja vista que as ferramentas e peças de reposição utilizadas serão as mesmas.

Desta forma, após o longo processo de estudos que culminou com a substituição de todos os 03 modelos de armas distintos e não compatíveis antes empregados pela PRF, por um único Sistema de armas, confiável, seguro e de qualidade, com funcionamento, teclas de operação, montagem e desmontagem e demais itens compatíveis entre si, permitindo uma uniformidade de procedimentos, instrução e operação, independente da área na qual o policial atue, especializada ou não, resta a PRF padronizar esse sistema de armas, a fim de que as futuras aquisições respeitem as especificações aqui estabelecidas e fortemente fundamentadas, evitando que armas incompatíveis com o atual sistemas de armas sejam adquiridas e inseridas dentro da PRF. De tal forma que, uma nova modificação ensejaria, obrigatoriamente, um novo e longo estudo, que comprovasse, a superioridade, não apenas na qualidade, segurança, confiabilidade e demais características, mas ainda na vantajosidade econômica da substituição, assim como foi comprovada ao longo deste processo.

11. **CONCLUSÃO**

Por fim, considerando o que prescreve o artigo 15 da Lei 8666, de 21 de junho de 1993, em seu inciso I, que estabelece que "As compras, sempre que possível, deverão: I - atender ao princípio da padronização, que imponha compatibilidade de especificações técnicas e de desempenho, observadas, quando for o caso, as condições de manutenção, assistência técnica e garantia oferecidas; ";

Considerando os relatórios constantes nos processos 08650.025836/2016-40, 08650.019721/2017-05 e 08650.006431/2018-74, confeccionados pela Equipe de técnicos do Projeto Estratégico ARM - Armamentos Institucionais, criado através das Portarias da Direção da PRF Nº 329, de 16 de outubro de 2015 e Nº 144 de 19 de maio de 2017 com a função de, entre outras atribuições: "propor melhorias, otimizações, mudanças, substituições, padronizações e possíveis aquisições com base nos estudos realizados."

Considerando a aquisição e distribuição, para todas as unidades da Polícia Rodoviária Federal em todo o Brasil, de 12.565 unidades de pistolas do Sistema de armas Glock, no calibre 9x19mm, incluindo 11.300 unidades do modelo G17 para uso ostensivo e 615 do modelo G26 para uso dissimulado, que tornou as pistolas da fabricante Glock, nos modelos G17 e G26, como sendo o único sistema de armas de porte atualmente empregada pela PRF. Fazendo com que independentemente da área em que atuem, todos os PRF´s possuem armas de mesma plataforma, com peças e carregadores intercambiáveis entre os modelos;

Considerando que as glocks adquiridas possuem vida útil prevista de aproximadamente de 20 anos, sendo que nesse período só haverão aquisições para substituição dos equipamentos danificados ou extraviados e para complementar o quadro de Policiais Rodoviárias Federais, hoje limitado a cerca de 13 mil servidores. Assim, projeta-se que até o ano de 2040 não serão adquiridos mais que 40% do total de armas já disponíveis no patrimônio da instituição, ou seja, qualquer aquisição de outro armamento teria repercussão em despesas que superariam em até 3,5 vezes o valor da própria aquisição, quando adotado como referência o valor pelo qual se adquiriu os atuais armamentos. Assim, até que não se esgote a vida útil das pistolas fornecidas ao efetivo em 2018, o modelo G17 deverá ser padronizados nos termos do § 5° do art. 7° da lei 8.666/93

Considerando o recolhimento dos 3 modelos de armas de porte, no calibre .40 S&W, pertencentes a fabricante Taurus, anteriormente empregados pela PRF;

Considerando a distribuição das novas pistolas Glock e recolhimento das pistolas da fabricante Taurus, as pistolas semiautomáticas da marca Glock, modelos G17 e G26 representam 100% (cem por cento) do acervo de pistolas em uso da Polícia Rodoviária Federal;

Considerando o resultado extremamente satisfatório obtido durante os eventos de capacitações com os quase 10,000 PRF´s que receberam o armamento, onde nenhuma pane, incidente ou problema foi relatado;

Considerando a aquisição e distribuição de simulacros para treinamento de todo o efetivo em todos os estados, que são idênticos às armas reais, o que tornou mais seguro e eficiência os treinamentos dos policiais;

Considerando o treinamento realizado com os armeiros da PRF (Os instrutores participantes do Workshop de Instrutores de AMT - 2018, foram habilitados na mecânica de armamentos do Sistema de Armas Glock, sendo aptos a total desmontagem e montagem do armamento, bem como identificação da necessidade de troca de peças, caso hajam), bem como o estoque de peças sobressalentes existentes para pistolas da marca Glock (adquiridas em conjunto com as armas) e a intercambialidade de peças entre os modelos das referidas pistolas;

Considerando a convergência entre outros órgãos de segurança pública nacionais e internacionais que realizaram estudos, laudos, perícias, pareceres técnicos, atestados e relatórios sobre padronização de armamento;

A Divisão de Prospecção e Desenvolvimento de Produtos recomenda **PADRONIZAR**, no âmbito da Polícia Rodoviária Federal, como Sistema de Armas de Porte, as pistolas calibre 9 x 19 mm, da fabricante GLOCK Ges.m.b.H; e **DEFINIR os modelos G17, G17 MOS e G26 e suas versões de treinamento (G17 R, G17 T, G17 Cutaway)** como os únicos modelos de arma de porte que devem ser adquiridos para uso ostensivo e dissimulado nas próximas aquisições a serem realizadas pela PRF.

VINICIUS RENATO MARTINI
Chefe da Divisão de Prospecção de Desenvolvimento de Produtos

De acordo:

ABDIAS VIEIRA DA COSTA NETO
Coordenador de Mobilização e Logística

De acordo:

PAULO R. CUNHA FIGUEIREDO SOUSA
Coordenador Geral de Administração

Aprovo a presente Nota Técnica:

MURILO CANGUSSU CAVALCANTE
Diretor de Administração e Logística

Documento assinado eletronicamente por **PAULO ROBERTO CUNHA FIGUEIREDO DE SOUSA**, **Coordenador(a)-Geral de Administração**, em 13/08/2020, às 08:48, horário oficial de Brasília, com fundamento no art. 10, § 2º, da Medida Provisória nº 2.200-2, de 24 de agosto de 2001, no art. 6º do Decreto nº 8.539, de 8 de outubro de 2015, e no art. 42 da Instrução Normativa nº 116/DG/PRF, de 16 de fevereiro de 2018.

Documento assinado eletronicamente por **ABDIAS VIEIRA DA COSTA NETO**, **Coordenador(a) de Mobilização e Logística**, em 13/08/2020, às 11:17, horário oficial de Brasília, com fundamento no art. 10, § 2º, da Medida Provisória nº 2.200-2, de 24 de agosto de 2001, no art. 6º do Decreto nº 8.539, de 8 de outubro de 2015, e no art. 42 da Instrução Normativa nº 116/DG/PRF, de 16 de fevereiro de 2018.

Documento assinado eletronicamente por **VINICIUS RENATO MARTINI**, **Chefe da Divisão de Prospecção e Desenvolvimento de Produtos**, em 13/08/2020, às 17:15, horário oficial de Brasília, com fundamento no art. 10, § 2º, da Medida Provisória nº 2.200-2, de 24 de agosto de 2001, no art. 6º do Decreto nº 8.539, de 8 de outubro de 2015, e no art. 42 da Instrução Normativa nº 116/DG/PRF, de 16 de fevereiro de 2018.

Referência: Processo nº 08650.014484/2019-40 SEI nº 26133170

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Ministério da Justiça e Segurança Pública

NORMA TÉCNICA SENASP

Esta Norma Técnica SENASP (NT-SENASP) foi elaborada através de processo preconizado pela Portaria MJSP nº 104, de 13/03/2020, com as fases desenvolvidas conforme segue:

RESPONSÁVEL	FASE	DATA
CNM	Elaboração da Minuta Preliminar pela Equipe Técnica CNM - 1ª versão	29/05/2019
CNM	Elaboração da Minuta Preliminar pela Equipe Técnica CNM - 2ª versão	09/07/2019
CNM	Elaboração da Minuta Preliminar pela Equipe Técnica CNM - 3ª versão	27/07/2019
CNM	Elaboração da Minuta Preliminar pela Equipe Técnica CNM - 4ª versão	10/09/2019
CNM	Câmara Técnica	11/09/2019
CNM	Audiência Pública	25/10/2019
CNM	Consulta Pública	02/01/2020

A NT-SENASP poderá cancelar ou substituir a edição anterior, quando tratar do mesmo tema e for devidamente aprovado, sendo que nesse ínterim a referida norma continua em vigor;

Aqueles que tiverem conhecimento de qualquer direito de patente devem apresentar esta informação em seus comentários, com documentação comprobatória;

Tomaram parte na elaboração deste documento:

Participantes:	Fabio Ferreira Real - Pesquisador-Tecnologista do Inmetro Ladislau Brito Santos Júnior - Perito Criminal PCAM Bruno Wendel de Oliveira Del Barco - Tenente Coronel PMMT Vinicius Frabetti - Capitão PMESP Paulo Eduardo Mascarello Gobbi - Gerente de Projetos Marcos Antonio Contel Secco - Perito Criminal POLITEC/MT Nilton Quilião - Agente de Polícia Federal Marco Aurélio Valério - Tenente Coronel PMESP Francisco Rodrigues de Oliveira Neto - Policial Rodoviário Federal Rogerio Nogueira Carvalho da Silva - Capitão PMDF João da Cunha Neto - Delegado de Polícia PCSC Marcos Eduardo Ticianel Paccola - Tenente Coronel PMMT Wendel de Jesus Costa - Tenente Coronel PMGO Neomar Christian Potuk - Capitão PMPR	**Função:**	Coordenador de Normatização e Metrologia - CGPI/DPSP/SENASP/MJSP CGPI/DPSP/SENASP/MJSP CGPI/DPSP/SENASP/MJSP CGPI/DPSP/SENASP/MJSP CGPI/DPSP/SENASP/MJSP Especialista em Armamento Especialista em Armamento Especialista em Armamento Especialista em Armamento Especialista em Armamento Especialista em Armamento Especialista em Armamento Especialista em Armamento Especialista em Armamento

NT-SENASP Nº 001/2020 – Pistolas calibre 9x19 mm e .40 S&W

1. PREFÁCIO

A Secretaria Nacional de Segurança Pública (SENASP), responsável pelo programa Pró-Segurança, em consonância com a perspectiva estruturante de suprir as necessidades fundamentais das instituições de segurança pública, no tocante a equipamentos de qualidade que proporcionem condições minimamente necessárias para a execução da atividade policial e com metodologia de construção coletiva, congregando experiências de profissionais com expertise consagrada na área, de forma a materializar a cooperação e a colaboração dos órgãos e instituições componentes do Sistema Único de Segurança Pública (SUSP), adotou a iniciativa de estabelecer Normas Técnicas para produtos de segurança pública, visando dar a devida atenção e base técnica à legítima demanda pelo estabelecimento de atas, nacionais e internacionais, de registro de preço para locação e/ou aquisição de serviços e produtos de interesse dos Estados, Distrito Federal e Municípios, todos ancorados por padrões de qualidade definidos e que agreguem substancial performance ao serviço policial.

Pretende-se com tal intento contribuir de forma incisiva para a prestação de um serviço de excelência à população brasileira, fornecendo às instituições de segurança pública meios e parâmetros para sua modernização, através de um planejamento baseado nas etapas de pesquisa, diagnose, estabelecimento de requisitos técnicos, normatização, e subsequente certificação dos produtos de acordo com as normas estabelecidas, para garantir a segurança, a qualidade e a confiabilidade dos produtos utilizados pelos profissionais de segurança pública.

Nesse sentido, a presente NT-SENASP regulará os requisitos técnicos mínimos, ensaios e esquema de certificação das armas curtas dos calibres majoritariamente utilizados na atividade de segurança pública no país, buscando garantir sua qualidade e segurança quanto ao uso e performance operacional, resultando em economia ao erário público.

2. **ESCOPO**

Esta NT-SENASP estabelece os requisitos mínimos de qualidade e desempenho os quais são aplicáveis ao fornecimento de pistolas calibre 9x19 mm e .40 S&W para a atividade profissional de segurança pública, de forma a garantir a segurança, a qualidade e a confiabilidade desse produto.

Scope

This SENASP Technical Standard establishes minimum requirements of quality and performance which are applied to supply 9x19 mm and .40 S&W caliber pistols for the public safety professional work, in order to guarantee safety, quality and reliability of this product.

3. **REFERÊNCIAS NORMATIVAS**

3.1. As normas basilares relacionadas a seguir contêm disposições que constituem premissas para esta NT-SENASP:

3.1.1. Decreto nº 24.602/1934, que dispõe sobre instalação e fiscalização de fábricas e comércio de armas, munições, explosivos, produtos químicos agressivos e matérias correlatas - do então Governo Provisório, recepcionado como Lei pela Constituição Federal de 1934;

3.1.2. Decreto nº 10.030/2019, que dá nova redação ao Regulamento para a Fiscalização de Produtos Controlados (R-105); e

3.1.3. Portaria MJSP nº 104/2020, que dispõe sobre o Pró-Segurança - Programa Nacional de Normalização e Certificação de Produtos de Segurança Pública.

3.2. As normas abaixo contém disposições consideradas complementares à presente NT-SENASP:

3.2.1. Norma ABNT NBR ISO/IEC 17067:2015 - Avaliação da conformidade - Fundamentos para certificação de produtos e diretrizes de esquemas para certificação de produtos;

3.2.2. Norma ABNT NBR 8094:1983 - Material metálico revestido e não revestido - Corrosão por exposição à névoa salina - Método de ensaio;

3.2.3. Norma *SAAMI* (*Sporting Arms and Ammunition manufacturer's Institute) Z* 299.3-2015; e

3.2.4. Norma *STANAG 4090* - adopted as standard small arms ammunition (9x19 mm), da Organização do Tratado do Atlântico Norte.

3.3. Foram utilizadas como referência na elaboração da presente NT-SENASP:

3.3.1. Norma ABNT NBR ISO 9001:2015 - Sistemas de gestão da qualidade-Requisitos;

3.3.2. Norma *NATO AC/225(LG/3-SG/1)D/14*, da Organização do Tratado do Atlântico Norte;

3.3.3. Norma *NATO STANDARD AQAP-2110*, da Organização do Tratado do Atlântico Norte;

3.3.4. Norma NEB/T E-267A, publicada pela Portaria n° 049-SCT/2011, do Exército Brasileiro;

3.3.5. Norma NIJ Standard - 0112.03, do Instituto Nacional de Justiça dos EUA;

3.3.6. *US Army Test Operations Procedure* (TOP) 3-2-045 *Small Arms - Hand and Shoulder Weapons and Machineguns*, do Exército dos EUA;

3.3.7. Norma *Erprobungsrichitlinien (ER) Zur Technischen Richtlinie (TR) Pistolen in Kaliber 9 mm x 19* – 2008 - Diretriz Técnica de Pistolas de Calibre 9 mm x 19, do Instituto Técnico Policial (PTI), da Escola Superior de Polícia Alemã (DHPol); e

3.3.8. *Philippine National Police Parameters In the conduct of test evaluation for caliber 9 mm pistol,* da Polícia Nacional das Filipinas.

3.3.9. ASTM D471:16a, Standard Test Method For Rubber Property - Effect Of Liquids.

As edições indicadas estavam em vigor no momento desta publicação. Como toda norma está sujeita a revisão, recomenda-se àqueles que realizam acordos com base nesta que verifiquem a conveniência de se usarem as edições mais recentes das normas citadas.

4. **TERMOS E DEFINIÇÕES**

Para os efeitos deste documento, aplicam-se os termos e definições abaixo reproduzidos:

4.1. Armas de porte: arma de fogo de dimensões e peso reduzido, que pode ser portada por um indivíduo em um coldre e disparado, comodamente, com somente uma das mãos pelo atirador; enquadram-se, nesta definição, pistolas, revólveres e garruchas.

4.2. Pistola: arma de fogo de porte, geralmente semi-automática, cuja única câmara faz parte do corpo do cano e cujo carregador, quando em posição fixa, mantém os cartuchos em fila e os apresenta sequencialmente para o carregamento inicial e após cada disparo. Após cada disparo, a energia cinética proveniente da expansão dos gases impulsiona o ferrolho à retaguarda fazendo com que o extrator remova o estojo da câmara e, após contato com o ejetor, seja expelido pela janela de ejeção. Ao atingir o ponto máximo de recuo o ferrolho é impulsionado a frente, devido a ação da mola recuperadora, momento em que insere um novo cartucho de munição na câmara e realiza o trancamento da culatra, estando em condições para produção do próximo tiro.

4.3. Modelo: arma com projeto registrado, contendo mesmas dimensões de cano, calibre, material constitutivo, sistemas de funcionamento e segurança.

4.3.1. Para efeito dessa norma não se consideram armas do mesmo "modelo": quando houver mudança no calibre, medidas dimensionais e/ou peso; quando houver alteração na constituição do todo ou de parte da arma, tanto pela substituição do material quanto pela mudança no acabamento; e quando houver mudança em seus sistemas de funcionamento e/ou segurança.

4.3.2. Serão consideradas armas do mesmo "modelo" os exemplares de cor predominante aparentemente díspares, sem as alterações previstas no item anterior, inclusive quanto ao material constitutivo e acabamento.

4.4. Ação dupla: nas armas de ação dupla, o gatilho tem a capacidade de engatilhar o sistema de disparo (cão ou percussor lançado) em sua totalidade e em seguida liberá-lo à frente, ocasionando o disparo.

4.5. Ação híbrida (ou ação dupla com semi-engatilhamento do percussor): sistema no qual com o carregamento da arma (inserção de uma munição na câmara) a mola do percussor fica semi-engatilhada.

4.6. *Striker fire*: são armas com sistema de percussão que não possui cão, podendo funcionar em ação simples, dupla, ou híbrida a depender do modelo.

4.7. Trava externa: entende-se por trava externa todo o mecanismo que, quando acionado com a arma carregada, exige do operador/atirador uma ação muscular distinta do empunhar a arma e acionar a tecla do gatilho para que o disparo seja efetuado.

4.8. Manutenção em primeiro escalão: montagem e desmontagem da arma em situação operacional realizada pelo seu usuário final para limpeza e lubrificação sem uso de qualquer ferramenta. Os demais escalões de manutenção prescindem de ferramentas para sua realização, necessitando da infra estrutura necessária para tanto.

5. **REQUISITOS TÉCNICOS MÍNIMOS**

5.1. **CARACTERÍSTICAS GERAIS OBRIGATÓRIAS:**

5.1.1. Sistema de operação mecânica em ação dupla ou híbrida, *striker fire*, com peso e curso de gatilho constante do primeiro ao último disparo, não se considerando variações *intra* disparo (durante um único disparo) e sim *inter* disparos (comparando-se o primeiro com os demais disparos);

5.1.2. Armamento deve estar apto ao uso de munições nacionais e importadas, dentro do calibre especificado, 124 gr, *hollow point*, com velocidade mínima de 350 m/s, para o calibre 9x19 mm, e 180 gr, *hollow point*, com velocidade mínima de 312 m/s para o calibre .40 S&W, que atendam à norma SAAMI (*Sporting Arms and Ammunition manufacturer's Institute*) Z 299.3-2015 ou homologadas de acordo com a C.I.P (*Commission internationale permanente pour l'épreuve des armes à feu portatives)* - HOMOLOGATION Lista de TDCC - Tab IV - cartuchos para pistolas e revólveres, no que se refere aos aspectos de dimensões, pressão e velocidade para pistolas de fogo central;

5.1.3. Deverá possuir acabamento de primeira linha, sem sinais de corrosão, imperfeições, rebarbas e/ou sobras de materiais que evidenciem falta de qualidade no processo fabril, a fim de evitar ferimentos nos usuários, falhas de funcionamento e de procedimento;

5.1.4. A manutenção de primeiro escalão deverá ser de fácil realização pelo usuário, sem o uso de ferramentas, bem como, apresentar dificuldade de montagem equivocada em primeiro escalão; assim, no caso desta possibilidade afetar a função e/ou a segurança, a arma deve ser reprovada.

5.2. **CARACTERÍSTICAS ESPECÍFICAS:**

5.2.1. **QUANTO A SEGURANÇA:**

5.2.1.1. Deverá possuir sistema de travamento para o gatilho (trava de gatilho), que impeça o gatilho de ser acionado por ação inercial ou acionamento acidental, exceto se a tecla localizada no gatilho for corretamente acionada;

5.2.1.2. Deverá possuir sistema interno de bloqueio do percussor (trava do percussor), impedindo que o percussor atinja a espoleta, a menos que a tecla do gatilho seja corretamente acionada, não sendo permitida a marcação da espoleta, quando do simples manejo do ferrolho, manuseio brusco ou queda da arma;

5.2.1.3. Deverá possuir como requisito adicional optativo o indicador de munição na câmara (indicador de arma carregada);

5.2.1.4. Deve possuir sistema de segurança que impossibilite a percussão da espoleta em casos de queda do armamento;

5.2.1.5. A arma, com cartucho de munição na câmara, não pode produzir tiro após uma queda de, ao menos, uma altura de 2.000 mm em piso de concreto.

5.2.2. **QUANTO AO ACABAMENTO EXTERNO E INTERNO:**

5.2.2.1. Todas as teclas, peças e mecanismos da arma, deverão ter capacidade de resistir, sem quaisquer aditivos depreciativos em sua constituição ou construção: a intempéries (incluindo as climáticas extremas); rusticidade de manipulação e transporte; condições adversas; oxidações, abrasões, choques e incidência de raios UV (no caso de polímero). Deverão ainda ser compatíveis com componentes químicos presentes em munições (ou decorrentes de sua queima), solventes, líquidos, lubrificantes, e materiais usados na manutenção de armas (conforme tabela abaixo):

Item n°	TIPO
1	Solução de limpeza, solvente
2	Solução de limpeza, secante
3	Equivalente a tricloroetano
4	Lubrificante, semifluido, automóveis, armas (a)
5	Óleo lubrificante, uso geral (a)
6	Lubrificante, limpador e preservativo (a) (CLP)
7	Gasolina, veículo de combate (b)
8	Combustível de turbina (b)
9	Óleo combustível, diesel (b)
10	Repelente de inseto
11	Fluido hidráulico
12	Anticongelante, etilenoglicol
13	Solução removedora de carbono
14	Água deionizada e destilada
15	Água do mar (simulada)
16	Agente descontaminante DS2
17	Agente descontaminante STB
18	Óleo lubrificante, armamento
19	Óleo lubrificante, motores
20	Fluído hidráulico, a base de petróleo
21	Fluído hidráulico, não inflamável
22	Etanol

(a) ASTM D471, Tabela 1 *(b) ASTM D471, Tabela 2*

ASTM - American Society for Testing and Materials

5.2.3. **QUANTO AO CANO, CÂMARA e TRANCAMENTO:**

5.2.3.1. CANO: dotado de estrias (raiamento), de sentido dextrogiro ou levogiro; ou com alma do tipo poligonal no eixo longitudinal (cantos arredondados); ou ainda com sulcos tradicionais L&G (canto vivo), medido do limite de intersecção do próprio cano com a câmara até a sua extremidade oposta (na boca do cano);

5.2.3.2. CÂMARA (*HEADSPACE*): de acordo com a definição da sistemática e indicadores de mensuração "*Go*" (verificar se o *headspace* é igual ou maior que mínimo da norma SAAMI referenciada) e "*No-Go*" (verificar se o *headspace* não é maior que o espaço máximo da norma SAAMI referenciada), seguindo o constante nos termos do subitem 5.2.1. da NIJ Standard - 0112.03, sendo medida do limite de intersecção da própria câmara com o cano até a sua extremidade oposta onde ocorre o trancamento;

5.2.3.3. TRANCAMENTO: a critério do fabricante desde que atenda as normas de segurança e funcionamento, não sendo admitida a possibilidade de produção do tiro sem o completo trancamento da culatra.

5.2.4. **QUANTO À ERGONOMIA:**

5.2.4.1. Deverá permitir que uma mesma arma possa ser utilizada por policiais de diferentes anatomias das mãos, devendo portanto, possuir solução de ajuste, para viabilizar adaptação ao tipo de empunhadura do usuário (tipo *backstrap* ou outra solução), em no mínimo três tamanhos distintos, ou qualquer outro meio, excetuando-se o uso de luvas de "*hogue*" e/ou variações no punho implementadas por customizações.

5.2.5. **OPERAÇÃO**:

5.2.5.1. **RETÉM DO FERROLHO:**

5.2.5.1.1. Deverá ser recartilhado ou texturizado, possibilitando ao operador destravar o ferrolho de maneira ergonômica e funcional, possuindo como requisito adicional optativo do tipo ambidestro ou reversível, para evitar prejuízo ou perda de empunhadura ou do aparelho de pontaria da arma durante sua utilização.

5.2.5.2. **RETÉM DO CARREGADOR:**

5.2.5.2.1. Obrigatoriamente do tipo ambidestro ou reversível, recartilhado ou texturizado, posicionado de forma a não atrapalhar a empunhadura, localizado na armação, na área de junção do guarda mato e a empunhadura (punho), possibilitando a retirada do carregador (totalmente municiado ou com qualquer quantidade de cartuchos ou, ainda, vazio), de maneira livre quando a arma está empunhada. A localização do retém do carregador não deverá favorecer seu acionamento acidental ou involuntário em decorrência do uso da arma pelo operador, ou quando do transporte em coldre;

5.2.5.2.2. Deve ser ativado pressionando-o no sentido lateral de movimento pelo polegar, não sendo permitido um retém que seja ativado por um movimento descendente;

5.2.5.2.3. Deve ser projetado para permitir a liberação positiva do carregador, para liberar quando totalmente comprimido pelo policial, para reduzir a probabilidade de liberação inadvertida do carregador durante o transporte, manuseio e / ou disparo;

5.2.5.2.4. Quando de seu acionamento, conforme o contido nos subitens anteriores, de modo imediato, sem forças externas, o carregador deverá cair livremente apenas pela ação da gravidade, estando vazio ou municiado.

5.2.5.3. **CAPACIDADE DE OPERAÇÃO E DISPAROS:**

5.2.5.3.1. Deverá ter capacidade de operação e disparos, sem o comprometimento da segurança, precisão do tiro e funcionamento da arma, após intercambialidade de 100% (cem por cento) das peças, em qualquer nível de desmontagem, nas condições constantes dos respectivos protocolos de ensaios previstos.

5.2.5.4. **ARMAÇÃO (*FRAME/RECEIVER*):**

5.2.5.4.1. Deverá ser anti-refletiva; capaz de resistir, sem quaisquer aditivos depreciativos em sua constituição ou construção: a intempéries (incluindo as climáticas extremas); rusticidade de manipulação e transporte; condições adversas; oxidações, abrasões e choques; a agentes químicos/minerais; a raios UV (no caso de polímero); ser compatível com agentes químicos, solventes, líquidos e lubrificantes (conforme item 5.2.2.1); com guarda-mato de dimensões capazes de permitir a operação da arma por usuário com luvas, sem comprometer a eficiência e eficácia do disparo;

5.2.5.4.2. Ter uma superfície antiderrapante ambidestra, na área do contato manual do punho.

5.2.5.5. **FERROLHO:**

5.2.5.5.1. Deverá ser anti-refletivo; capaz de resistir, sem quaisquer aditivos depreciativos em sua constituição ou construção: a intempéries (incluindo as climáticas extremas); rusticidade de manipulação e transporte; condições adversas; oxidações, abrasões e choques; ; a agentes químicos/minerais; e ser compatível com agentes químicos, solventes, líquidos e lubrificantes (conforme item 5.2.2.1);

5.2.5.5.2. Obrigatoriamente, na parte traseira, nas laterais (direita e esquerda), ser dotado de sulcos, recartilhados ou ranhuras, a fim de permitir ao usuário fácil ciclagem quando em operação, na área do contato manual;

5.2.5.5.3. É permitido, na parte dianteira, nas laterais (direita e esquerda), ser dotado de sulcos, recartilhados ou ranhuras, a fim de permitir ao usuário fácil ciclagem quando em operação, na área do contato manual.

5.2.5.6. **GATILHO:**

5.2.5.6.1. A força necessária para premir o gatilho deve ser de no mínimo 2 kgf e no máximo 4,5 kgf;

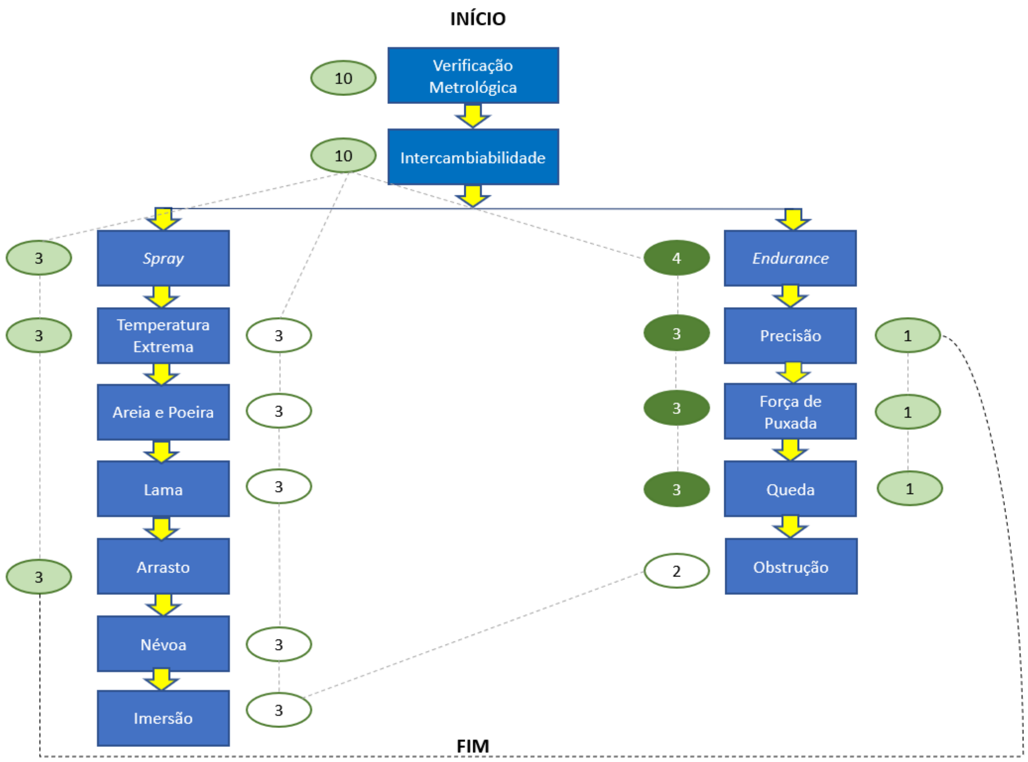
5.2.5.6.2. Deve ser consistente em seu percurso e peso, possibilitando ao policial, com a mão que empunha a arma, voluntariamente com apenas uma ação de seu acionamento, realizar o ciclo para o disparo e recuperação para engrenar (armar) novamente o mecanismo de percussão;

5.2.5.6.3. São vedadas folgas e/ou deslocamentos laterais, durante o acionamento para o disparo e recuperação para engrenar novamente com o mecanismo de percussão, pois isto resulta em erros e falta de precisão.

6. **ENSAIOS**

6.1. **SEQUÊNCIA DE ENSAIOS**

Os ensaios serão executados, no mínimo, em uma amostra total composta por 10 (dez) unidades, conforme a seguinte sequência: verificação de características gerais e metrologia, intercambiabilidade, *spray* de água acelerado, temperatura extrema e umidade, dinâmico de areia e poeira, lama, arrasto na areia, névoa salina, imersão em água salgada, *endurance* (resistência), precisão, força de puxada do gatilho, queda e obstrução do cano por projétil.



6.2. **CRITÉRIOS COMUNS**

6.2.1. Durante os ensaios serão utilizadas munições no calibre especificado, 124 gr, *hollow point*, com velocidade mínima de 350 m/s, para o calibre 9X19 mm, e 180 gr, *hollow point*, com velocidade mínima de 312 m/s para o calibre .40 S&W; que atendam à norma SAAMI (Sporting Arms and Ammunition manufacturer's Institute) Z 299.3-2015 ou homologadas de acordo com a C.I.P (*Commission internationale permanente pour l'épreuve des armes à feu portatives*) - *HOMOLOGATION* Lista de TDCC - Tab IV - cartuchos para pistolas e revólveres, no que se refere aos aspectos de dimensões, pressão e velocidade para pistolas de fogo central.

6.2.2. Falha funcional é considerada como uma função defeituosa da pistola, da munição, do equipamento suplementar ou acessório, podendo levar ou não à pane ou impedimento.

6.2.3. Pane ou impedimento é a interrupção não intencional da execução do tiro.

6.2.4. As falhas funcionais devem ser avaliadas de acordo com suas consequências, sendo classificadas como críticas, graves ou leves.

6.2.4.1. Falhas funcionais críticas levam à falha total da pistola (impedimento), sendo somente eliminadas com o auxílio de ferramentas, somada ao fato de afetar a segurança do operador ou de terceiros. Pode ocorrer ainda quando uma ou mais peças da arma precisam ser substituídas, ou quando ocorrer sua inutilização.

6.2.4.1.1. Não será tolerada falha funcional crítica durante os ensaios, sendo a amostra reprovada quando de sua ocorrência.

6.2.4.2. Falhas funcionais graves levam ao impedimento da pistola e tem como consequência a interrupção do uso da arma, podendo a pane ser sanada somente com o auxílio de ferramentas.

6.2.4.3. Falhas funcionais leves não levam ao impedimento, ou quando este ocorrer que possa ser eliminado sem o auxílio de ferramentas.

6.2.5. Falhas funcionais decorrentes de manuseio e tratamento inadequados pelo manipulador e as que surgem em decorrência de uma falha da munição não devem ser consideradas na computação da cota de falha.

6.2.6. Códigos numéricos das falhas funcionais seguem conforme tabela a seguir:

CÓDIGOS NUMÉRICOS DAS FALHAS FUNCIONAIS

CÓDIGO	TIPO DE FALHA FUNCIONAL
1	Cartucho não deflagra
2	Projétil não sai do cano
3	Estojo não é extraído
4	Estojo não é ejetado para fora da arma
5	Disparo sem acionamento do gatilho
6	Falha no trancamento do ferrolho
7	Vários disparos com acionamento único do gatilho
8	Dupla alimentação
9	Ferrolho travado à retaguarda com o carregador municiado
10	Mecanismo de percusão não é armado
11	Gatilho não rearma
12	Carregador é ejetado da arma durante a execução de tiro sem acionamento do retém
13	Carregador solto no seu poço (não trava)
14	Cartuchos emperram no carregador
15	Ferrolho é liberado com a introdução do carregador (sem acionamento do retém)
16	Ferrolho não fecha após acionamento do retém
17	Cartucho não é empurrado para fora do carregador
18	Cartucho não é totalmente introduzido na câmara
19	Desprendimento de peças da pistola
20	Gatilho com difícil acionamento
21	Outras teclas com difícil acionamento
22	Outros

6.3. **ENSAIOS POR ESPÉCIE**

6.3.1. **VERIFICAÇÃO DE CARACTERÍSTICAS GERAIS E METROLOGIA**

6.3.1.1. Objetivo: verificar a adequação dos exemplares em análise aos parâmetros técnicos mínimos e análise das especificidades do modelo, bem como conformidade das munições utilizadas no roteiro de ensaios.

6.3.1.2. Amostra: composta pelo total de 10 (dez) unidades.

6.3.1.3. Roteiro:

I - Esse ensaio deverá ser executado a uma temperatura de 25° C ± 5° C.

II - As unidades da amostra deverão estar limpas e lubrificadas de acordo com o manual da arma, sem excesso de lubrificação.

III - A arma deverá ser classificada, verificando-se visualmente: calibre, cor predominante, material constitutivo, acabamento interno e externo, cano, trilho, sistemas de funcionamento e segurança, trancamento, presença de zarelho, armação (*frame/receiver*), ferrolho, alça e massa de mira, gatilho, carregador, presença de falhas de acabamento como por exemplo cantos vivos, ergonomia e demais requisitos técnicos mínimos.

IV - A arma deverá ser classificada, verificando-se metrologicamente: câmara (*headspace*), parâmetros dimensionais, comprimento e diâmetro do cano, comprimento total, peso total da arma com carregador vazio, outros parâmetros de peso (peso das amostras com o carregador vazio, com o carregador cheio e apenas do carregador vazio), protusão do percussor, força da mola do percussor, força para carregamento, profundidade da câmara, força da mola recuperadora, força necessária para desconectar o sistema de disparo do sistema de acionamento (conector), força para acionamento do gatilho. A câmara (*headspace*) deverá ser aferida pelos indicadores de mensuração "*Go*" (verificar se o *headspace* é igual ou maior que o mínimo da norma SAAMI referenciada) e "*No-Go*" (verificar se o *headspace* não é maior que o espaço máximo da norma SAAMI referenciada).

V - Deverá ser verificada a conformidade do lote de munições a ser utilizado nos ensaios das armas, nos parâmetros do item 6.2.1., inclusive com aferição da velocidade mínima de projétil através de cronógrafo.

6.3.1.4. Critérios de aceitação:

I - Presença integral dos requisitos técnicos mínimos observáveis neste ensaio, e em especial a segurança e ergonomia.

II - O sistema de travamento para o gatilho (trava de gatilho) deverá impedir que o gatilho seja acionado por ação inercial ou por acionamento acidental, exceto quando acionado pelo operador.

III - O sistema interno de bloqueio do percussor deverá impedir que o percussor atinja a espoleta, a menos que a tecla do gatilho seja corretamente acionada. Não será admitida qualquer marcação da espoleta, quando do simples manejo do ferrolho, trava de segurança, manuseio brusco ou queda da arma.

IV - O retém do carregador deverá ser do tipo ambidestro ou reversível, recartilhado ou texturizado, posicionado de forma a não atrapalhar a empunhadura, localizado na armação, na área de junção do guarda mato e da empunhadura (punho). Não deverá favorecer seu acionamento acidental ou involuntário em decorrência do uso da arma, ou quando do transporte em coldre, possibilitando sua retirada de maneira livre (totalmente municiado, ou com qualquer quantidade de cartuchos, ou ainda vazio), quando a arma está empunhada.

V - A arma deverá ter acabamento de primeira linha e não apresentar sinais de corrosão, imperfeições, rebarbas e/ou sobras de materiais, que evidenciem falta de qualidade no processo fabril, falhas de funcionamento e de procedimento.

6.3.2. **ENSAIO DE INTERCAMBIABILIDADE**

6.3.2.1. Objetivo: verificar a total intercambiabilidade entre as unidades da amostra, apurando a constância nas medidas das peças e a possibilidade de utilização das peças entre diversas pistolas para a realização de manutenção sem a necessidade de realizar ajustes individualizados de peça por peça. Este ensaio tem por finalidade ainda a mitigação de intercorrências e inconsistências que comprometam a qualidade, funcionamento, segurança e suporte logístico do armamento, parametrizando-se em processos de fabricação e controle de primeira linha.

6.3.2.2. Amostra: composta pelo total de 10 (dez) unidades.

6.3.2.3. Roteiro:

I - Esse ensaio deverá ser executado a uma temperatura de 25° C ± 5° C.

II - As unidades da amostra deverão estar limpas e lubrificadas de acordo com o manual da arma, sem excesso de lubrificação.

III - Todas as armas deverão ser desmontadas em todos escalões e montadas com peças uma das outras, de forma aleatória, verificando a intercambiabilidade de seus componentes.

IV - Serão realizados na sequência 35 (trinta e cinco) disparos por arma, verificando-se sua funcionalidade.

6.3.2.4. Critérios de aceitação:

I - As armas deverão possuir 100% de intercambialidade de peças entre unidades distintas de pistolas, sendo estas da mesma marca, calibre e modelo;

II - A manutenção de primeiro escalão (montagem e desmontagem) deverá ser de fácil realização pelo usuário, sem o uso de ferramentas;

III - A dificuldade de montagem equivocada em primeiro escalão;

IV - A não incidência de falhas críticas ou graves;

V - A incidência de, no máximo, 02 (duas) falhas funcionais leves em toda amostra, não sendo computadas as falhas decorrentes de manuseio e tratamento inadequados pelo laboratorista e as que surgem em decorrência de uma falha da munição.

6.3.3. **ENSAIO DE *SPRAY* DE ÁGUA ACELERADO**

6.3.3.1. Objetivo: verificar a performance da arma em situação climática de alta incidência pluviométrica.

6.3.3.2. Amostra: composta de 3 (três) unidades escolhidas aleatoriamente do grupo de 10 pistolas.

6.3.3.3. Roteiro:

I - Esse ensaio deverá ser executado a uma temperatura de 25° C ± 5° C.

II - Como procedimento de preparação da amostra essa deve ser limpa e lubrificada de acordo com o manual da arma, sem excesso de lubrificação.

III - O ensaio deverá simular uma chuva onde o *spray* atinja todo o compartimento de acomodação da arma nas posições conforme tabela do subitem III. O aspersor deverá ficar no máximo a uma distância da arma de 1 m com dispersão de água uniforme no compartimento. A vazão será de 0,17 cm/min por m^2, suficiente para simular o máximo total de chuva em um período de 12 horas em condições de clima Equatorial. A execução deste ensaio pode oferecer o risco de falha catastrófica devido a obstrução do cano da pistola por água.

IV - As munições deverão ser removida das embalagens e expostas junto com as armas (carregadores carregados).

V - O ensaio deve ser executado conforme sequência da tabela a seguir:

Condições de ensaio	Tempo de exposição (min)	Tempo acumulado (min)	Chuva (cm)	
			Por condição	Acumulado
Arma na horizontal Ferrolho aberto	12	12	2	2
Carregada, Ferrolho fechado	12	24	2	4
120 tiros (total da amostra)	6	30	1	5
Ferrolho aberto	12	42	2	7
Carregada, Ferrolho fechado	12	54	2	9
120 tiros (total da amostra)	6	60	1	10
Cano da arma para cima (a) Ferrolho aberto	12	72	2	12
Carregada, Ferrolho fechado	12	84	2	14
120 tiros (total da amostra)	6	90	1	15
Ferrolho aberto	12	102	2	17
Carregada, Ferrolho fechado	12	114	2	19
120 tiros (total da amostra)	6	120	1	20
Cano da arma para baixo Ferrolho aberto	12	132	2	22
Carregada, Ferrolho fechado	12	144	2	24
120 tiros (total da amostra)	6	150	1	25
Ferrolho aberto	(b) 12	162	(b) 2	27
Carregada, Ferrolho fechado	(b) 12	174	(b) 2	29
10 tiros (total da amostra)	(b) 6	180	(b) 1	30

VI - (a) Antes dos disparos, a arma deverá ser voltada com o cano para baixo para drenar toda a água acumulada, destravando o ferrolho suavemente.

VII - (b) Como requerido, terminar o ensaio com coluna de 30 cm de água.

VIII - A cadência de tiro terá a regularidade de aproximadamente 01 tiro por segundo.

IX - A recarga e substituição de carregadores devem ser feitas em um ritmo que pode ser confortavelmente mantido durante os disparos.

X - Se necessário, deverá se ajustar a contagem de rodadas de acordo com a capacidade máxima do carregador.

XI - As armas deverão permanecer o tempo todo sob *spray* de água, inclusive durante os tiros.

XII - Nenhuma manutenção deverá ser permitida durante o ensaio.

XIII - Depois dos ensaios, as armas deverão ser desmontadas, inspecionadas, limpas e lubrificadas. Se a operação das armas estiver comprometida, repetir o ciclo de desmontagem até a lubrificação para determinar que ações de manutenção devem ser tomadas para o completo restabelecimento operacional destas.

6.3.3.4. Critérios de aceitação:

I - Se ocorrerem falhas graves ou críticas durante os ensaios, o ensaio deverá ser interrompido e a amostra será considerada reprovada.

II - Como critério de aceitação, a amostra será considerada "aprovada sem ressalvas" se não apresentar falhas no ensaio, “aprovada com ressalvas” se apresentar cota de falhas menor ou igual a 2% de falhas leves, e “reprovada” se apresentar cota de falhas maior que 2% de falhas leves.

III - Será anotada a circunstância da aprovação da amostra "sem" ou "com" ressalvas no relatório de ensaios.

IV - Deverá ser analisada a arma para identificação da causa da falha, para possível aprovação no caso da munição ser sua raiz, desde que não decorrente da exposição da munição a excesso de umidade proporcionada pela própria arma.

6.3.4. **ENSAIO DE TEMPERATURA EXTREMA E UMIDADE**

6.3.4.1. Objetivo: verificar a performance da arma em situação climática de alta temperatura ambiente.

6.3.4.2. Amostra: composta de 6 (seis) unidades, sendo 3 (três) unidades que passaram pelo ensaio de *spray* de água acelerado, somadas a mais 3 (três) unidades escolhidas aleatoriamente do grupo de 7 pistolas.

6.3.4.3. Roteiro:

I - Os ensaios deverão ser executados sob duas condições: à temperatura de 52°C com uma umidade máxima de 5% na câmara, e à temperatura de 52°C com uma umidade mínima de 90% na câmara. Para fins de evitar a autocombustão, deverá ser observada a temperatura na região da câmara de combustão na parte externa do ferrolho, que não poderá ser superior a 150 °C.

II - Como procedimento de preparação das amostras, limpar e lubrificar as 06 (seis) armas de acordo com o manual da arma, sem excesso de lubrificação.

III - A amostra e as munições deverão ser acondicionadas na câmara climatizada por pelo menos 06 (seis) horas.

IV - Os ensaios deverão ser executados em cada condição dentro da câmara num total de 96 tiros por arma (48 tiros em cada condição de umidade) em ciclos de 12 tiros, sendo 01 tiro por segundo.

V - O intervalo mínimo entre os ciclos deverá ser de 02 horas. Caso seja necessária uma intervenção para manutenção antes de concluir o total de tiros, a arma deverá ser removida da câmara.

VI - Após os 96 tiros, as armas deverão ser removidas da câmara de acondicionamento para desmontagem, limpeza, lubrificação e inspeção.

6.3.4.4. Critérios de aceitação:

I - Se ocorrerem falhas graves ou críticas durante os ensaios, o ensaio deverá ser interrompido e a amostra será considerada reprovada.

II - Será aprovada a amostra que apresentar cota de falhas menor ou igual a 1% de falhas leves em todo o ensaio.

6.3.5. **ENSAIO DINÂMICO DE AREIA E POEIRA**

6.3.5.1. Objetivo: verificar a performance da arma em situação climática de alta incidência de vento contendo areia e poeira.

6.3.5.2. Amostra: composta pelas 3 (três) unidades que passaram pelo ensaio de temperatura e umidade e que não tenham passado pelo ensaio pelo ensaio de *spray* de água acelerado.

6.3.5.3. Roteiro:

I - Esse ensaio deverá ser executado a uma temperatura de 25° C ± 5° C.

II - A amostra deverá estar limpa e lubrificada de acordo com o manual da arma, sem excesso de lubrificação, sendo preparadas um total de 450 unidades de munição (150 unidades por arma).

III - Cada arma que será ensaiada deverá ser instalada no suporte do dispositivo, carregada e municiada. Se a arma possuir tampa da janela de ejeção, esta deverá estar fechada antes de execução do primeiro disparo. Os carregadores restantes deverão estar protegidos com bolsas plásticas e dentro da caixa de poeira e areia.

IV - Este ensaio buscará investigar os efeitos da exposição da arma à poeira e areia durante o disparo. Para sua execução, será necessária uma caixa de poeira e areia construída de madeira compensada de espessura de 25 mm, 0,90 m de largura, 1,20 m de profundidade e 1,40 m de comprimento, com laterais em acrílico e um suporte interno para segurar a arma. Um compressor rotativo, com lâminas de 30 cm, motorizado ou manual, similar aos comumente utilizados por ferreiros, deverá ser montado em uma das extremidades na parte superior central, com 7,5 cm abaixo do tampo e soprando para dentro da caixa. Um furo de ventilação adicional de 7,5 cm, alinhado com o compressor, deverá ser colocado na outra extremidade da caixa. Um furo de 5 cm para a entrada de mistura de poeira e areia deve ser feita no tampo da caixa, alinhado com o compressor em uma distância de 38 cm do mesmo. Dois pares de luvas de proteção de cano longo de borracha para serem utilizadas pelo atirador deverão ser adaptadas, cada par, dos lados direito e esquerdo da caixa. Estas luvas promovem a impermeabilidade da poeira para o manuseio e total controle da arma, inclusive municiamento de carregadores e disparar a arma. A composição da mistura de poeira e areia deve ser conforme mostrado na mesma tabela do abaixo:

Tabela 2.17 MISTURA DE POEIRA E AREIA

	Remanescente			
Medida da malha da peneira(mm)	R (g)	R. 100 (%) SR	Total (%) peneirado	Notas
2.0 1.0 0.63 0.4 0.2 0.1 0.063 -	- - 19.4 20.0 63.2 34.0 53.2 10.2	- - 9.7 10.0 31.6 17.0 26.6 5.1	100.0 100.0 90.3 80.3 48.7 31.7 5.1 -	
Total SR	200.0	100.0	-	

V - A mistura de poeira e areia será insuflada através do furo de entrada numa razão de 1 kg/min com o compressor a 60 rotações por minuto (RPM). Sob essas condições, deverão ser efetuados 150 disparos em séries de 25 disparos no tempo de 20 s, resultando num tempo total de aproximadamente 3 (três) min de duração de ensaio por arma.

VI - Um gravador de cadência de disparos de forma contínua deverá ser utilizado durante cada ensaio, de forma que haja o registro cronológico do tempo total do ensaio, o tempo decorrido até que ocorra um mau funcionamento, o tempo levado para solucionar a pane, e outros, assim como a cadência de disparo da arma. O tempo total que o ferrolho permanece aberto (para solucionar panes, trocar carregador, etc.) é uma medição crítica neste ensaio.

VII - Nenhuma limpeza ou manutenção será permitida até o final dos ensaios ou até ficarem inoperantes.

6.3.5.4. Critérios de aceitação:

I - Se ocorrerem falhas graves ou críticas durante o ensaio, este deverá ser interrompido e a amostra será considerada reprovada.

II - Como critério de aceitação, a amostra será considerada "aprovada sem ressalvas" se apresentar cota de falhas menor ou igual a 1% de falhas leves, “aprovada com ressalvas” se apresentar cota de falhas entre 1% e 2% (incluso este valor) de falhas leves, e “reprovada” se apresentar cota de falhas maior que 2% de falhas leves.

III - Será anotada a circunstância da aprovação da amostra "sem" ou "com" ressalvas no relatório de ensaios.

IV - Uma inspeção será necessária para avaliação das partes internas e para relatar os níveis de dano, deterioração e funcionalidade dessas, bem como as dificuldades para desmontagem de primeiro e segundo escalão.

6.3.6. **ENSAIO DE LAMA**

6.3.6.1. Objetivo: este ensaio buscará investigar o limite de funcionamento e o nível de desempenho da arma após uma exposição à lama, simulando as condições que se espera quando o usuário está rastejando em terreno com lama e barro.

6.3.6.2. Amostra: composta de 3 (três) unidades que passaram pelo ensaio dinâmico de areia e poeira.

6.3.6.3. Roteiro:

I - Esse ensaio deverá ser executado a com a temperatura da água igual a 19 ± 1° C.

II - Antes de ser submetida aos ensaios, a amostra deverá ter sua eficiência constatada, disparando o total de 15 (quinze) munições.

III - Após a constatação de sua eficiência, a amostra deverá ser limpa e lubrificada de acordo com o manual da arma, sem excesso de lubrificação, sendo preparada com carregadores com 15 munições inseridos em cada arma.

IV - Devem ser preparados 4 (quatro) carregadores para cada arma (total de 60 munições por arma).

V - Com cada arma totalmente carregada, fechada e travada, deverá ser colocada uma fita adesiva na boca do cano.

VI - Esse ensaio deverá ser executado com a imersão da arma em banheira de lama com variação de densidade conforme tabela 2.18.

VII - Cada arma deverá ser imersa e agitada na banheira de lama por 60 s em cada densidade.

VIII - Em seguida, cada arma deverá ser soprada e chacoalhada por 30 s.

IX - O procedimento deverá ser repetido por mais 5 vezes, totalizando 6 banhos sucessivos de lama.

X - No banho de lama nº 7, logo após o banho, cada arma deverá ser soprada e chacoalhada por 30 s, tomando em conta que o período de tempo decorrido entre a retirada da arma da banheira de lama e o disparo deve ser o menor possível (menor que 60 s). Devem ser disparados 15 tiros em ato contínuo (um carregador completo). Cada arma deverá ser completamente limpa após os 15 disparos.

XI - O procedimento de acordo com o banho de lama nº 7 deverá ser repetido nos banhos nº 8, 10 e 12; os banhos de lama nº 9 e nº 11 devem ser de acordo com o procedimento dos seis primeiros banhos.

Tabela 2.18 Composição do Banho de Lama

Ingredientes			
Banho nº	Argila (kg)	Areia (kg)	Água (l)
1	0,1	-	10
2	0,3	-	10
3	0,5	-	10
4	1	-	10
5	3	-	10
6	5	-	10
7	1	0,5	10
8	1	1,0	10
9	3	0,5	10
10	3	1,0	10
11	5	0,5	10
12	5	1,0	10

6.3.6.4. Critérios de aceitação:

I - Se ocorrerem falhas graves ou críticas durante os ensaios, o ensaio deverá ser interrompido e a amostra será considerada reprovada.

II - Como critério de aceitação, a amostra será considerada "aprovada sem ressalvas" se apresentar cota de falhas menor ou igual a 10% de falhas leves, "aprovada com ressalvas" se apresentar cota de falhas entre 10% e 20% (incluso este valor) de falhas leves, e "reprovada" se apresentar cota de falhas maior que 20% de falhas leves.

III - Será anotada a circunstância da aprovação da amostra "sem" ou "com" ressalvas no relatório de ensaios.

6.3.7. **ENSAIO DE ARRASTO NA AREIA**

6.3.7.1. Objetivo: Este ensaio buscará investigar os efeitos da areia no funcionamento da arma, simulando as condições que se espera quando o usuário está rastejando em terreno arenoso.

6.3.7.2. Amostra: Serão escolhidas 3 (três) unidades do grupo que passou pelo ensaio de temperatura e umidade.

6.3.7.3. Roteiro:

I - Esse ensaio deverá ser executado a uma temperatura de 25° C ± 5° C.

II - Antes de ser submetida aos ensaios, a amostra deverá ter sua eficiência constatada, disparando o total de 15 (quinze) munições.

III - Após a constatação de sua eficiência, a amostra deverá ser limpa e lubrificada de acordo com o manual da arma, sem excesso de lubrificação, sendo preparada com carregadores com 10 munições inseridos em cada arma.

IV - Devem ser preparados 5 (cinco) carregadores para cada arma (total de 50 munições por arma).

V - Com cada arma totalmente carregada, fechada e travada, deverá ser colocada uma fita adesiva na boca do cano.

VI - O ensaio deverá ser realizado em calha de areia com 4,5 m de comprimento, 0,45 m de largura e 0,25 m de profundidade. Deverá conter 4 aquecedores tubulares de 60 W de potência, cada qual com 183 cm de comprimento e 30 cm de distância, promovendo uma temperatura aproximada de 44° C. Cada arma deverá ser fixada a um transportador que realizará o arraste em orientação e profundidade padronizada. A calha deve ser preenchida com areia (mesma do teste dinâmico de areia e poeira), deixando 7,5 cm de altura livre até o topo da calha. A calha deverá ser colocada no chão ou em container apropriado com a janela de ejeção da arma para cima.

VII - A arma deverá ser deslocada ao longo de todo o comprimento da calha à velocidade de 1 m/s, lado direito em contato com a areia, apontado para a direção do arraste e com inclinação de 15° em relação a linha da calha.

VIII - Após esse deslocamento, o excesso de areia deverá ser retirado balançando a arma ou soprando, por aproximadamente 10 (dez) s.

IX - A proteção da boca do cano deverá ser retirada e 5 (cinco) disparos em 3 (três) s deverão ser efetuados.

X - A arma deverá ser travada, protegida a sua boca do cano, posicionada o outro lado em contato com a areia e repetido o processo.

XI - Deverão ser executados um total de 10 arrastes, 5 de cada lado.

XII - Nenhuma limpeza ou manutenção será permitida até o final dos ensaios ou até ficarem inoperantes.

6.3.7.4. Critérios de aceitação:

I - Se ocorrerem falhas graves ou críticas durante os ensaios, o ensaio deverá ser interrompido e a amostra será considerada reprovada.

II - Como critério de aceitação, a amostra será considerada "aprovada sem ressalvas" se apresentar cota de falhas menor ou igual a 10% de falhas leves, "aprovada com ressalvas" se apresentar cota de falhas entre 10% e 20% (incluso este valor) de falhas leves, e "reprovada" se apresentar cota de falhas maior que 20% de falhas leves.

III - Será anotada a circunstância da aprovação da amostra "sem" ou "com" ressalvas no relatório de ensaios.

IV - Uma inspeção será necessária para avaliação das partes internas e para relatar os níveis de dano, deterioração e funcionalidade dessas, bem como as dificuldades para desmontagem de primeiro e segundo escalão.

6.3.8. **ENSAIO DE NÉVOA SALINA**

6.3.8.1. Objetivo: verificar o funcionamento e a durabilidade da arma quanto a sua corrosão quando exposta a condição ambiente extrema.

6.3.8.2. Amostra: composta de 3 (três) unidades que passaram pelo ensaio de lama.

6.3.8.3. Roteiro:

I - A amostra deverá ser armazenada à temperatura de 35° C ± 5° C por pelo menos 2 (duas) horas.

II - A amostra deverá estar limpa e lubrificada de acordo com o manual da arma, sem excesso de lubrificação.

III - As armas deverão ser carregadas com ferrolho trancado na câmara e arma travada.

IV - Os ensaios deverão ser executados conforme norma técnica ABNT NBR 8094:1983 (solução da névoa salina, câmara e outros), com uma exposição de dois períodos de 24 h em ambiente de névoa salina alternados com dois períodos de 24 h de condição sem umidade.

V - Tanto os carregadores vazios quanto as armas carregadas deverão ser submetidos à névoa salina por 24 h. Após esse período, tanto as armas quanto os carregadores deverão ser removidos da câmara, drenados e colocados com o cano para baixo, sendo recuado o ferrolho.

VI - As armas e os carregadores deverão ser armazenadas por 24 h em condições ambientais a uma temperatura de 35° C ± 5° C e 20% de umidade.

VII - Deverão ser repetidos mais um ciclo de 24 h de névoa salina e mais um ciclo de 24 h de temperatura ambiente com baixa umidade.

VIII - Com os ciclos completos, executar os 120 disparos em cada arma.

IX - Nenhum tipo de limpeza, desmontagem e manutenção serão permitidas até o fim dos ensaios.

X - Caso alguma arma fique inoperante durante a execução dos tiros, deverá ser anotada a quantidade de tiros executados por essa e deverá ser encaminhada para a inspeção final com essa informação.

XI - Após a execução dos tiros, deverá ser realizada a inspeção final onde todas as peças internas e externas serão avaliadas quanto à corrosão, deterioração e funcionalidade.

6.3.8.4. Critérios de aceitação:

I - Se ocorrerem falhas críticas durante os ensaios, o ensaio deverá ser interrompido e a amostra será considerada reprovada.

II - Como critério de aceitação, a amostra será considerada "aprovada sem ressalvas" se apresentar cota de falhas menor ou igual a 1% de falhas leves, "aprovada com ressalvas" se apresentar cota de falhas entre 1% e 5% (incluso este valor) de falhas leves, e "reprovada" se apresentar cota de falhas maior que 5% de falhas leves.

III - Será anotada a circunstância da aprovação da amostra "sem" ou "com" ressalvas no relatório de ensaios.

IV - Como critério de aceitação somente serão admitidos pontos vermelhos que poderão ser restabelecidas as condições normais de uso após uma manutenção de primeiro escalão.

V - Caso seja necessária uma manutenção de segundo escalão, a arma será considerada reprovada.

6.3.9. **ENSAIO DE IMERSÃO EM ÁGUA SALGADA**

6.3.9.1. Objetivo: verificar o funcionamento e a durabilidade da arma no tocante a sua corrosão, quando exposta a condição ambiente extrema.

6.3.9.2. Amostra: composta de 3 (três) unidades que passaram pelo ensaio de névoa salina.

6.3.9.3. Roteiro:

I - Os ensaios devem ser realizados a 25° C ± 5° C.

II - A amostra deverá estar limpa e lubrificada de acordo com o manual da arma (em conformidade com a tabela 2.18), sem excesso de lubrificação.

III - A solução utilizada no ensaio será composta de 20% de cloreto de sódio e 80% de água por peso, com o cloreto de sódio com teor igual ou inferior a 0,1% iodo de sódio e 0,2% de outras impurezas.

IV - As armas, carregadores e 60 (sessenta) munições deverão ser imersas totalmente uma única vez por 1 (um) min na solução.

V - A diferença de temperatura entre as armas e a solução deverá ser inferior a 10° C no início do ensaio.

VI - Após a imersão, as armas deverão ser posicionadas com o cano para baixo e recuados os ferrolhos para drenar a água.

VII - Imediatamente após a drenagem da água, as armas deverão produzir 60 (sessenta) disparos por arma, com cadência de tiro com regularidade de, aproximadamente, 01 tiro por segundo;

VIII - A seguir a amostra será armazenada em uma câmara com alta umidade (90% até o 5º dia e 95% até o final) em um total de 10 dias, sem limpeza ou lubrificação.

IX - Nos dias 3, 5, 8 e 10, cada arma será disparada 60 (sessenta) vezes com munições integras (que não tenham sido expostas a solução), em um total de 240 (duzentos e quarenta) tiros por arma.

X - A recarga e substituição de carregadores devem ser feitas em um ritmo que confortavelmente pode ser mantido durante os disparos.

XI - Se necessário, deverá se ajustar a contagem de rodadas de acordo com a capacidade máxima do carregador.

XII - Se acontecer algum mau funcionamento da arma será admitido seu descarregamento, golpes sucessivos no ferrolho e remoção por meio de batidas.

XIII - Nenhuma limpeza ou manutenção será permitida até o final dos ensaios ou até ficarem inoperantes.

6.3.9.4. Critérios de aceitação:

I - Caso uma arma fique inoperante antes dos 10 dias, a amostra será considerada reprovada.

II - Se ocorrerem falhas graves ou críticas durante os ensaios, este deverá ser interrompido e a amostra será considerada reprovada.

III - Como critério de aceitação, a amostra será considerada "aprovada sem ressalvas" se apresentar cota de falhas menor ou igual a 2% de falhas leves, “aprovada com ressalvas” se apresentar cota de falhas entre 2% e 10% (incluso este valor) de falhas leves, e “reprovada” se apresentar cota de falhas maior que 10% de falhas leves.

IV - Será anotada a circunstância da aprovação da amostra "sem" ou "com" ressalvas no relatório de ensaios.

V - Uma inspeção será necessária para avaliação das partes internas e para relatar os níveis de corrosão, deterioração e funcionalidade dessas, bem como as dificuldades para desmontagem de primeiro e segundo escalão.

6.3.10. **ENSAIO DE *ENDURANCE***

6.3.10.1. Objetivo: este ensaio buscará investigar o nível de resistência e desempenho da arma sob *stress* de uso, simulando um envelhecimento da arma (envelhecimento acelerado) através de seu acionamento por equipe de atiradores.

6.3.10.2. Amostra: será composta de 04 (quatro) armas, selecionadas do total das 10 (dez) pistolas que realizaram o teste de intercambiabilidade.

6.3.10.3. Roteiro ensaio de resistência:

I - Esse ensaio deverá ser executado a uma temperatura entre 10° C e 40° C.

II - A amostra deverá estar limpa e lubrificada de acordo com o manual da arma, sem excesso de lubrificação.

III - Um total de 10.000 (dez mil) disparos deverão ser executados em cada arma da amostra por grupo de atiradores, sem qualquer limpeza ou lubrificação, sendo que a cada 1.000 (mil) disparos com uma cadência regular de dois disparos por segundo, as armas deverão ser resfriadas por 2 (dois) min, permanecendo o armamento em temperatura ambiente.

6.3.10.4. Critérios de aceitação:

I - Será considerada reprovada a amostra que apresentar:

a) qualquer falha grave ou crítica, sendo o ensaio interrompido;

b) mais de 2 (duas) ocorrências (por milhar) de falhas leves;

c) qualquer desgaste excessivo, dano estrutural, dilatação ou deformação que altere o funcionamento e/ou comprometa a segurança;

d) desgaste nas peças que impeça a continuidade dos ensaios.

6.3.11. **ENSAIO DE PRECISÃO**

6.3.11.1. Objetivo: determinar o desempenho de precisão da pistola por meio do resultado de seus acertos.

6.3.11.2. Amostra: será composta de 4 (quatro) armas, sendo 3 (três) unidades que realizaram o ensaio de *endurance*, e 1 (uma) unidade que não passou por ensaios severos, sendo preparadas com um total de 40 munições (10 por arma).

6.3.11.3. Roteiro:

I - Esse ensaio deverá ser executado a uma temperatura entre 10° C e 40° C.

II - A amostra deverá estar limpa e lubrificada de acordo com o manual da arma, sem excesso de lubrificação.

III - Serão verificados os resultados dos acertos, a partir da utilização de um suporte padrão (*Ranson Rest*) a uma distância de 25 m do alvo.

IV - Cada arma será acionada por 10 (dez) disparos, devendo o projétil atingir uma circunferência máxima de 16 (dezesseis) cm de diâmetro.

6.3.11.4. Critérios de aceitação:

I - Será considerada aprovada a amostra em que as armas apresentarem os 10 disparos por arma dentro de uma circunferência igual ou inferior a 16 cm de diâmetro, não ocorrendo:

a) falha crítica ou grave;

b) falha funcional leve maior que 2 (duas) falhas desta natureza, não sendo computadas as falhas decorrentes de manuseio e tratamento inadequados pelo operador e as que surgem em decorrência de uma falha da munição;

c) qualquer acerto fora do agrupamento desejado;

d) oscilação pendular do projétil no alvo (entende-se como oscilação pendular do projétil, a entrada do projétil no alvo de forma diversa da posição frontal, sem estabilidade de voo ou com o não alinhamento do cano com a guia do armamento).

6.3.12. **ENSAIO DE FORÇA DE PUXADA DO GATILHO**

6.3.12.1. Objetivo: este ensaio tem por objetivo medir a resistência do acionamento do gatilho e seu curso, verificando a usabilidade da arma quanto ao seu acionamento.

6.3.12.2. Amostra: composta de 4 (quatro) unidades que passaram pelo ensaio de precisão.

6.3.12.3. Roteiro:

I - Esse ensaio deverá ser executado a uma temperatura entre 10° C e 40° C.

II - A amostra deverá estar limpa e lubrificada de acordo com o manual da arma, sem excesso de lubrificação.

III - Para a execução do ensaio, será utilizado um dinamômetro (ou *Trigger Pull device*) que meça a força linear de puxada do gatilho durante todo o seu percurso, registrando em forma de curva a variação da força, momento em que deve ser calculado o trabalho resultante.

6.3.12.4. Critérios de aceitação:

I - Como critério de aceitação, o pico da força deve estar entre 2 kgf e 4,5 kgf, inclusos estes valores.

6.3.13. **ENSAIO DE QUEDA**

6.3.13.1. Objetivo: este ensaio deve comprovar que a pistola possui segurança em caso de sofrer uma queda, bem como resistência constitutiva para subsequente uso operacional.

6.3.13.2. Amostra: será composta de 04 (quatro) armas, sendo 3 (três) unidades que realizaram o ensaio de *endurance*, e outra que não passou por ensaios severos.

6.3.13.3. Roteiro:

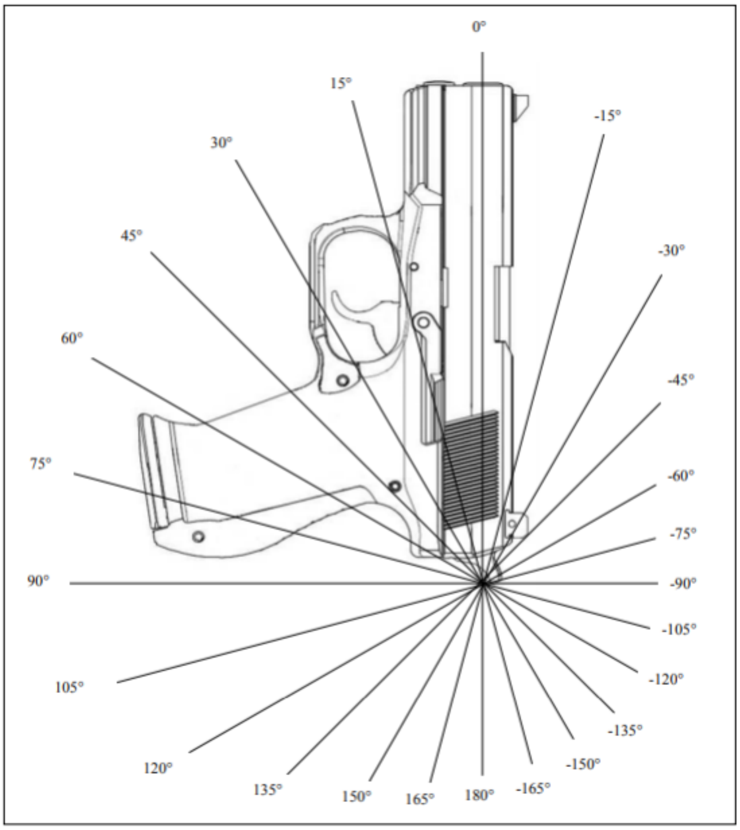
I - Esse ensaio deverá ser executado a uma temperatura entre 10° C e 40° C.

II - A amostra deverá estar limpa e lubrificada de acordo com o manual da arma, sem excesso de lubrificação.

III - As armas deverão ter seus carregadores municiados em sua capacidade máxima com munição inerte contendo a mesma massa da munição real, podendo ser utilizado um lastro para tal fim. Admite-se tolerância máxima de +/- 1% na massa da munição inerte em relação a munição que foi utilizada nos outros ensaios.

IV - A arma deverá estar carregada com cartucho provido apenas de espoleta (sem propelente e projetil).

V - Será utilizado trilho com atrito desprezível para aferição dos ângulos de queda de 0°, 30°, -30°, 90°,-90°, 180°, lado direito abaixo e lado esquerdo abaixo, cada uma delas com a arma travada e destravada (no caso de presença de trava externa na arma), devendo observar os pontos de impacto, conforme ilustração abaixo:



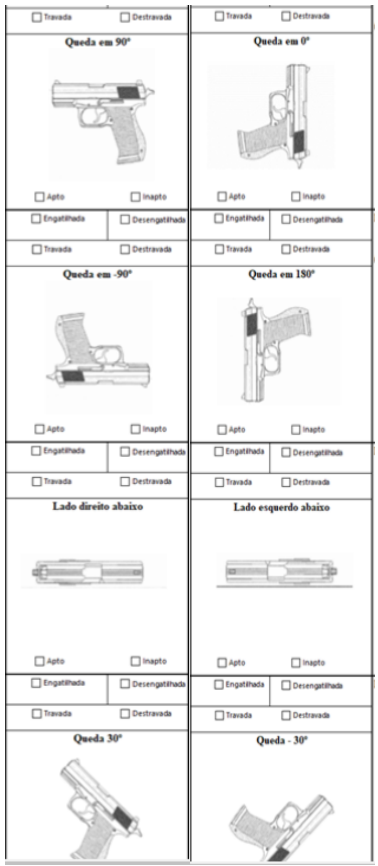


FOTO MERAMENTE ILUSTRATIVA

VI - Cada uma das faces de impacto será avaliada a uma altura de 2.000 mm, diretamente sobre um piso de concreto liso.

VII - A queda deverá ser sem influência de forças externas, de forma livre.

VIII - Após cada queda, a pistola deverá ser descarregada, sendo examinadas as espoletas, passando a seguir ao exame quanto a danos e a capacidade de tiros, com seu carregamento com munição real e sequência de 5 (cinco) disparos para aferir seu funcionamento.

IX - Antes de uma nova queda da pistola, somente as peças danificadas em decorrência da queda anterior podem ser substituídas.

X - Os resultados dos ensaios de queda e a avaliação decorrente deverão ser documentados, devendo ser registradas as condições de aptidão para tiros após os respectivos ensaios de queda.

6.3.13.4. Critérios de aceitação:

I - Será considerada aprovada a amostra em que as armas apresentarem a não ocorrência de:

a) percussão da espoleta;

b) liberação do carregador (exceto no caso da queda da lateral da face do retém do carregador, com o subsequente acionamento deste);

c) desmontagem do carregador ou liberação de munição;

d) marcação da espoleta;

e) falhas críticas ou graves (para efeitos desse ensaio, não será considerada como falha crítica a quebra de componentes da alça e massa de mira).

II - O dano em peças que comprometam a produção do tiro é critério de reprovação.

6.3.14. **ENSAIO DE OBSTRUÇÃO DO CANO POR PROJÉTIL**

6.3.14.1. Objetivo: este ensaio buscará investigar o nível de desempenho da arma após uma obstrução em seu cano, avaliando o risco do usuário ou de pessoas próximas serem atingidas por estilhaços.

6.3.14.2. Amostra: a amostra será composta de 2 (duas) armas.

6.3.14.3. Roteiro:

I - Esse ensaio deverá ser executado a uma temperatura de 25° C ± 5° C.

II - A amostra deverá estar limpa e lubrificada, sendo preparadas um total de 4 (quatro) munições.

III - Para a execução deste ensaio, uma tela testemunho deverá ser colocada em volta da arma para detectar presença de detritos em direção ao atirador ou pessoas próximas, com a arma em dispositivo para disparo remoto.

IV - Cada arma da amostra será submetida a uma das posições de obstrução do cano por projétil: projétil na entrada do cano, com sua base em contato com a ponta do projétil do cartucho inserido na câmara; e ponta do projétil alinhada com a boca do cano.

6.3.14.4. Critérios de aceitação:

I - Como critério de aceitação, não poderá haver a presença de estilhaços no ferrolho, cano e empunhadura em ambas as armas da amostra.

7. **ESQUEMA DE CERTIFICAÇÃO**

7.1. O processo de certificação e os ensaios deverão ser executado por Organismos de Certificação de Produto (OCP) e laboratórios acreditados pelo Instituto Nacional de Metrologia, Qualidade e Tecnologia (Inmetro) no escopo desta norma ou/em normas similares (conforme item 3), ou por organismos e laboratórios acreditados por órgãos que sejam signatários dos acordos de reconhecimento mútuo em fóruns internacionais disponíveis no sítio http://www.inmetro.gov.br/credenciamento/reconh_inter.asp.

7.2. Caberá ao OCP avaliar a aceitação e/ou complementação de relatórios de ensaios executados com base em outras normas similares para pistolas, desde que a metodologia e o roteiro dos ensaios sejam equivalentes aos aqui normatizados, sendo respeitados os critérios de aceitação estabelecidos neste documento.

7.3. A critério do OCP será admitida a hipótese de aproveitamento de relatórios de ensaios em propósitos comuns oriundos de modelos de diferentes dimensões do mesmo fabricante, respeitando-se a manutenção de mesmo material constitutivo e idênticos sistemas de funcionamento e segurança. No caso de evolução de projeto devidamente certificado, o OCP verificará a viabilidade de serem realizados apenas os ensaios para aferição das mudanças implementadas.

7.4. Para certificação das pistolas serão adotados alternativamente um dos seguintes procedimentos:

a) Procedimento 1: aplicação do esquema 1 (ensaio de tipo), em caráter preliminar a qualquer processo aquisitivo (ou através de certificação por OCP), a cada "modelo" de pistola; acrescido da aplicação do esquema 1b (ensaio de lote) por ocasião de cada processo de aquisição do "modelo" submetido ao esquema anterior, com o tamanho da amostra a ser submetida aos ensaios especificado no certame (desejavelmente com significância estatística), tendo como parâmetro mínimo o total de armas especificado no item 6.1 desta norma, conforme esquemas especificados na norma ABNT NBR ISO/IEC 17067:2015; ou

b) Procedimento 2: aplicação do esquema 5 de certificação, composto pelo ensaio de tipo a cada "modelo" de pistola, acrescido da Avaliação e Aprovação do Sistema de Gestão da Qualidade do fabricante, acompanhamento através de auditorias no fabricante e ensaio em amostras retiradas no comércio (caso se aplique) e no fabricante, conforme esquema especificado na norma ABNT NBR ISO/IEC 17067:2013, com auditorias e ensaios para a manutenção da certificação do modelo a cada 2 (dois) anos, contemplando o tamanho da amostra o total especificado no item 6.1 desta norma para os ensaios iniciais e os ensaios de manutenção da certificação.

7.5. O certificado de conformidade da arma obrigatoriamente conterá em anexo o seu(s) relatório(s) de ensaios completo(s) com os conceitos (aprovação "com" ou "sem" ressalvas), desempenho, número de falhas e outras observações.

7.6. Em caráter precário, tanto os processos de certificação quanto os ensaios poderão ser executados por OCP ou laboratórios acreditados em outros escopos, ou ainda em laboratórios não acreditados, desde que sejam designados pela SENASP através de Portaria.

7.7. Até a implementação definitiva da rede de certificação de armas pela SENASP, provisoriamente os ensaios de verificação de características gerais e metrologia, intercambiabilidade, *endurance* (resistência), precisão, força de puxada do gatilho e queda serão executados no procedimento 1 (item 7.4 acima) em cada certame aquisitivo. Nessas circunstâncias, serão necessárias as certificações nas normas referenciadas nos itens 3.3.2. ou 3.3.7, ou relatórios de ensaios elaborados conforme as citadas normas em laboratórios acreditados que contemplem os ensaios de *spray* de água acelerado, temperatura extrema e umidade, dinâmico de areia e poeira, lama, arrasto em areia, névoa salina, imersão em água salgada, e obstrução do cano por projétil, sendo respeitados, no mínimo, os critérios de aceitação estabelecidos neste documento.

GUILHERME CALS THEOPHILO GASPAR DE OLIVEIRA
Secretário Nacional de Segurança Pública - Senasp

Documento assinado eletronicamente por **GUILHERME CALS THEOPHILO GASPAR DE OLIVEIRA**, **Secretário(a) Nacional de Segurança Pública**, em 16/04/2020, às 16:12, conforme o § 1º do art. 6º e art. 10 do Decreto nº 8.539/2015.

Referência: Processo nº 08020.003561/2019-52 SEI nº 11504548

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Ministério da Justiça e Segurança Pública
Secretaria Nacional de Segurança Pública
Coordenação de Normatização e Metrologia

GUIA DE APLICAÇÃO DA NORMA TÉCNICA Nº 5/2020/CNM/CGPI/DPSP/SENASP/MJ

PROCESSO Nº 08020.003561/2019-52

INTERESSADO: DIRETORIA DE POLÍTICAS DE SEGURANÇA PÚBLICA, COORDENAÇÃO-GERAL DE PESQUISA E INOVAÇÃO, COORDENAÇÃO-GERAL DE POLÍTICAS PARA AS INSTITUIÇÕES DE SEGURANÇA PÚBLICA, DIRETORIA DE ADMINISTRAÇÃO - DIAD

1. OBJETIVO

1.1. O presente **Guia de Aplicação** tem por objetivo auxiliar na normalização, esclarecendo pontos de possíveis vias de interpretação na aplicação da **NT-SENASP Nº 001/2019 – Pistolas calibre 9x19mm e .40 S&W** (11238105) para facilitar aos interessados o processo de efetivação dos ensaios estabelecidos, bem como destacando pontos sensíveis.

2. INTRODUÇÃO

2.1. O § 3º do art. 17 do Decreto nº 10.030, de 30 de setembro de 2019 facultou ao MJSP o estabelecimento de requisitos adicionais aos Produtos Controlados pelo Exército Brasileiro (PCE) de interesse da segurança pública, com vistas à padronização de equipamentos, de tecnologias e dos procedimentos de avaliação da conformidade, nos termos do disposto na Lei nº 13.675, de 11 de junho de 2018.

2.2. Diante da imperiosa necessidade estratégica identificada, a Secretária Nacional de Segurança Pública, em fevereiro de 2019 deu início ao Programa Nacional de Normalização e Certificação de Produtos de Segurança Pública - Pró-Segurança, implementando paulatinamente estudos técnicos e análise de bases normativas e legais existentes em todo o mundo, visando a construções das Normas Técnicas nacionais, sendo um dos eixos essenciais do Planejamento Estratégico do Ministério da Justiça e Segurança Pública para o quinquênio 2015-2019 estabelecido pela Portaria nº 1.684, de 10 de novembro 2017, alterada pela Portaria SE nº 1155, de 28 de maio de 2019.

2.3. Materializando tais diretrizes estratégicas, o Ministério da Justiça e Segurança Pública (MJSP), através da Portaria MJSP nº 104/2020 (11162914), instituiu formalmente o Programa Nacional de Normalização e Certificação de Produtos de Segurança Pública - Pró-Segurança, tendo como um dos seus objetivos primordiais o estabelecimento de Normas Técnicas que contemplassem requisitos mínimos de segurança, qualidade e desempenho de equipamentos, produtos e serviços de segurança pública, de forma a subsidiar as aquisições públicas (art 4º).

2.4. A responsabilidade para a edição das Normas Técnicas foi atribuída à Secretaria Nacional de Segurança Pública (art 5º).

2.5. As Normas Técnicas após editadas orientarão as aquisições de equipamentos policiais pelos órgãos do Sistema Único de Segurança Pública (SUSP), possuindo caráter obrigatório quando do emprego de recursos financeiros oriundos do Orçamento Geral da União e sugestivo quando da utilização de recursos públicos de outras fontes (art. 7º).

> *Art. 7º As aquisições de equipamentos e serviços de segurança realizadas pelas instituições do Sistema Único de Segurança Pública - Susp, no âmbito federal, estadual, ou municipal, que utilizem recursos financeiros oriundos do Orçamento Geral da União, incluindo os do Fundo Nacional de Segurança Pública, deverão observar as Normas Técnicas Senasp, quando existirem.*
>
> *Parágrafo único. Na hipótese de os recursos orçamentários, para aquisição de equipamentos e serviços de segurança pública, não serem de origem federal, a adoção das Normas Técnicas Senasp possuirá caráter meramente facultativo.*

2.6. Neste sentido, foi publicada em abril de 2020 a NT-SENASP Nº 001/2019 – Pistolas calibre 9x19mm e .40 S&W, sendo a primeira normatização técnica nacional acerca do tema, o que possibilitará a melhoria dos processos aquisitivos, a avaliação da conformidade dos produtos e a normalização do mercado.

2.7. Deste modo, o presente Guia de Aplicação, visa trazer a luz em pontos que por ventura não tenham sido esclarecidos na Norma Técnica, proporcionando aos gestores logísticos, ensaístas, laboratórios, indústria, mercado e demais interessados, a eficaz aplicação dos processos estabelecidos.

3. REQUISITOS TÉCNICOS MÍNIMOS DE DESEMPENHO E REQUISITOS ADICIONAIS OPTATIVOS

3.1. A NT-SENASP nº 001/2020 – Pistolas calibre 9x19 mm e .40 S&W materializa o estabelecimento de requisitos técnicos mínimos de desempenho e segurança das armas de porte destinadas às instituições policiais, de forma a proporcionar condições adequadas para a atividade profissional em benefício da sociedade atendida por seus serviços.

3.2. Neste sentido, visando a sua adequada aplicação prática, segue abaixo elucidário dos pontos sensíveis ou de necessário esclarecimento adicional.

3.3. **Requisitos mínimos de segurança e desempenho**: são parâmetros essenciais que quaisquer armas de porte para uso policial devem possuir, representando então o mínimo existencial necessário ao desempenho e eficiência do produto. Decorre de tal afirmação a inferência de que não devem ser adquiridas armas de porte aquém dos requisitos mínimos, sendo vedados certames aquisitivos com uso de recursos da União cujos objetos não contemplem integralmente tais parâmetros.

3.4. **Requisitos adicionais optativos:** são parâmetros não obrigatórios, mas que por se revestirem de relevante importância podem ser contemplados de forma justificada nos certames aquisitivos, de acordo com as especificidades de cada instituição policial e ambiente operacional em que atuem. Funcionam também como um clara indicação à industria e mercado das necessidades do mercado profissional para evolução de seus produtos, podendo se tornar requisitos mínimos (obrigatórios) em uma nova versão da norma.

3.5. **Aspectos silentes da Norma:** a NT-SENASP é silente quanto a aspectos dimensionais, peso, quantitativo mínimo de munições no carregador, material constitutivo, acabamento externo e interno, entre outras especificações. Tal posição foi adotada para abarcar todo espectro possível de atividades operacionais, devendo tais questões, assim como outros requisitos operacionais específicos, serem tratadas em cada certame aquisitivo, se necessário, justificando-se as opções adotadas.

3.6. **Normativos de padronização:** recomendação do Tribunal de Contas da União (TCU) para que se evitem alterações subjetivas a cada edital licitatório. A padronização poderá estabelecer exigências complementares à Norma Técnica em comento, de acordo com as diretrizes doutrinárias da instituição, adotando os requisitos adicionais optativos da norma, ou quando esta for silente, estabelecendo especificações adicionais, justificando-se a motivação de cada opção de acordo com as peculiaridades daquela força, equilibrando-se tais necessidades com a avaliação de restrição mercadológica e possível majoração de custos, elegendo-se àquelas essenciais. Nesse sentido, dimensões, peso, calibre e outras características suplementares aos padrões mínimos estabelecidos na Norma Técnica serão perenizados de acordo com a necessidade técnico-doutrinária de cada instituição, evitando-se sua alteração a cada aquisição.

4. APLICAÇÃO DE ENSAIOS

4.1. Preliminarmente, importante salientar que é essencial a previsão expressa da necessidade de verificação de conformidade em cada edital licitatório de armas de porte, com a descrição da forma e momento de aplicação dos ensaios e/ou exigência de apresentação de relatório de ensaios, sob pena de questionamentos judiciais quando de sua implementação, bem como cometimento de inconformidade administrativa.

4.2. SEQUÊNCIA DE ENSAIOS

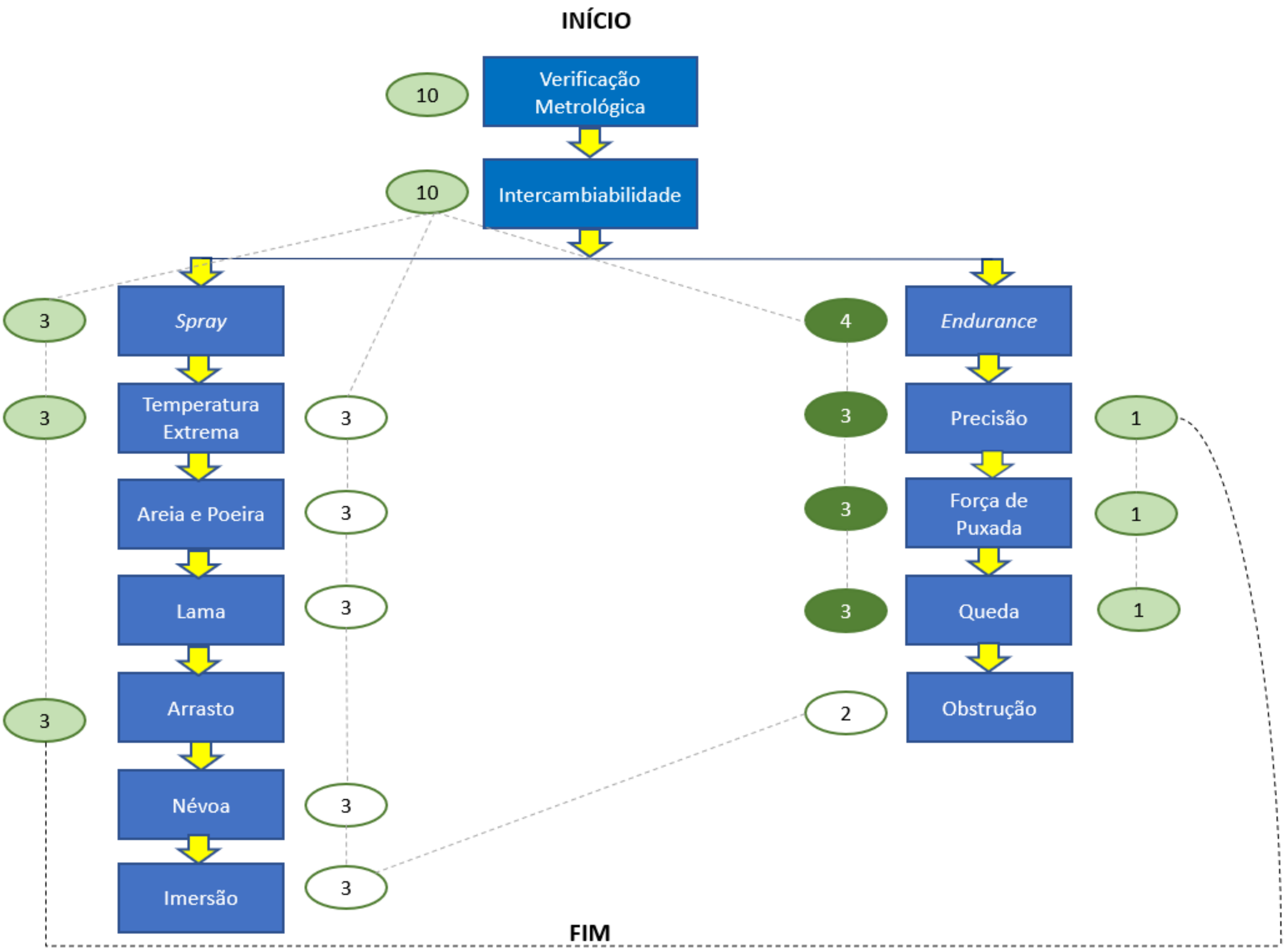

Figura 1

4.2.1. Os ensaios seguem o esquema acima por consistir na melhor combinação entre a efetividade na avaliação da conformidade e a economicidade em sua execução:

4.2.1.1. A amostra mínima será de 10 (dez) unidades, podendo ser majorada se houver necessidade, sempre em múltiplos de 10 (dez).

4.2.1.2. No esquema acima, 7 (sete) unidades da amostra serão potencialmente destruídas devido ao desgaste resultante (ensaios de *endurance* (resistência)(item 6.3.10.), queda (item 6.3.13.) e obstrução do cano por projétil (item 6.3.14.)).

4.2.1.3. Na hipótese prevista no item acima, as armas poderão ser doadas para a instituição contratante, não contando de qualquer forma no quantitativo total da aquisição.

4.2.2. Descrição da permuta de armas entre os ensaios:

4.2.2.1. **Momento 1 (ensaios iniciais)**: toda amostra, composta de 10 (dez) unidades, passa pelos ensaios iniciais de características gerais e metrologia (item 6.3.1.) e intercambiabilidade (item 6.3.2.).

4.2.2.2. **Momento 2 (ensaios não destrutivos)**: do total de 10 (dez) unidades que foram submetidas aos ensaios iniciais de características gerais e metrologia (item 6.3.1.) e intercambiabilidade (item 6.3.2.), 6 (seis) unidades seguirão para os ensaios não destrutivos (ensaios representados no lado esquerdo da Figura 1 acima), sendo que:

4.2.2.2.1. 3 (três) unidades seguirão para os ensaios de *spray* de água acelerado (item 6.3.3.), temperatura extrema e umidade (item 6.3.4.), e arrasto em areia (item 6.3.7.); e

4.2.2.2.2. 3 (três) unidades seguirão para os ensaios de temperatura extrema e umidade (item 6.3.4.)(aqui somado a mais 3 (três) unidades que já passaram pelo ensaio de *Spray*), dinâmico de areia e poeira (item 6.3.5.), lama (item 6.3.6.),névoa salina (item 6.3.8.) e imersão em água salgada (item 6.3.9.).

4.2.2.3. **Momento 3 (ensaios destrutivos)**: do total de 10 (dez) unidades que foram submetidas aos ensaios iniciais de características gerais e metrologia (item 6.3.1.) e intercambiabilidade (item 6.3.2.), 4 (quatro) unidades seguirão para os ensaios destrutivos (ensaios representados no lado direito da Figura 1 acima), somadas a mais 3 (três) unidades que já passaram pelos ensaios não destrutivos, sendo que:

4.2.2.3.1. 4 (quatro) unidades seguirão para os ensaio de *endurance* (resistência)(item 6.3.10.);

4.2.2.3.2. Das 4 (quatro) unidades que passaram pelo ensaio de *endurance* (resistência) (item 6.3.10.), 3 (três) unidades seguirão para os ensaios de precisão (item 6.3.11.), força de puxada do gatilho (item 6.3.12.) e queda (item 6.3.13.). Nesse momento será acrescida 1 (uma) unidade que passou pelo momento 2 (representado no item 4.2.2.2.1.) e que também passará pelos ensaios aqui citados;

4.2.2.3.3. Das 3 (três) unidades que passaram pelo ensaio de imersão em água salgada (item 6.3.9.), 2 (duas) unidades seguirão para o ensaio de obstrução do cano por projétil (item 6.3.14.).

4.3. CRITÉRIOS COMUNS

4.3.1. Falha funcional: quando a pistola, munição, equipamento suplementar ou acessório apresenta função defeituosa. A falha pode ou não levar à pane ou impedimento (interrupção não intencional da execução do tiro).

4.3.2. Classificação das falhas funcionais de acordo com suas consequências: críticas, graves e leves.

4.3.2.1. Falha crítica: leva ao impedimento da arma que só pode ser eliminado com o auxílio de ferramentas, somada ao fato de afetar a segurança do operador ou de terceiros. Ocorre ainda quando uma ou mais peças da arma precisam ser substituídas, ou quando ocorrer sua inutilização. Não será tolerada falha funcional crítica durante os ensaios, sendo a amostra reprovada quando de sua ocorrência.

4.3.2.2. Falha grave: leva ao impedimento da arma podendo ser sanada somente com o auxílio de ferramentas.

4.3.2.3. Falha leve: não leva ao impedimento, ou quando este ocorrer que possa ser eliminado sem o auxílio de ferramentas.

4.3.3. Códigos numéricos das falhas:

CÓDIGOS NUMÉRICOS DAS FALHAS FUNCIONAIS

CÓDIGO	TIPO DE FALHA FUNCIONAL
1	Cartucho não deflagra
2	Projétil não sai do cano
3	Estojo não é extraído
4	Estojo não é ejetado para fora da arma
5	Disparo sem acionamento do gatilho
6	Falha no trancamento do ferrolho
7	Vários disparos com acionamento único do gatilho
8	Dupla alimentação
9	Ferrolho travado à retaguarda com o carregador municiado
10	Mecanismo de percusão não é armado
11	Gatilho não rearma
12	Carregador é ejetado da arma durante a execução de tiro sem acionamento do retém
13	Carregador solto no seu poço (não trava)
14	Cartuchos emperram no carregador
15	Ferrolho é liberado com a introdução do carregador (sem acionamento do retém)
16	Ferrolho não fecha após acionamento do retém
17	Cartucho não é empurrado para fora do carregador
18	Cartucho não é totalmente introduzido na câmara
19	Desprendimento de peças da pistola
20	Gatilho com difícil acionamento
21	Outras teclas com difícil acionamento
22	Outros

Figura 2

4.3.4. Falhas funcionais decorrentes de manuseio e tratamento inadequados pelo manipulador e as que surgem em decorrência de uma falha da munição não devem ser consideradas na computação da cota de falha.

4.4. DISPOSIÇÕES TEMPORAIS NA AVALIAÇÃO DA CONFORMIDADE

4.5. <u>**Provisoriamente**</u>, até a estruturação de rede de certificação pela Senasp, a verificação de conformidade será executada da seguinte forma:

4.5.1. Os ensaios de *spray* de água acelerado (item 6.3.3.), temperatura extrema e umidade (item 6.3.4.), dinâmico de areia e poeira (item 6.3.5.), lama (item 6.3.6.), arrasto em areia (item 6.3.7.), névoa salina (item 6.3.8.), imersão em água salgada (item 6.3.9.), e obstrução do cano por projétil (item 6.3.14.), cuja complexidade dificultam sua executação em laboratório nacional no momento, poderão ser supridos pela exigência da certificação do item (ou exibição de relatório de ensaios atinente) nos ensaios equivalentes da norma referência *NATO AC/225(LG/3-SG/1)D/14*, da Organização do Tratado do Atlântico Norte, ou da norma *Erprobungsrichitlinien (ER) Zur Technischen Richtlinie (TR) Pistolen in Kaliber 9 mm x 19* – 2008 - Diretriz Técnica de Pistolas de Calibre 9 mm x 19, do Instituto Técnico Policial (PTI), da Escola Superior de Polícia Alemã (DHPol), sendo respeitados, no mínimo, os critérios de aceitação estabelecidos na NT-SENASP.

4.5.2. Os ensaios de verificação de características gerais e metrologia (item 6.3.1.), intercambiabilidade (item 6.3.2.), *endurance* (resistência)(item 6.3.10.), precisão (item 6.3.11.), força de puxada do gatilho (item 6.3.12.) e queda (item 6.3.13.) serão executados por laboratório designado pela SENASP, em cada certame aquisitivo, no procedimento 1 (item 7.4.a): ensaio de tipo (esquema 1), acrescido do ensaio de lote (esquema 1b).

4.5.2.1. O **ensaio de tipo** será realizado durante a fase de habilitação (ou correspondente no caso da modalidade licitatória não ser o pregão):

4.5.2.1.1. Amostra mínima: 10 (dez) unidades.

4.5.2.1.2. Após as verificações formais, com aferição do cumprimento de requisitos técnicos mínimos, especificações adicionais e outras exigências editalícias, a amostra do "modelo" ofertado na proposta de menor preço, será submetida ao ensaio de tipo.

4.5.2.1.3. Aplicação dos ensaios do item 4.3.2 supra.

4.5.2.1.4. No caso da reprovação da "modelo" ofertado na proposta melhor colocada, será convocado o titular da proposta segundo colocada para apresentação de amostra de seu "modelo" para o ensaio de tipo e assim por diante.

4.5.2.1.5. Apenas após a aprovação do objeto da proposta, esta será considerada "habilitada".

4.5.2.2. O **ensaio de lote** será realizado após a fabricação ou pré-entrega (no caso de item de balcão) do objeto:

4.5.2.2.1. Amostra mínima: 10 (dez) unidades. É desejável que a amostra tenha significância estatística frente ao quantitativo de itens adquiridos.

4.5.2.2.2. Aplicação dos ensaios do item 4.3.2 supra.

4.5.2.2.3. No caso de reprovação poderá haver previsão de ensaios de contrapova e testemunho no edital licitatório.

4.5.2.2.4. No caso de previsão de ensaios de contraprova, serão escolhidas dentro do mesmo lote, aleatoriamente e de forma representativa, o total de 10 (dez) armas que serão submetidas aos ensaios previstos no item 4.3.2. supra. Em caso de aprovação da amostra o lote estará habilitado para os ensaios de testemunho. Em caso de reprovação, o lote será considerado "rejeitado e inservível".

4.5.2.2.5. No caso de ensaios de testemunho, serão escolhidas dentro do mesmo lote, aleatoriamente e de forma representativa, o total de 10 (dez) armas que serão submetidas aos ensaios previstos no item 4.3.2. supra. Em caso de aprovação da amostra o lote será considerado "aprovado" e o total de 10 (dez) novas armas deverão ser acrescidas ao lote padrão em reposição às armas inutilizadas. Em caso de reprovação, o lote será considerado "rejeitado e inservível".

4.5.2.2.6. Ressalta-se que o ônus dos ensaios de contraprova e testemunho devem ser suportados pela contratada.

4.5.2.3. Na hipótese da impossibilidade da realização dos ensaios previstos neste item em laboratório devidamente designado, a instituição policial contratante poderá realizar o roteiro com seus próprios meios. Ocorrendo dificuldade para sua implementação neste contexto, poderá ainda a contratante prever no certame aquisitivo a contratação, como item acessório, de serviços de suporte aos ensaios, a ser ofertado pela própria fabricante ou terceiro, consistente na oferta de infra estrutura básica (incluindo munições, estande de tiro, suporte *ranson rest*, mão de obra para apoio, etc) para realização dos ensaios, que de qualquer forma ocorrerá sob responsabilidade técnica e supervisão da contratante, que deverá designar formalmente comissão composta por profissionais com experiência na área de armamento, tiro e armaria.

4.5.2.4. Excepcionalmente, no caso do quantitativo de itens adquiridos ser inferior a 100 (cem) unidades a exigência da execução dos ensaios poderá ser suprida pela exigência da certificação da arma (ou exibição de relatório de ensaios) nos ensaios equivalentes da norma referência *NATO AC/225(LG/3-SG/1)D/14*, da Organização do Tratado do Atlântico Norte, ou da norma *Erprobungsrichitlinien (ER) Zur Technischen Richtlinie (TR) Pistolen in Kaliber 9 mm x 19* – 2008 - Diretriz Técnica de Pistolas de Calibre 9 mm x 19, do Instituto Técnico Policial (PTI), da Escola Superior de Polícia Alemã (DHPol).

4.6. De forma **definitiva**, após a estruturação de rede de certificação pela Senasp, a verificação de conformidade será executada da seguinte forma:

4.6.1. Os ensaios de verificação de características gerais e metrologia (item 6.3.1.), intercambiabilidade (item 6.3.2.), *spray* de água acelerado (item 6.3.3.), temperatura extrema e umidade (item 6.3.4.), dinâmico de areia e poeira (item 6.3.5.), lama (item 6.3.6.), arrasto em areia (item 6.3.7.), névoa salina (item 6.3.8.), imersão em água salgada (item 6.3.9.), *endurance* (resistência)(item 6.3.10.), precisão (item 6.3.11.), força de puxada do gatilho (item 6.3.12.) e queda (item 6.3.13.) e obstrução do cano por projétil (item 6.3.14.), serão executados por laboratório designado pela SENASP, **alternativamente:**

4.6.1.1. No procedimento 1 (item 7.4.a): ensaio de tipo (esquema 1), acrescido do ensaio de lote (esquema 1b).

4.6.1.1.1. O ensaio de tipo (esquema 1) será realizado previamente (arma certificada), ou durante o certame (arma não certificada), conforme item 4.3.2.1.1. supra.

4.6.1.1.2. Acrescido do ensaio de lote (esquema 1b) realizado em cada certame aquisitivo.

4.6.1.2. Procedimento 2: aplicação do esquema 5 de certificação, composto pelo ensaio de tipo a cada "modelo" de pistola, acrescido da Avaliação e Aprovação do Sistema de Gestão da Qualidade do fabricante, acompanhamento através de auditorias no fabricante e ensaio em amostras retiradas no comércio (caso se aplique) e no fabricante, conforme esquema especificado na norma ABNT NBR ISO/IEC 17067:2013, com auditorias e ensaios para a manutenção da certificação do modelo a cada 2 (dois) anos, contemplando o tamanho da amostra o total especificado no item 6.1 desta norma para os ensaios iniciais e os ensaios de manutenção da certificação.

4.6.1.2.1. O certificado de conformidade da arma obrigatoriamente conterá em anexo o seu(s) relatório(s) de ensaios completo(s) com os conceitos (aprovação "com" ou "sem" ressalvas), desempenho, número de falhas e outras observações.

5. DISPOSIÇÕES GERAIS

5.1. A qualquer tempo poderá ser atualizado o presente guia, visando o esclarecimento adicional de pontos da norma a critério da Senasp.

5.2. O Guia será atualizado obrigatoriamente em todas as atualizações da Norma Técnica correspondente

5.3. Esclarecimentos adicionais que se façam necessário podem ser obtidos através do e-mail: proseguranca@mj.gov.br.

ANEXO I

Elucidário interpretativo da NT-SENASP Nº 001/2019 – Pistolas calibre 9x19mm e .40 S&W:

1. No item 6.3.6. ENSAIO DE LAMA, subitem 6.3.6.3., inciso X:

De: X - No banho de lama nº 7, logo após o banho, cada arma deverá ser soprada e chacoalhada por 30 s, tomando em conta que o período de tempo decorrido entre a retirada da arma da banheira de lama e o disparo deve ser o menor possível (menor que 60 s).

Devem ser disparados 15 tiros em ato continuo (um carregador completo). Cada arma deverá ser completamente limpa após os 15 disparos.

Deve ser interpretado como: X - No banho de lama nº 7, logo após o banho, cada arma deverá ser soprada e chacoalhada por 30 s, tomando em conta que o período de tempo decorrido entre a retirada da arma da banheira de lama e o disparo deve ser o menor possível (menor que 60 s). Devem ser disparados 15 tiros em ato continuo (<u>se o carregador da arma comportar menos de 15 munições, as munições faltantes serão inseridas no prório carregador exposto as condições do ensaio</u>) para execução dos disparos. Cada arma deverá ser completamente limpa após os 15 disparos.

Referência: Processo nº 08020.003561/2019-52 SEI nº 11800077

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Órgão: Ministério da Justiça e Segurança Pública/Secretaria Nacional de Segurança Pública

PORTARIA Nº 130, DE 15 DE ABRIL DE 2020

Aprova a Norma Técnica atinente a pistolas calibre 9x19 mm e .40 S&W para utilização policial (NTSENASP nº 001/2020 - Pistolas calibre 9x19 mm e .40 S&W).

O SECRETÁRIO NACIONAL DE SEGURANÇA PÚBLICA, no uso da competência que lhe confere o art. 23, do Anexo I, do Decreto n° 9.662, de 1º de janeiro de 2019, e o art. 5º da Portaria do Ministro de Estado da Justiça e Segurança Pública nº 104, de 13 de março de 2020, resolve:

Art. 1º Esta Portaria aprova a Norma Técnica atinente a pistolas calibre 9x19 mm e .40 S&W para utilização policial (NT-SENASP nº 001/2020 - Pistolas calibre 9x19 mm e .40 S&W), nº SEI 11504548.

Art. 2º Para fins de ampla divulgação e transparência ativa, a presente Norma Técnica estará disponível na página institucional do Ministério da Justiça e Segurança Pública, no Wikiseg e nos aplicativos atinentes à Secretaria Nacional de Segurança Pública.

Art. 3º Esta Portaria entra em vigor em 4 de maio de 2020.

GUILHERME CALS THEOPHILO GASPAR DE OLIVEIRA

11504548 08020.003561/2019-52

Ministério da Justiça e Segurança Pública

NORMA TÉCNICA SENASP

Esta Norma Técnica SENASP (NT-SENASP) foi elaborada através de processo preconizado pela Portaria MJSP nº 104, de 13/03/2020, com as fases desenvolvidas conforme segue:

RESPONSÁVEL	FASE	DATA
CNM	Elaboração da Minuta Preliminar pela Equipe Técnica CNM - 1ª versão	29/05/2019
CNM	Elaboração da Minuta Preliminar pela Equipe Técnica CNM - 2ª versão	09/07/2019
CNM	Elaboração da Minuta Preliminar pela Equipe Técnica CNM - 3ª versão	27/07/2019
CNM	Elaboração da Minuta Preliminar pela Equipe Técnica CNM - 4ª versão	10/09/2019
CNM	Câmara Técnica	11/09/2019
CNM	Audiência Pública	25/10/2019
CNM	Consulta Pública	02/01/2020

A NT-SENASP poderá cancelar ou substituir a edição anterior, quando tratar do mesmo tema e for devidamente aprovado, sendo que nesse ínterim a referida norma continua em vigor;

Aqueles que tiverem conhecimento de qualquer direito de patente devem apresentar esta informação em seus comentários, com documentação comprobatória;

Tomaram parte na elaboração deste documento:

Participantes:	Fabio Ferreira Real - Pesquisador-Tecnologista do Inmetro Ladislau Brito Santos Júnior - Perito Criminal PCAM Bruno Wendel de Oliveira Del Barco - Tenente Coronel PMMT Vinicius Frabetti - Capitão PMESP Paulo Eduardo Mascarello Gobbi - Gerente de Projetos Marcos Antonio Contel Secco - Perito Criminal POLITEC/MT Nilton Quilião - Agente de Polícia Federal Marco Aurélio Valério - Tenente Coronel PMESP Francisco Rodrigues de Oliveira Neto - Policial Rodoviário Federal Rogerio Nogueira Carvalho da Silva - Capitão PMDF João da Cunha Neto - Delegado de Polícia PCSC Marcos Eduardo Ticianel Paccola - Tenente Coronel PMMT Wendel de Jesus Costa - Tenente Coronel PMGO Neomar Christian Potuk - Capitão PMPR	**Função:**	Coordenador de Normatização e Metrologia - CGPI/DPSP/SENASP/MJSP CGPI/DPSP/SENASP/MJSP CGPI/DPSP/SENASP/MJSP CGPI/DPSP/SENASP/MJSP CGPI/DPSP/SENASP/MJSP Especialista em Armamento Especialista em Armamento Especialista em Armamento Especialista em Armamento Especialista em Armamento Especialista em Armamento Especialista em Armamento Especialista em Armamento

NT-SENASP Nº 001/2020 – Pistolas calibre 9x19 mm e .40 S&W

1. PREFÁCIO

A Secretaria Nacional de Segurança Pública (SENASP), responsável pelo programa Pró-Segurança, em consonância com a perspectiva estruturante de suprir as necessidades fundamentais das instituições de segurança pública, no tocante a equipamentos de qualidade que proporcionem condições minimamente necessárias para a execução da atividade policial e com metodologia de construção coletiva, congregando experiências de profissionais com expertise consagrada na área, de forma a materializar a cooperação e a colaboração dos órgãos e instituições componentes do Sistema Único de Segurança Pública (SUSP), adotou a iniciativa de estabelecer Normas Técnicas para produtos de segurança pública, visando dar a devida atenção e base técnica à legítima demanda pelo estabelecimento de atas, nacionais e internacionais, de registro de preço para locação e/ou aquisição de serviços e produtos de interesse dos Estados, Distrito Federal e Municípios, todos ancorados por padrões de qualidade definidos e que agreguem substancial performance ao serviço policial.

Pretende-se com tal intento contribuir de forma incisiva para a prestação de um serviço de excelência à população brasileira, fornecendo às instituições de segurança pública meios e parâmetros para sua modernização, através de um planejamento baseado nas etapas de pesquisa, diagnose, estabelecimento de requisitos técnicos, normatização, e subsequente certificação dos produtos de acordo com as normas estabelecidas, para garantir a segurança, a qualidade e a confiabilidade dos produtos utilizados pelos profissionais de segurança pública.

Nesse sentido, a presente NT-SENASP regulará os requisitos técnicos mínimos, ensaios e esquema de certificação das armas curtas dos calibres majoritariamente utilizados na atividade de segurança pública no país, buscando garantir sua qualidade e segurança quanto ao uso e performance operacional, resultando em economia ao erário público.

2. **ESCOPO**

Esta NT-SENASP estabelece os requisitos mínimos de qualidade e desempenho os quais são aplicáveis ao fornecimento de pistolas calibre 9x19 mm e .40 S&W para a atividade profissional de segurança pública, de forma a garantir a segurança, a qualidade e a confiabilidade desse produto.

Scope

This SENASP Technical Standard establishes minimum requirements of quality and performance which are applied to supply 9x19 mm and .40 S&W caliber pistols for the public safety professional work, in order to guarantee safety, quality and reliability of this product.

3. **REFERÊNCIAS NORMATIVAS**

3.1. As normas basilares relacionadas a seguir contêm disposições que constituem premissas para esta NT-SENASP:

3.1.1. Decreto nº 24.602/1934, que dispõe sobre instalação e fiscalização de fábricas e comércio de armas, munições, explosivos, produtos químicos agressivos e matérias correlatas - do então Governo Provisório, recepcionado como Lei pela Constituição Federal de 1934;

3.1.2. Decreto nº 10.030/2019, que dá nova redação ao Regulamento para a Fiscalização de Produtos Controlados (R-105); e

3.1.3. Portaria MJSP nº 104/2020, que dispõe sobre o Pró-Segurança - Programa Nacional de Normalização e Certificação de Produtos de Segurança Pública.

3.2. As normas abaixo contém disposições consideradas complementares à presente NT-SENASP:

3.2.1. Norma ABNT NBR ISO/IEC 17067:2015 - Avaliação da conformidade - Fundamentos para certificação de produtos e diretrizes de esquemas para certificação de produtos;

3.2.2. Norma ABNT NBR 8094:1983 - Material metálico revestido e não revestido - Corrosão por exposição à névoa salina - Método de ensaio;

3.2.3. Norma *SAAMI* (*Sporting Arms and Ammunition manufacturer's Institute) Z* 299.3-2015; e

3.2.4. Norma *STANAG 4090* - adopted as standard small arms ammunition (9x19 mm), da Organização do Tratado do Atlântico Norte.

3.3. Foram utilizadas como referência na elaboração da presente NT-SENASP:

3.3.1. Norma ABNT NBR ISO 9001:2015 - Sistemas de gestão da qualidade-Requisitos;

3.3.2. Norma *NATO AC/225(LG/3-SG/1)D/14*, da Organização do Tratado do Atlântico Norte;

3.3.3. Norma *NATO STANDARD AQAP-2110*, da Organização do Tratado do Atlântico Norte;

3.3.4. Norma NEB/T E-267A, publicada pela Portaria n° 049-SCT/2011, do Exército Brasileiro;

3.3.5. Norma NIJ Standard - 0112.03, do Instituto Nacional de Justiça dos EUA;

3.3.6. *US Army Test Operations Procedure* (TOP) 3-2-045 *Small Arms - Hand and Shoulder Weapons and Machineguns*, do Exército dos EUA;

3.3.7. Norma *Erprobungsrichitlinien (ER) Zur Technischen Richtlinie (TR) Pistolen in Kaliber 9 mm x 19* – 2008 - Diretriz Técnica de Pistolas de Calibre 9 mm x 19, do Instituto Técnico Policial (PTI), da Escola Superior de Polícia Alemã (DHPol); e

3.3.8. *Philippine National Police Parameters In the conduct of test evaluation for caliber 9 mm pistol,* da Polícia Nacional das Filipinas.

3.3.9. ASTM D471:16a, Standard Test Method For Rubber Property - Effect Of Liquids.

As edições indicadas estavam em vigor no momento desta publicação. Como toda norma está sujeita a revisão, recomenda-se àqueles que realizam acordos com base nesta que verifiquem a conveniência de se usarem as edições mais recentes das normas citadas.

4. **TERMOS E DEFINIÇÕES**

Para os efeitos deste documento, aplicam-se os termos e definições abaixo reproduzidos:

4.1. Armas de porte: arma de fogo de dimensões e peso reduzido, que pode ser portada por um indivíduo em um coldre e disparado, comodamente, com somente uma das mãos pelo atirador; enquadram-se, nesta definição, pistolas, revólveres e garruchas.

4.2. Pistola: arma de fogo de porte, geralmente semi-automática, cuja única câmara faz parte do corpo do cano e cujo carregador, quando em posição fixa, mantém os cartuchos em fila e os apresenta sequencialmente para o carregamento inicial e após cada disparo. Após cada disparo, a energia cinética proveniente da expansão dos gases impulsiona o ferrolho à retaguarda fazendo com que o extrator remova o estojo da câmara e, após contato com o ejetor, seja expelido pela janela de ejeção. Ao atingir o ponto máximo de recuo o ferrolho é impulsionado a frente, devido a ação da mola recuperadora, momento em que insere um novo cartucho de munição na câmara e realiza o trancamento da culatra, estando em condições para produção do próximo tiro.

4.3. Modelo: arma com projeto registrado, contendo mesmas dimensões de cano, calibre, material constitutivo, sistemas de funcionamento e segurança.

4.3.1. Para efeito dessa norma não se consideram armas do mesmo "modelo": quando houver mudança no calibre, medidas dimensionais e/ou peso; quando houver alteração na constituição do todo ou de parte da arma, tanto pela substituição do material quanto pela mudança no acabamento; e quando houver mudança em seus sistemas de funcionamento e/ou segurança.

4.3.2. Serão consideradas armas do mesmo "modelo" os exemplares de cor predominante aparentemente díspares, sem as alterações previstas no item anterior, inclusive quanto ao material constitutivo e acabamento.

4.4. Ação dupla: nas armas de ação dupla, o gatilho tem a capacidade de engatilhar o sistema de disparo (cão ou percussor lançado) em sua totalidade e em seguida liberá-lo à frente, ocasionando o disparo.

4.5. Ação híbrida (ou ação dupla com semi-engatilhamento do percussor): sistema no qual com o carregamento da arma (inserção de uma munição na câmara) a mola do percussor fica semi-engatilhada.

4.6. *Striker fire*: são armas com sistema de percussão que não possui cão, podendo funcionar em ação simples, dupla, ou híbrida a depender do modelo.

4.7. Trava externa: entende-se por trava externa todo o mecanismo que, quando acionado com a arma carregada, exige do operador/atirador uma ação muscular distinta do empunhar a arma e acionar a tecla do gatilho para que o disparo seja efetuado.

4.8. Manutenção em primeiro escalão: montagem e desmontagem da arma em situação operacional realizada pelo seu usuário final para limpeza e lubrificação sem uso de qualquer ferramenta. Os demais escalões de manutenção prescindem de ferramentas para sua realização, necessitando da infra estrutura necessária para tanto.

5. **REQUISITOS TÉCNICOS MÍNIMOS**

5.1. **CARACTERÍSTICAS GERAIS OBRIGATÓRIAS:**

5.1.1. Sistema de operação mecânica em ação dupla ou híbrida, *striker fire*, com peso e curso de gatilho constante do primeiro ao último disparo, não se considerando variações *intra* disparo (durante um único disparo) e sim *inter* disparos (comparando-se o primeiro com os demais disparos);

5.1.2. Armamento deve estar apto ao uso de munições nacionais e importadas, dentro do calibre especificado, 124 gr, *hollow point*, com velocidade mínima de 350 m/s, para o calibre 9x19 mm, e 180 gr, *hollow point*, com velocidade mínima de 312 m/s para o calibre .40 S&W, que atendam à norma SAAMI (*Sporting Arms and Ammunition manufacturer's Institute*) Z 299.3-2015 ou homologadas de acordo com a C.I.P (*Commission internationale permanente pour l'épreuve des armes à feu portatives)* - HOMOLOGATION Lista de TDCC - Tab IV - cartuchos para pistolas e revólveres, no que se refere aos aspectos de dimensões, pressão e velocidade para pistolas de fogo central;

5.1.3. Deverá possuir acabamento de primeira linha, sem sinais de corrosão, imperfeições, rebarbas e/ou sobras de materiais que evidenciem falta de qualidade no processo fabril, a fim de evitar ferimentos nos usuários, falhas de funcionamento e de procedimento;

5.1.4. A manutenção de primeiro escalão deverá ser de fácil realização pelo usuário, sem o uso de ferramentas, bem como, apresentar dificuldade de montagem equivocada em primeiro escalão; assim, no caso desta possibilidade afetar a função e/ou a segurança, a arma deve ser reprovada.

5.2. **CARACTERÍSTICAS ESPECÍFICAS:**

5.2.1. **QUANTO A SEGURANÇA:**

5.2.1.1. Deverá possuir sistema de travamento para o gatilho (trava de gatilho), que impeça o gatilho de ser acionado por ação inercial ou acionamento acidental, exceto se a tecla localizada no gatilho for corretamente acionada;

5.2.1.2. Deverá possuir sistema interno de bloqueio do percussor (trava do percussor), impedindo que o percussor atinja a espoleta, a menos que a tecla do gatilho seja corretamente acionada, não sendo permitida a marcação da espoleta, quando do simples manejo do ferrolho, manuseio brusco ou queda da arma;

5.2.1.3. Deverá possuir como requisito adicional optativo o indicador de munição na câmara (indicador de arma carregada);

5.2.1.4. Deve possuir sistema de segurança que impossibilite a percussão da espoleta em casos de queda do armamento;

5.2.1.5. A arma, com cartucho de munição na câmara, não pode produzir tiro após uma queda de, ao menos, uma altura de 2.000 mm em piso de concreto.

5.2.2. **QUANTO AO ACABAMENTO EXTERNO E INTERNO:**

5.2.2.1. Todas as teclas, peças e mecanismos da arma, deverão ter capacidade de resistir, sem quaisquer aditivos depreciativos em sua constituição ou construção: a intempéries (incluindo as climáticas extremas); rusticidade de manipulação e transporte; condições adversas; oxidações, abrasões, choques e incidência de raios UV (no caso de polímero). Deverão ainda ser compatíveis com componentes químicos presentes em munições (ou decorrentes de sua queima), solventes, líquidos, lubrificantes, e materiais usados na manutenção de armas (conforme tabela abaixo):

Item n°	TIPO
1	Solução de limpeza, solvente
2	Solução de limpeza, secante
3	Equivalente a tricloroetano
4	Lubrificante, semifluido, automóveis, armas (a)
5	Óleo lubrificante, uso geral (a)
6	Lubrificante, limpador e preservativo (a) (CLP)
7	Gasolina, veículo de combate (b)
8	Combustível de turbina (b)
9	Óleo combustível, diesel (b)
10	Repelente de inseto
11	Fluido hidráulico
12	Anticongelante, etilenoglicol
13	Solução removedora de carbono
14	Água deionizada e destilada
15	Água do mar (simulada)
16	Agente descontaminante DS2
17	Agente descontaminante STB
18	Óleo lubrificante, armamento
19	Óleo lubrificante, motores
20	Fluído hidráulico, a base de petróleo
21	Fluído hidráulico, não inflamável
22	Etanol

(a) ASTM D471, Tabela 1 (b) ASTM D471, Tabela 2

ASTM - American Society for Testing and Materials

5.2.3. **QUANTO AO CANO, CÂMARA e TRANCAMENTO:**

5.2.3.1. CANO: dotado de estrias (raiamento), de sentido dextrogiro ou levogiro; ou com alma do tipo poligonal no eixo longitudinal (cantos arredondados); ou ainda com sulcos tradicionais L&G (canto vivo), medido do limite de intersecção do próprio cano com a câmara até a sua extremidade oposta (na boca do cano);

5.2.3.2. CÂMARA (*HEADSPACE*): de acordo com a definição da sistemática e indicadores de mensuração "*Go*" (verificar se o *headspace* é igual ou maior que mínimo da norma SAAMI referenciada) e "*No-Go*" (verificar se o *headspace* não é maior que o espaço máximo da norma SAAMI referenciada), seguindo o constante nos termos do subitem 5.2.1. da NIJ Standard - 0112.03, sendo medida do limite de intersecção da própria câmara com o cano até a sua extremidade oposta onde ocorre o trancamento;

5.2.3.3. TRANCAMENTO: a critério do fabricante desde que atenda as normas de segurança e funcionamento, não sendo admitida a possibilidade de produção do tiro sem o completo trancamento da culatra.

5.2.4. **QUANTO À ERGONOMIA:**

5.2.4.1. Deverá permitir que uma mesma arma possa ser utilizada por policiais de diferentes anatomias das mãos, devendo portanto, possuir solução de ajuste, para viabilizar adaptação ao tipo de empunhadura do usuário (tipo *backstrap* ou outra solução), em no mínimo três tamanhos distintos, ou qualquer outro meio, excetuando-se o uso de luvas de "*hogue*" e/ou variações no punho implementadas por customizações.

5.2.5. **OPERAÇÃO**:

5.2.5.1. **RETÉM DO FERROLHO:**

5.2.5.1.1. Deverá ser recartilhado ou texturizado, possibilitando ao operador destravar o ferrolho de maneira ergonômica e funcional, possuindo como requisito adicional optativo do tipo ambidestro ou reversível, para evitar prejuízo ou perda de empunhadura ou do aparelho de pontaria da arma durante sua utilização.

5.2.5.2. **RETÉM DO CARREGADOR:**

5.2.5.2.1. Obrigatoriamente do tipo ambidestro ou reversível, recartilhado ou texturizado, posicionado de forma a não atrapalhar a empunhadura, localizado na armação, na área de junção do guarda mato e a empunhadura (punho), possibilitando a retirada do carregador (totalmente municiado ou com qualquer quantidade de cartuchos ou, ainda, vazio), de maneira livre quando a arma está empunhada. A localização do retém do carregador não deverá favorecer seu acionamento acidental ou involuntário em decorrência do uso da arma pelo operador, ou quando do transporte em coldre;

5.2.5.2.2. Deve ser ativado pressionando-o no sentido lateral de movimento pelo polegar, não sendo permitido um retém que seja ativado por um movimento descendente;

5.2.5.2.3. Deve ser projetado para permitir a liberação positiva do carregador, para liberar quando totalmente comprimido pelo policial, para reduzir a probabilidade de liberação inadvertida do carregador durante o transporte, manuseio e / ou disparo;

5.2.5.2.4. Quando de seu acionamento, conforme o contido nos subitens anteriores, de modo imediato, sem forças externas, o carregador deverá cair livremente apenas pela ação da gravidade, estando vazio ou municiado.

5.2.5.3. **CAPACIDADE DE OPERAÇÃO E DISPAROS:**

5.2.5.3.1. Deverá ter capacidade de operação e disparos, sem o comprometimento da segurança, precisão do tiro e funcionamento da arma, após intercambialidade de 100% (cem por cento) das peças, em qualquer nível de desmontagem, nas condições constantes dos respectivos protocolos de ensaios previstos.

5.2.5.4. **ARMAÇÃO (*FRAME/RECEIVER*):**

5.2.5.4.1. Deverá ser anti-refletiva; capaz de resistir, sem quaisquer aditivos depreciativos em sua constituição ou construção: a intempéries (incluindo as climáticas extremas); rusticidade de manipulação e transporte; condições adversas; oxidações, abrasões e choques; a agentes químicos/minerais; a raios UV (no caso de polímero); ser compatível com agentes químicos, solventes, líquidos e lubrificantes (conforme item 5.2.2.1); com guarda-mato de dimensões capazes de permitir a operação da arma por usuário com luvas, sem comprometer a eficiência e eficácia do disparo;

5.2.5.4.2. Ter uma superfície antiderrapante ambidestra, na área do contato manual do punho.

5.2.5.5. **FERROLHO:**

5.2.5.5.1. Deverá ser anti-refletivo; capaz de resistir, sem quaisquer aditivos depreciativos em sua constituição ou construção: a intempéries (incluindo as climáticas extremas); rusticidade de manipulação e transporte; condições adversas; oxidações, abrasões e choques; ; a agentes químicos/minerais; e ser compatível com agentes químicos, solventes, líquidos e lubrificantes (conforme item 5.2.2.1);

5.2.5.5.2. Obrigatoriamente, na parte traseira, nas laterais (direita e esquerda), ser dotado de sulcos, recartilhados ou ranhuras, a fim de permitir ao usuário fácil ciclagem quando em operação, na área do contato manual;

5.2.5.5.3. É permitido, na parte dianteira, nas laterais (direita e esquerda), ser dotado de sulcos, recartilhados ou ranhuras, a fim de permitir ao usuário fácil ciclagem quando em operação, na área do contato manual.

5.2.5.6. **GATILHO:**

5.2.5.6.1. A força necessária para premir o gatilho deve ser de no mínimo 2 kgf e no máximo 4,5 kgf;

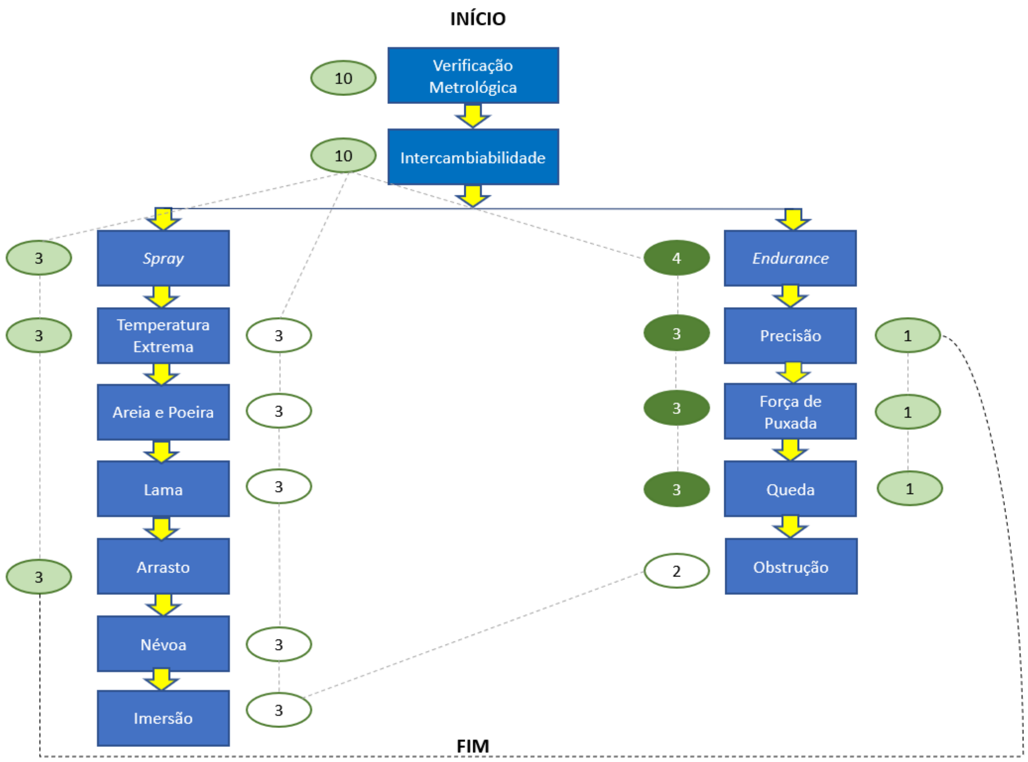
5.2.5.6.2. Deve ser consistente em seu percurso e peso, possibilitando ao policial, com a mão que empunha a arma, voluntariamente com apenas uma ação de seu acionamento, realizar o ciclo para o disparo e recuperação para engrenar (armar) novamente o mecanismo de percussão;

5.2.5.6.3. São vedadas folgas e/ou deslocamentos laterais, durante o acionamento para o disparo e recuperação para engrenar novamente com o mecanismo de percussão, pois isto resulta em erros e falta de precisão.

6. **ENSAIOS**

6.1. **SEQUÊNCIA DE ENSAIOS**

Os ensaios serão executados, no mínimo, em uma amostra total composta por 10 (dez) unidades, conforme a seguinte sequência: verificação de características gerais e metrologia, intercambiabilidade, *spray* de água acelerado, temperatura extrema e umidade, dinâmico de areia e poeira, lama, arrasto na areia, névoa salina, imersão em água salgada, *endurance* (resistência), precisão, força de puxada do gatilho, queda e obstrução do cano por projétil.



6.2. **CRITÉRIOS COMUNS**

6.2.1. Durante os ensaios serão utilizadas munições no calibre especificado, 124 gr, *hollow point*, com velocidade mínima de 350 m/s, para o calibre 9X19 mm, e 180 gr, *hollow point*, com velocidade mínima de 312 m/s para o calibre .40 S&W; que atendam à norma SAAMI (Sporting Arms and Ammunition manufacturer's Institute) Z 299.3-2015 ou homologadas de acordo com a C.I.P (*Commission internationale permanente pour l'épreuve des armes à feu portatives*) - *HOMOLOGATION* Lista de TDCC - Tab IV - cartuchos para pistolas e revólveres, no que se refere aos aspectos de dimensões, pressão e velocidade para pistolas de fogo central.

6.2.2. Falha funcional é considerada como uma função defeituosa da pistola, da munição, do equipamento suplementar ou acessório, podendo levar ou não à pane ou impedimento.

6.2.3. Pane ou impedimento é a interrupção não intencional da execução do tiro.

6.2.4. As falhas funcionais devem ser avaliadas de acordo com suas consequências, sendo classificadas como críticas, graves ou leves.

6.2.4.1. Falhas funcionais críticas levam à falha total da pistola (impedimento), sendo somente eliminadas com o auxílio de ferramentas, somada ao fato de afetar a segurança do operador ou de terceiros. Pode ocorrer ainda quando uma ou mais peças da arma precisam ser substituídas, ou quando ocorrer sua inutilização.

6.2.4.1.1. Não será tolerada falha funcional crítica durante os ensaios, sendo a amostra reprovada quando de sua ocorrência.

6.2.4.2. Falhas funcionais graves levam ao impedimento da pistola e tem como consequência a interrupção do uso da arma, podendo a pane ser sanada somente com o auxílio de ferramentas.

6.2.4.3. Falhas funcionais leves não levam ao impedimento, ou quando este ocorrer que possa ser eliminado sem o auxílio de ferramentas.

6.2.5. Falhas funcionais decorrentes de manuseio e tratamento inadequados pelo manipulador e as que surgem em decorrência de uma falha da munição não devem ser consideradas na computação da cota de falha.

6.2.6. Códigos numéricos das falhas funcionais seguem conforme tabela a seguir:

CÓDIGOS NUMÉRICOS DAS FALHAS FUNCIONAIS

CÓDIGO	TIPO DE FALHA FUNCIONAL
1	Cartucho não deflagra
2	Projétil não sai do cano
3	Estojo não é extraído
4	Estojo não é ejetado para fora da arma
5	Disparo sem acionamento do gatilho
6	Falha no trancamento do ferrolho
7	Vários disparos com acionamento único do gatilho
8	Dupla alimentação
9	Ferrolho travado à retaguarda com o carregador municiado
10	Mecanismo de percusão não é armado
11	Gatilho não rearma
12	Carregador é ejetado da arma durante a execução de tiro sem acionamento do retém
13	Carregador solto no seu poço (não trava)
14	Cartuchos emperram no carregador
15	Ferrolho é liberado com a introdução do carregador (sem acionamento do retém)
16	Ferrolho não fecha após acionamento do retém
17	Cartucho não é empurrado para fora do carregador
18	Cartucho não é totalmente introduzido na câmara
19	Desprendimento de peças da pistola
20	Gatilho com difícil acionamento
21	Outras teclas com difícil acionamento
22	Outros

6.3. **ENSAIOS POR ESPÉCIE**

6.3.1. **VERIFICAÇÃO DE CARACTERÍSTICAS GERAIS E METROLOGIA**

6.3.1.1. Objetivo: verificar a adequação dos exemplares em análise aos parâmetros técnicos mínimos e análise das especificidades do modelo, bem como conformidade das munições utilizadas no roteiro de ensaios.

6.3.1.2. Amostra: composta pelo total de 10 (dez) unidades.

6.3.1.3. Roteiro:

I - Esse ensaio deverá ser executado a uma temperatura de 25° C ± 5° C.

II - As unidades da amostra deverão estar limpas e lubrificadas de acordo com o manual da arma, sem excesso de lubrificação.

III - A arma deverá ser classificada, verificando-se visualmente: calibre, cor predominante, material constitutivo, acabamento interno e externo, cano, trilho, sistemas de funcionamento e segurança, trancamento, presença de zarelho, armação (*frame/receiver*), ferrolho, alça e massa de mira, gatilho, carregador, presença de falhas de acabamento como por exemplo cantos vivos, ergonomia e demais requisitos técnicos mínimos.

IV - A arma deverá ser classificada, verificando-se metrologicamente: câmara (*headspace*), parâmetros dimensionais, comprimento e diâmetro do cano, comprimento total, peso total da arma com carregador vazio, outros parâmetros de peso (peso das amostras com o carregador vazio, com o carregador cheio e apenas do carregador vazio), protusão do percussor, força da mola do percussor, força para carregamento, profundidade da câmara, força da mola recuperadora, força necessária para desconectar o sistema de disparo do sistema de acionamento (conector), força para acionamento do gatilho. A câmara (*headspace*) deverá ser aferida pelos indicadores de mensuração "*Go*" (verificar se o *headspace* é igual ou maior que o mínimo da norma SAAMI referenciada) e "*No-Go*" (verificar se o *headspace* não é maior que o espaço máximo da norma SAAMI referenciada).

V - Deverá ser verificada a conformidade do lote de munições a ser utilizado nos ensaios das armas, nos parâmetros do item 6.2.1., inclusive com aferição da velocidade mínima de projétil através de cronógrafo.

6.3.1.4. Critérios de aceitação:

I - Presença integral dos requisitos técnicos mínimos observáveis neste ensaio, e em especial a segurança e ergonomia.

II - O sistema de travamento para o gatilho (trava de gatilho) deverá impedir que o gatilho seja acionado por ação inercial ou por acionamento acidental, exceto quando acionado pelo operador.

III - O sistema interno de bloqueio do percussor deverá impedir que o percussor atinja a espoleta, a menos que a tecla do gatilho seja corretamente acionada. Não será admitida qualquer marcação da espoleta, quando do simples manejo do ferrolho, trava de segurança, manuseio brusco ou queda da arma.

IV - O retém do carregador deverá ser do tipo ambidestro ou reversível, recartilhado ou texturizado, posicionado de forma a não atrapalhar a empunhadura, localizado na armação, na área de junção do guarda mato e da empunhadura (punho). Não deverá favorecer seu acionamento acidental ou involuntário em decorrência do uso da arma, ou quando do transporte em coldre, possibilitando sua retirada de maneira livre (totalmente municiado, ou com qualquer quantidade de cartuchos, ou ainda vazio), quando a arma está empunhada.

V - A arma deverá ter acabamento de primeira linha e não apresentar sinais de corrosão, imperfeições, rebarbas e/ou sobras de materiais, que evidenciem falta de qualidade no processo fabril, falhas de funcionamento e de procedimento.

6.3.2. **ENSAIO DE INTERCAMBIABILIDADE**

6.3.2.1. Objetivo: verificar a total intercambiabilidade entre as unidades da amostra, apurando a constância nas medidas das peças e a possibilidade de utilização das peças entre diversas pistolas para a realização de manutenção sem a necessidade de realizar ajustes individualizados de peça por peça. Este ensaio tem por finalidade ainda a mitigação de intercorrências e inconsistências que comprometam a qualidade, funcionamento, segurança e suporte logístico do armamento, parametrizando-se em processos de fabricação e controle de primeira linha.

6.3.2.2. Amostra: composta pelo total de 10 (dez) unidades.

6.3.2.3. Roteiro:

I - Esse ensaio deverá ser executado a uma temperatura de 25° C ± 5° C.

II - As unidades da amostra deverão estar limpas e lubrificadas de acordo com o manual da arma, sem excesso de lubrificação.

III - Todas as armas deverão ser desmontadas em todos escalões e montadas com peças uma das outras, de forma aleatória, verificando a intercambiabilidade de seus componentes.

IV - Serão realizados na sequência 35 (trinta e cinco) disparos por arma, verificando-se sua funcionalidade.

6.3.2.4. Critérios de aceitação:

I - As armas deverão possuir 100% de intercambialidade de peças entre unidades distintas de pistolas, sendo estas da mesma marca, calibre e modelo;

II - A manutenção de primeiro escalão (montagem e desmontagem) deverá ser de fácil realização pelo usuário, sem o uso de ferramentas;

III - A dificuldade de montagem equivocada em primeiro escalão;

IV - A não incidência de falhas críticas ou graves;

V - A incidência de, no máximo, 02 (duas) falhas funcionais leves em toda amostra, não sendo computadas as falhas decorrentes de manuseio e tratamento inadequados pelo laboratorista e as que surgem em decorrência de uma falha da munição.

6.3.3. **ENSAIO DE *SPRAY* DE ÁGUA ACELERADO**

6.3.3.1. Objetivo: verificar a performance da arma em situação climática de alta incidência pluviométrica.

6.3.3.2. Amostra: composta de 3 (três) unidades escolhidas aleatoriamente do grupo de 10 pistolas.

6.3.3.3. Roteiro:

I - Esse ensaio deverá ser executado a uma temperatura de 25° C ± 5° C.

II - Como procedimento de preparação da amostra essa deve ser limpa e lubrificada de acordo com o manual da arma, sem excesso de lubrificação.

III - O ensaio deverá simular uma chuva onde o *spray* atinja todo o compartimento de acomodação da arma nas posições conforme tabela do subitem III. O aspersor deverá ficar no máximo a uma distância da arma de 1 m com dispersão de água uniforme no compartimento. A vazão será de 0,17 cm/min por m^2, suficiente para simular o máximo total de chuva em um período de 12 horas em condições de clima Equatorial. A execução deste ensaio pode oferecer o risco de falha catastrófica devido a obstrução do cano da pistola por água.

IV - As munições deverão ser removida das embalagens e expostas junto com as armas (carregadores carregados).

V - O ensaio deve ser executado conforme sequência da tabela a seguir:

Condições de ensaio	Tempo de exposição (min)	Tempo acumulado (min)	Chuva (cm)	
			Por condição	Acumulado
Arma na horizontal Ferrolho aberto	12	12	2	2
Carregada, Ferrolho fechado	12	24	2	4
120 tiros (total da amostra)	6	30	1	5
Ferrolho aberto	12	42	2	7
Carregada, Ferrolho fechado	12	54	2	9
120 tiros (total da amostra)	6	60	1	10
Cano da arma para cima (a) Ferrolho aberto	12	72	2	12
Carregada, Ferrolho fechado	12	84	2	14
120 tiros (total da amostra)	6	90	1	15
Ferrolho aberto	12	102	2	17
Carregada, Ferrolho fechado	12	114	2	19
120 tiros (total da amostra)	6	120	1	20
Cano da arma para baixo Ferrolho aberto	12	132	2	22
Carregada, Ferrolho fechado	12	144	2	24
120 tiros (total da amostra)	6	150	1	25
Ferrolho aberto	(b) 12	162	(b) 2	27
Carregada, Ferrolho fechado	(b) 12	174	(b) 2	29
10 tiros (total da amostra)	(b) 6	180	(b) 1	30

VI - (a) Antes dos disparos, a arma deverá ser voltada com o cano para baixo para drenar toda a água acumulada, destravando o ferrolho suavemente.

VII - (b) Como requerido, terminar o ensaio com coluna de 30 cm de água.

VIII - A cadência de tiro terá a regularidade de aproximadamente 01 tiro por segundo.

IX - A recarga e substituição de carregadores devem ser feitas em um ritmo que pode ser confortavelmente mantido durante os disparos.

X - Se necessário, deverá se ajustar a contagem de rodadas de acordo com a capacidade máxima do carregador.

XI - As armas deverão permanecer o tempo todo sob *spray* de água, inclusive durante os tiros.

XII - Nenhuma manutenção deverá ser permitida durante o ensaio.

XIII - Depois dos ensaios, as armas deverão ser desmontadas, inspecionadas, limpas e lubrificadas. Se a operação das armas estiver comprometida, repetir o ciclo de desmontagem até a lubrificação para determinar que ações de manutenção devem ser tomadas para o completo restabelecimento operacional destas.

6.3.3.4. Critérios de aceitação:

I - Se ocorrerem falhas graves ou críticas durante os ensaios, o ensaio deverá ser interrompido e a amostra será considerada reprovada.

II - Como critério de aceitação, a amostra será considerada "aprovada sem ressalvas" se não apresentar falhas no ensaio, “aprovada com ressalvas” se apresentar cota de falhas menor ou igual a 2% de falhas leves, e “reprovada” se apresentar cota de falhas maior que 2% de falhas leves.

III - Será anotada a circunstância da aprovação da amostra "sem" ou "com" ressalvas no relatório de ensaios.

IV - Deverá ser analisada a arma para identificação da causa da falha, para possível aprovação no caso da munição ser sua raiz, desde que não decorrente da exposição da munição a excesso de umidade proporcionada pela própria arma.

6.3.4. **ENSAIO DE TEMPERATURA EXTREMA E UMIDADE**

6.3.4.1. Objetivo: verificar a performance da arma em situação climática de alta temperatura ambiente.

6.3.4.2. Amostra: composta de 6 (seis) unidades, sendo 3 (três) unidades que passaram pelo ensaio de *spray* de água acelerado, somadas a mais 3 (três) unidades escolhidas aleatoriamente do grupo de 7 pistolas.

6.3.4.3. Roteiro:

I - Os ensaios deverão ser executados sob duas condições: à temperatura de 52°C com uma umidade máxima de 5% na câmara, e à temperatura de 52°C com uma umidade mínima de 90% na câmara. Para fins de evitar a autocombustão, deverá ser observada a temperatura na região da câmara de combustão na parte externa do ferrolho, que não poderá ser superior a 150 °C.

II - Como procedimento de preparação das amostras, limpar e lubrificar as 06 (seis) armas de acordo com o manual da arma, sem excesso de lubrificação.

III - A amostra e as munições deverão ser acondicionadas na câmara climatizada por pelo menos 06 (seis) horas.

IV - Os ensaios deverão ser executados em cada condição dentro da câmara num total de 96 tiros por arma (48 tiros em cada condição de umidade) em ciclos de 12 tiros, sendo 01 tiro por segundo.

V - O intervalo mínimo entre os ciclos deverá ser de 02 horas. Caso seja necessária uma intervenção para manutenção antes de concluir o total de tiros, a arma deverá ser removida da câmara.

VI - Após os 96 tiros, as armas deverão ser removidas da câmara de acondicionamento para desmontagem, limpeza, lubrificação e inspeção.

6.3.4.4. Critérios de aceitação:

I - Se ocorrerem falhas graves ou críticas durante os ensaios, o ensaio deverá ser interrompido e a amostra será considerada reprovada.

II - Será aprovada a amostra que apresentar cota de falhas menor ou igual a 1% de falhas leves em todo o ensaio.

6.3.5. **ENSAIO DINÂMICO DE AREIA E POEIRA**

6.3.5.1. Objetivo: verificar a performance da arma em situação climática de alta incidência de vento contendo areia e poeira.

6.3.5.2. Amostra: composta pelas 3 (três) unidades que passaram pelo ensaio de temperatura e umidade e que não tenham passado pelo ensaio pelo ensaio de *spray* de água acelerado.

6.3.5.3. Roteiro:

I - Esse ensaio deverá ser executado a uma temperatura de 25° C ± 5° C.

II - A amostra deverá estar limpa e lubrificada de acordo com o manual da arma, sem excesso de lubrificação, sendo preparadas um total de 450 unidades de munição (150 unidades por arma).

III - Cada arma que será ensaiada deverá ser instalada no suporte do dispositivo, carregada e municiada. Se a arma possuir tampa da janela de ejeção, esta deverá estar fechada antes de execução do primeiro disparo. Os carregadores restantes deverão estar protegidos com bolsas plásticas e dentro da caixa de poeira e areia.

IV - Este ensaio buscará investigar os efeitos da exposição da arma à poeira e areia durante o disparo. Para sua execução, será necessária uma caixa de poeira e areia construída de madeira compensada de espessura de 25 mm, 0,90 m de largura, 1,20 m de profundidade e 1,40 m de comprimento, com laterais em acrílico e um suporte interno para segurar a arma. Um compressor rotativo, com lâminas de 30 cm, motorizado ou manual, similar aos comumente utilizados por ferreiros, deverá ser montado em uma das extremidades na parte superior central, com 7,5 cm abaixo do tampo e soprando para dentro da caixa. Um furo de ventilação adicional de 7,5 cm, alinhado com o compressor, deverá ser colocado na outra extremidade da caixa. Um furo de 5 cm para a entrada de mistura de poeira e areia deve ser feita no tampo da caixa, alinhado com o compressor em uma distância de 38 cm do mesmo. Dois pares de luvas de proteção de cano longo de borracha para serem utilizadas pelo atirador deverão ser adaptadas, cada par, dos lados direito e esquerdo da caixa. Estas luvas promovem a impermeabilidade da poeira para o manuseio e total controle da arma, inclusive municiamento de carregadores e disparar a arma. A composição da mistura de poeira e areia deve ser conforme mostrado na mesma tabela do abaixo:

Tabela 2.17 MISTURA DE POEIRA E AREIA

	Remanescente			
Medida da malha da peneira(mm)	R (g)	R. 100 (%) SR	Total (%) peneirado	Notas
2.0	-	-	100.0	
1.0	-	-	100.0	
0.63	19.4	9.7	90.3	
0.4	20.0	10.0	80.3	
0.2	63.2	31.6	48.7	
0.1	34.0	17.0	31.7	
0.063	53.2	26.6	5.1	
-	10.2	5.1	-	
Total SR	200.0	100.0	-	

V - A mistura de poeira e areia será insuflada através do furo de entrada numa razão de 1 kg/min com o compressor a 60 rotações por minuto (RPM). Sob essas condições, deverão ser efetuados 150 disparos em séries de 25 disparos no tempo de 20 s, resultando num tempo total de aproximadamente 3 (três) min de duração de ensaio por arma.

VI - Um gravador de cadência de disparos de forma contínua deverá ser utilizado durante cada ensaio, de forma que haja o registro cronológico do tempo total do ensaio, o tempo decorrido até que ocorra um mau funcionamento, o tempo levado para solucionar a pane, e outros, assim como a cadência de disparo da arma. O tempo total que o ferrolho permanece aberto (para solucionar panes, trocar carregador, etc.) é uma medição crítica neste ensaio.

VII - Nenhuma limpeza ou manutenção será permitida até o final dos ensaios ou até ficarem inoperantes.

6.3.5.4. Critérios de aceitação:

I - Se ocorrerem falhas graves ou críticas durante o ensaio, este deverá ser interrompido e a amostra será considerada reprovada.

II - Como critério de aceitação, a amostra será considerada "aprovada sem ressalvas" se apresentar cota de falhas menor ou igual a 1% de falhas leves, “aprovada com ressalvas” se apresentar cota de falhas entre 1% e 2% (incluso este valor) de falhas leves, e “reprovada” se apresentar cota de falhas maior que 2% de falhas leves.

III - Será anotada a circunstância da aprovação da amostra "sem" ou "com" ressalvas no relatório de ensaios.

IV - Uma inspeção será necessária para avaliação das partes internas e para relatar os níveis de dano, deterioração e funcionalidade dessas, bem como as dificuldades para desmontagem de primeiro e segundo escalão.

6.3.6. **ENSAIO DE LAMA**

6.3.6.1. Objetivo: este ensaio buscará investigar o limite de funcionamento e o nível de desempenho da arma após uma exposição à lama, simulando as condições que se espera quando o usuário está rastejando em terreno com lama e barro.

6.3.6.2. Amostra: composta de 3 (três) unidades que passaram pelo ensaio dinâmico de areia e poeira.

6.3.6.3. Roteiro:

I - Esse ensaio deverá ser executado a com a temperatura da água igual a 19 ± 1° C.

II - Antes de ser submetida aos ensaios, a amostra deverá ter sua eficiência constatada, disparando o total de 15 (quinze) munições.

III - Após a constatação de sua eficiência, a amostra deverá ser limpa e lubrificada de acordo com o manual da arma, sem excesso de lubrificação, sendo preparada com carregadores com 15 munições inseridos em cada arma.

IV - Devem ser preparados 4 (quatro) carregadores para cada arma (total de 60 munições por arma).

V - Com cada arma totalmente carregada, fechada e travada, deverá ser colocada uma fita adesiva na boca do cano.

VI - Esse ensaio deverá ser executado com a imersão da arma em banheira de lama com variação de densidade conforme tabela 2.18.

VII - Cada arma deverá ser imersa e agitada na banheira de lama por 60 s em cada densidade.

VIII - Em seguida, cada arma deverá ser soprada e chacoalhada por 30 s.

IX - O procedimento deverá ser repetido por mais 5 vezes, totalizando 6 banhos sucessivos de lama.

X - No banho de lama nº 7, logo após o banho, cada arma deverá ser soprada e chacoalhada por 30 s, tomando em conta que o período de tempo decorrido entre a retirada da arma da banheira de lama e o disparo deve ser o menor possível (menor que 60 s). Devem ser disparados 15 tiros em ato contínuo (um carregador completo). Cada arma deverá ser completamente limpa após os 15 disparos.

XI - O procedimento de acordo com o banho de lama nº 7 deverá ser repetido nos banhos nº 8, 10 e 12; os banhos de lama nº 9 e nº 11 devem ser de acordo com o procedimento dos seis primeiros banhos.

Tabela 2.18 Composição do Banho de Lama

Ingredientes			
Banho nº	Argila (kg)	Areia (kg)	Água (l)
1	0,1	-	10
2	0,3	-	10
3	0,5	-	10
4	1	-	10
5	3	-	10
6	5	-	10
7	1	0,5	10
8	1	1,0	10
9	3	0,5	10
10	3	1,0	10
11	5	0,5	10
12	5	1,0	10

6.3.6.4. Critérios de aceitação:

I - Se ocorrerem falhas graves ou críticas durante os ensaios, o ensaio deverá ser interrompido e a amostra será considerada reprovada.

II - Como critério de aceitação, a amostra será considerada "aprovada sem ressalvas" se apresentar cota de falhas menor ou igual a 10% de falhas leves, “aprovada com ressalvas” se apresentar cota de falhas entre 10% e 20% (incluso este valor) de falhas leves, e “reprovada” se apresentar cota de falhas maior que 20% de falhas leves.

III - Será anotada a circunstância da aprovação da amostra "sem" ou "com" ressalvas no relatório de ensaios.

6.3.7. **ENSAIO DE ARRASTO NA AREIA**

6.3.7.1. Objetivo: Este ensaio buscará investigar os efeitos da areia no funcionamento da arma, simulando as condições que se espera quando o usuário está rastejando em terreno arenoso.

6.3.7.2. Amostra: Serão escolhidas 3 (três) unidades do grupo que passou pelo ensaio de temperatura e umidade.

6.3.7.3. Roteiro:

I - Esse ensaio deverá ser executado a uma temperatura de 25° C ± 5° C.

II - Antes de ser submetida aos ensaios, a amostra deverá ter sua eficiência constatada, disparando o total de 15 (quinze) munições.

III - Após a constatação de sua eficiência, a amostra deverá ser limpa e lubrificada de acordo com o manual da arma, sem excesso de lubrificação, sendo preparada com carregadores com 10 munições inseridos em cada arma.

IV - Devem ser preparados 5 (cinco) carregadores para cada arma (total de 50 munições por arma).

V - Com cada arma totalmente carregada, fechada e travada, deverá ser colocada uma fita adesiva na boca do cano.

VI - O ensaio deverá ser realizado em calha de areia com 4,5 m de comprimento, 0,45 m de largura e 0,25 m de profundidade. Deverá conter 4 aquecedores tubulares de 60 W de potência, cada qual com 183 cm de comprimento e 30 cm de distância, promovendo uma temperatura aproximada de 44° C. Cada arma deverá ser fixada a um transportador que realizará o arraste em orientação e profundidade padronizada. A calha deve ser preenchida com areia (mesma do teste dinâmico de areia e poeira), deixando 7,5 cm de altura livre até o topo da calha. A calha deverá ser colocada no chão ou em container apropriado com a janela de ejeção da arma para cima.

VII - A arma deverá ser deslocada ao longo de todo o comprimento da calha à velocidade de 1 m/s, lado direito em contato com a areia, apontado para a direção do arraste e com inclinação de 15° em relação a linha da calha.

VIII - Após esse deslocamento, o excesso de areia deverá ser retirado balançando a arma ou soprando, por aproximadamente 10 (dez) s.

IX - A proteção da boca do cano deverá ser retirada e 5 (cinco) disparos em 3 (três) s deverão ser efetuados.

X - A arma deverá ser travada, protegida a sua boca do cano, posicionada o outro lado em contato com a areia e repetido o processo.

XI - Deverão ser executados um total de 10 arrastes, 5 de cada lado.

XII - Nenhuma limpeza ou manutenção será permitida até o final dos ensaios ou até ficarem inoperantes.

6.3.7.4. Critérios de aceitação:

I - Se ocorrerem falhas graves ou críticas durante os ensaios, o ensaio deverá ser interrompido e a amostra será considerada reprovada.

II - Como critério de aceitação, a amostra será considerada "aprovada sem ressalvas" se apresentar cota de falhas menor ou igual a 10% de falhas leves, “aprovada com ressalvas” se apresentar cota de falhas entre 10% e 20% (incluso este valor) de falhas leves, e “reprovada” se apresentar cota de falhas maior que 20% de falhas leves.

III - Será anotada a circunstância da aprovação da amostra "sem" ou "com" ressalvas no relatório de ensaios.

IV - Uma inspeção será necessária para avaliação das partes internas e para relatar os níveis de dano, deterioração e funcionalidade dessas, bem como as dificuldades para desmontagem de primeiro e segundo escalão.

6.3.8. **ENSAIO DE NÉVOA SALINA**

6.3.8.1. Objetivo: verificar o funcionamento e a durabilidade da arma quanto a sua corrosão quando exposta a condição ambiente extrema.

6.3.8.2. Amostra: composta de 3 (três) unidades que passaram pelo ensaio de lama.

6.3.8.3. Roteiro:

I - A amostra deverá ser armazenada à temperatura de 35° C ± 5° C por pelo menos 2 (duas) horas.

II - A amostra deverá estar limpa e lubrificada de acordo com o manual da arma, sem excesso de lubrificação.

III - As armas deverão ser carregadas com ferrolho trancado na câmara e arma travada.

IV - Os ensaios deverão ser executados conforme norma técnica ABNT NBR 8094:1983 (solução da névoa salina, câmara e outros), com uma exposição de dois períodos de 24 h em ambiente de névoa salina alternados com dois períodos de 24 h de condição sem umidade.

V - Tanto os carregadores vazios quanto as armas carregadas deverão ser submetidos à névoa salina por 24 h. Após esse período, tanto as armas quanto os carregadores deverão ser removidos da câmara, drenados e colocados com o cano para baixo, sendo recuado o ferrolho.

VI - As armas e os carregadores deverão ser armazenadas por 24 h em condições ambientais a uma temperatura de 35° C ± 5° C e 20% de umidade.

VII - Deverão ser repetidos mais um ciclo de 24 h de névoa salina e mais um ciclo de 24 h de temperatura ambiente com baixa umidade.

VIII - Com os ciclos completos, executar os 120 disparos em cada arma.

IX - Nenhum tipo de limpeza, desmontagem e manutenção serão permitidas até o fim dos ensaios.

X - Caso alguma arma fique inoperante durante a execução dos tiros, deverá ser anotada a quantidade de tiros executados por essa e deverá ser encaminhada para a inspeção final com essa informação.

XI - Após a execução dos tiros, deverá ser realizada a inspeção final onde todas as peças internas e externas serão avaliadas quanto à corrosão, deterioração e funcionalidade.

6.3.8.4. Critérios de aceitação:

I - Se ocorrerem falhas críticas durante os ensaios, o ensaio deverá ser interrompido e a amostra será considerada reprovada.

II - Como critério de aceitação, a amostra será considerada "aprovada sem ressalvas" se apresentar cota de falhas menor ou igual a 1% de falhas leves, “aprovada com ressalvas” se apresentar cota de falhas entre 1% e 5% (incluso este valor) de falhas leves, e “reprovada” se apresentar cota de falhas maior que 5% de falhas leves.

III - Será anotada a circunstância da aprovação da amostra "sem" ou "com" ressalvas no relatório de ensaios.

IV - Como critério de aceitação somente serão admitidos pontos vermelhos que poderão ser restabelecidas as condições normais de uso após uma manutenção de primeiro escalão.

V - Caso seja necessária uma manutenção de segundo escalão, a arma será considerada reprovada.

6.3.9. **ENSAIO DE IMERSÃO EM ÁGUA SALGADA**

6.3.9.1. Objetivo: verificar o funcionamento e a durabilidade da arma no tocante a sua corrosão, quando exposta a condição ambiente extrema.

6.3.9.2. Amostra: composta de 3 (três) unidades que passaram pelo ensaio de névoa salina.

6.3.9.3. Roteiro:

I - Os ensaios devem ser realizados a 25° C ± 5° C.

II - A amostra deverá estar limpa e lubrificada de acordo com o manual da arma (em conformidade com a tabela 2.18), sem excesso de lubrificação.

III - A solução utilizada no ensaio será composta de 20% de cloreto de sódio e 80% de água por peso, com o cloreto de sódio com teor igual ou inferior a 0,1% iodo de sódio e 0,2% de outras impurezas.

IV - As armas, carregadores e 60 (sessenta) munições deverão ser imersas totalmente uma única vez por 1 (um) min na solução.

V - A diferença de temperatura entre as armas e a solução deverá ser inferior a 10° C no início do ensaio.

VI - Após a imersão, as armas deverão ser posicionadas com o cano para baixo e recuados os ferrolhos para drenar a água.

VII - Imediatamente após a drenagem da água, as armas deverão produzir 60 (sessenta) disparos por arma, com cadência de tiro com regularidade de, aproximadamente, 01 tiro por segundo;

VIII - A seguir a amostra será armazenada em uma câmara com alta umidade (90% até o 5º dia e 95% até o final) em um total de 10 dias, sem limpeza ou lubrificação.

IX - Nos dias 3, 5, 8 e 10, cada arma será disparada 60 (sessenta) vezes com munições integras (que não tenham sido expostas a solução), em um total de 240 (duzentos e quarenta) tiros por arma.

X - A recarga e substituição de carregadores devem ser feitas em um ritmo que confortavelmente pode ser mantido durante os disparos.

XI - Se necessário, deverá se ajustar a contagem de rodadas de acordo com a capacidade máxima do carregador.

XII - Se acontecer algum mau funcionamento da arma será admitido seu descarregamento, golpes sucessivos no ferrolho e remoção por meio de batidas.

XIII - Nenhuma limpeza ou manutenção será permitida até o final dos ensaios ou até ficarem inoperantes.

6.3.9.4. Critérios de aceitação:

I - Caso uma arma fique inoperante antes dos 10 dias, a amostra será considerada reprovada.

II - Se ocorrerem falhas graves ou críticas durante os ensaios, este deverá ser interrompido e a amostra será considerada reprovada.

III - Como critério de aceitação, a amostra será considerada "aprovada sem ressalvas" se apresentar cota de falhas menor ou igual a 2% de falhas leves, "aprovada com ressalvas" se apresentar cota de falhas entre 2% e 10% (incluso este valor) de falhas leves, e "reprovada" se apresentar cota de falhas maior que 10% de falhas leves.

IV - Será anotada a circunstância da aprovação da amostra "sem" ou "com" ressalvas no relatório de ensaios.

V - Uma inspeção será necessária para avaliação das partes internas e para relatar os níveis de corrosão, deterioração e funcionalidade dessas, bem como as dificuldades para desmontagem de primeiro e segundo escalão.

6.3.10. **ENSAIO DE *ENDURANCE***

6.3.10.1. Objetivo: este ensaio buscará investigar o nível de resistência e desempenho da arma sob *stress* de uso, simulando um envelhecimento da arma (envelhecimento acelerado) através de seu acionamento por equipe de atiradores.

6.3.10.2. Amostra: será composta de 04 (quatro) armas, selecionadas do total das 10 (dez) pistolas que realizaram o teste de intercambiabilidade.

6.3.10.3. Roteiro ensaio de resistência:

I - Esse ensaio deverá ser executado a uma temperatura entre 10° C e 40° C.

II - A amostra deverá estar limpa e lubrificada de acordo com o manual da arma, sem excesso de lubrificação.

III - Um total de 10.000 (dez mil) disparos deverão ser executados em cada arma da amostra por grupo de atiradores, sem qualquer limpeza ou lubrificação, sendo que a cada 1.000 (mil) disparos com uma cadência regular de dois disparos por segundo, as armas deverão ser resfriadas por 2 (dois) min, permanecendo o armamento em temperatura ambiente.

6.3.10.4. Critérios de aceitação:

I - Será considerada reprovada a amostra que apresentar:

a) qualquer falha grave ou crítica, sendo o ensaio interrompido;

b) mais de 2 (duas) ocorrências (por milhar) de falhas leves;

c) qualquer desgaste excessivo, dano estrutural, dilatação ou deformação que altere o funcionamento e/ou comprometa a segurança;

d) desgaste nas peças que impeça a continuidade dos ensaios.

6.3.11. **ENSAIO DE PRECISÃO**

6.3.11.1. Objetivo: determinar o desempenho de precisão da pistola por meio do resultado de seus acertos.

6.3.11.2. Amostra: será composta de 4 (quatro) armas, sendo 3 (três) unidades que realizaram o ensaio de *endurance*, e 1 (uma) unidade que não passou por ensaios severos, sendo preparadas com um total de 40 munições (10 por arma).

6.3.11.3. Roteiro:

I - Esse ensaio deverá ser executado a uma temperatura entre 10° C e 40° C.

II - A amostra deverá estar limpa e lubrificada de acordo com o manual da arma, sem excesso de lubrificação.

III - Serão verificados os resultados dos acertos, a partir da utilização de um suporte padrão (*Ranson Rest*) a uma distância de 25 m do alvo.

IV - Cada arma será acionada por 10 (dez) disparos, devendo o projétil atingir uma circunferência máxima de 16 (dezesseis) cm de diâmetro.

6.3.11.4. Critérios de aceitação:

I - Será considerada aprovada a amostra em que as armas apresentarem os 10 disparos por arma dentro de uma circunferência igual ou inferior a 16 cm de diâmetro, não ocorrendo:

a) falha crítica ou grave;

b) falha funcional leve maior que 2 (duas) falhas desta natureza, não sendo computadas as falhas decorrentes de manuseio e tratamento inadequados pelo operador e as que surgem em decorrência de uma falha da munição;

c) qualquer acerto fora do agrupamento desejado;

d) oscilação pendular do projétil no alvo (entende-se como oscilação pendular do projétil, a entrada do projétil no alvo de forma diversa da posição frontal, sem estabilidade de voo ou com o não alinhamento do cano com a guia do armamento).

6.3.12. **ENSAIO DE FORÇA DE PUXADA DO GATILHO**

6.3.12.1. Objetivo: este ensaio tem por objetivo medir a resistência do acionamento do gatilho e seu curso, verificando a usabilidade da arma quanto ao seu acionamento.

6.3.12.2. Amostra: composta de 4 (quatro) unidades que passaram pelo ensaio de precisão.

6.3.12.3. Roteiro:

I - Esse ensaio deverá ser executado a uma temperatura entre 10° C e 40° C.

II - A amostra deverá estar limpa e lubrificada de acordo com o manual da arma, sem excesso de lubrificação.

III - Para a execução do ensaio, será utilizado um dinamômetro (ou *Trigger Pull device*) que meça a força linear de puxada do gatilho durante todo o seu percurso, registrando em forma de curva a variação da força, momento em que deve ser calculado o trabalho resultante.

6.3.12.4. Critérios de aceitação:

I - Como critério de aceitação, o pico da força deve estar entre 2 kgf e 4,5 kgf, inclusos estes valores.

6.3.13. **ENSAIO DE QUEDA**

6.3.13.1. Objetivo: este ensaio deve comprovar que a pistola possui segurança em caso de sofrer uma queda, bem como resistência constitutiva para subsequente uso operacional.

6.3.13.2. Amostra: será composta de 04 (quatro) armas, sendo 3 (três) unidades que realizaram o ensaio de *endurance*, e outra que não passou por ensaios severos.

6.3.13.3. Roteiro:

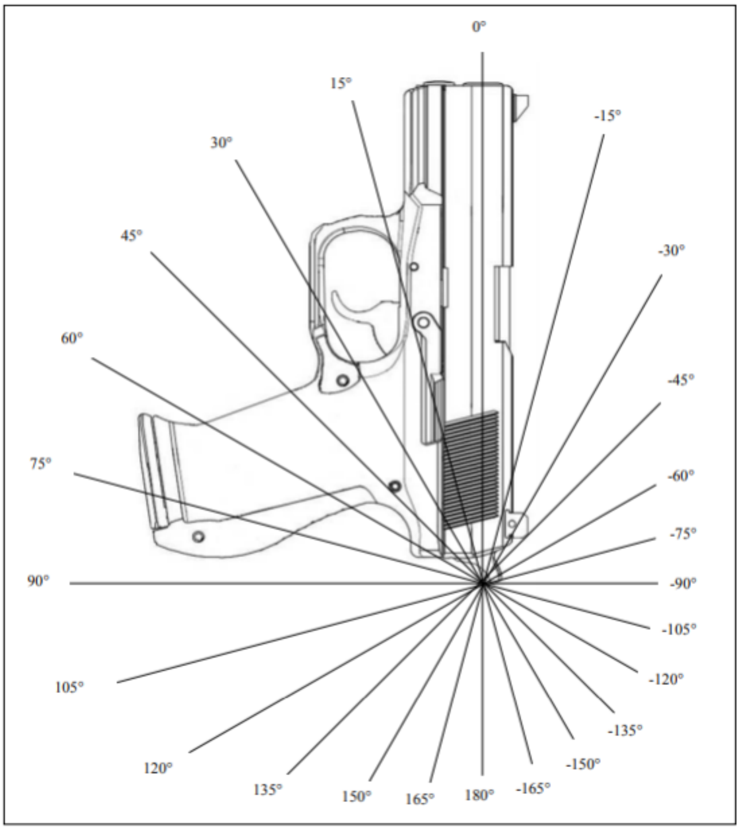
I - Esse ensaio deverá ser executado a uma temperatura entre 10° C e 40° C.

II - A amostra deverá estar limpa e lubrificada de acordo com o manual da arma, sem excesso de lubrificação.

III - As armas deverão ter seus carregadores municiados em sua capacidade máxima com munição inerte contendo a mesma massa da munição real, podendo ser utilizado um lastro para tal fim. Admite-se tolerância máxima de +/- 1% na massa da munição inerte em relação a munição que foi utilizada nos outros ensaios.

IV - A arma deverá estar carregada com cartucho provido apenas de espoleta (sem propelente e projetil).

V - Será utilizado trilho com atrito desprezível para aferição dos ângulos de queda de 0°, 30°, -30°, 90°,-90°, 180°, lado direito abaixo e lado esquerdo abaixo, cada uma delas com a arma travada e destravada (no caso de presença de trava externa na arma), devendo observar os pontos de impacto, conforme ilustração abaixo:



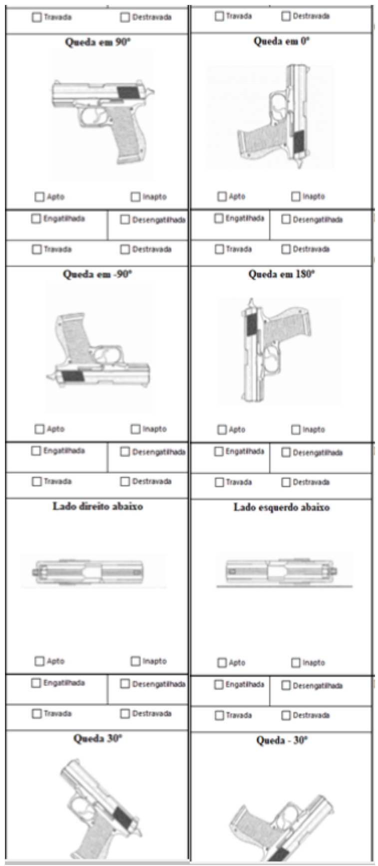


FOTO MERAMENTE ILUSTRATIVA

VI - Cada uma das faces de impacto será avaliada a uma altura de 2.000 mm, diretamente sobre um piso de concreto liso.

VII - A queda deverá ser sem influência de forças externas, de forma livre.

VIII - Após cada queda, a pistola deverá ser descarregada, sendo examinadas as espoletas, passando a seguir ao exame quanto a danos e a capacidade de tiros, com seu carregamento com munição real e sequência de 5 (cinco) disparos para aferir seu funcionamento.

IX - Antes de uma nova queda da pistola, somente as peças danificadas em decorrência da queda anterior podem ser substituídas.

X - Os resultados dos ensaios de queda e a avaliação decorrente deverão ser documentados, devendo ser registradas as condições de aptidão para tiros após os respectivos ensaios de queda.

6.3.13.4. Critérios de aceitação:

I - Será considerada aprovada a amostra em que as armas apresentarem a não ocorrência de:

a) percussão da espoleta;

b) liberação do carregador (exceto no caso da queda da lateral da face do retém do carregador, com o subsequente acionamento deste);

c) desmontagem do carregador ou liberação de munição;

d) marcação da espoleta;

e) falhas críticas ou graves (para efeitos desse ensaio, não será considerada como falha crítica a quebra de componentes da alça e massa de mira).

II - O dano em peças que comprometam a produção do tiro é critério de reprovação.

6.3.14. **ENSAIO DE OBSTRUÇÃO DO CANO POR PROJÉTIL**

6.3.14.1. Objetivo: este ensaio buscará investigar o nível de desempenho da arma após uma obstrução em seu cano, avaliando o risco do usuário ou de pessoas próximas serem atingidas por estilhaços.

6.3.14.2. Amostra: a amostra será composta de 2 (duas) armas.

6.3.14.3. Roteiro:

I - Esse ensaio deverá ser executado a uma temperatura de 25° C ± 5° C.

II - A amostra deverá estar limpa e lubrificada, sendo preparadas um total de 4 (quatro) munições.

III - Para a execução deste ensaio, uma tela testemunho deverá ser colocada em volta da arma para detectar presença de detritos em direção ao atirador ou pessoas próximas, com a arma em dispositivo para disparo remoto.

IV - Cada arma da amostra será submetida a uma das posições de obstrução do cano por projétil: projétil na entrada do cano, com sua base em contato com a ponta do projétil do cartucho inserido na câmara; e ponta do projétil alinhada com a boca do cano.

6.3.14.4. Critérios de aceitação:

I - Como critério de aceitação, não poderá haver a presença de estilhaços no ferrolho, cano e empunhadura em ambas as armas da amostra.

7. **ESQUEMA DE CERTIFICAÇÃO**

7.1. O processo de certificação e os ensaios deverão ser executado por Organismos de Certificação de Produto (OCP) e laboratórios acreditados pelo Instituto Nacional de Metrologia, Qualidade e Tecnologia (Inmetro) no escopo desta norma ou/em normas similares (conforme item 3), ou por organismos e laboratórios acreditados por órgãos que sejam signatários dos acordos de reconhecimento mútuo em fóruns internacionais disponíveis no sítio http://www.inmetro.gov.br/credenciamento/reconh_inter.asp.

7.2. Caberá ao OCP avaliar a aceitação e/ou complementação de relatórios de ensaios executados com base em outras normas similares para pistolas, desde que a metodologia e o roteiro dos ensaios sejam equivalentes aos aqui normatizados, sendo respeitados os critérios de aceitação estabelecidos neste documento.

7.3. A critério do OCP será admitida a hipótese de aproveitamento de relatórios de ensaios em propósitos comuns oriundos de modelos de diferentes dimensões do mesmo fabricante, respeitando-se a manutenção de mesmo material constitutivo e idênticos sistemas de funcionamento e segurança. No caso de evolução de projeto devidamente certificado, o OCP verificará a viabilidade de serem realizados apenas os ensaios para aferição das mudanças implementadas.

7.4. Para certificação das pistolas serão adotados alternativamente um dos seguintes procedimentos:

a) Procedimento 1: aplicação do esquema 1 (ensaio de tipo), em caráter preliminar a qualquer processo aquisitivo (ou através de certificação por OCP), a cada "modelo" de pistola; acrescido da aplicação do esquema 1b (ensaio de lote) por ocasião de cada processo de aquisição do "modelo" submetido ao esquema anterior, com o tamanho da amostra a ser submetida aos ensaios especificado no certame (desejavelmente com significância estatística), tendo como parâmetro mínimo o total de armas especificado no item 6.1 desta norma, conforme esquemas especificados na norma ABNT NBR ISO/IEC 17067:2015; ou

b) Procedimento 2: aplicação do esquema 5 de certificação, composto pelo ensaio de tipo a cada "modelo" de pistola, acrescido da Avaliação e Aprovação do Sistema de Gestão da Qualidade do fabricante, acompanhamento através de auditorias no fabricante e ensaio em amostras retiradas no comércio (caso se aplique) e no fabricante, conforme esquema especificado na norma ABNT NBR ISO/IEC 17067:2013, com auditorias e ensaios para a manutenção da certificação do modelo a cada 2 (dois) anos, contemplando o tamanho da amostra o total especificado no item 6.1 desta norma para os ensaios iniciais e os ensaios de manutenção da certificação.

7.5. O certificado de conformidade da arma obrigatoriamente conterá em anexo o seu(s) relatório(s) de ensaios completo(s) com os conceitos (aprovação "com" ou "sem" ressalvas), desempenho, número de falhas e outras observações.

7.6. Em caráter precário, tanto os processos de certificação quanto os ensaios poderão ser executados por OCP ou laboratórios acreditados em outros escopos, ou ainda em laboratórios não acreditados, desde que sejam designados pela SENASP através de Portaria.

7.7. Até a implementação definitiva da rede de certificação de armas pela SENASP, provisoriamente os ensaios de verificação de características gerais e metrologia, intercambiabilidade, *endurance* (resistência), precisão, força de puxada do gatilho e queda serão executados no procedimento 1 (item 7.4 acima) em cada certame aquisitivo. Nessas circunstâncias, serão necessárias as certificações nas normas referenciadas nos itens 3.3.2. ou 3.3.7, ou relatórios de ensaios elaborados conforme as citadas normas em laboratórios acreditados que contemplem os ensaios de *spray* de água acelerado, temperatura extrema e umidade, dinâmico de areia e poeira, lama, arrasto em areia, névoa salina, imersão em água salgada, e obstrução do cano por projétil, sendo respeitados, no mínimo, os critérios de aceitação estabelecidos neste documento.

GUILHERME CALS THEOPHILO GASPAR DE OLIVEIRA
Secretário Nacional de Segurança Pública - Senasp

Documento assinado eletronicamente por **GUILHERME CALS THEOPHILO GASPAR DE OLIVEIRA**, **Secretário(a) Nacional de Segurança Pública**, em 16/04/2020, às 16:12, conforme o § 1º do art. 6º e art. 10 do Decreto nº 8.539/2015.

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Referência: Processo nº 08020.003561/2019-52 SEI nº 11504548

ACÓRDÃO Nº 4369/2019 - TCU - 2ª Câmara

Este processo trata de representação oferecida pela Secretaria de Controle Externo da Defesa Nacional e da Segurança Pública a respeito de possíveis irregularidades ocorridas no curso do Contrato 29/2017, celebrado por meio de inexigibilidade de licitação entre o Departamento de Polícia Rodoviária Federal e a empresa Glock América S.A., no valor total de R$ 18.582.838,47, cujo objeto era a aquisição de pistolas de uso individual para uso ostensivo, dissimulado e em treinamentos pelos policiais rodoviários federais.

Considerando que, após análise dos documentos acostados nos autos, a Secretaria de Controle Externo da Defesa Nacional e da Segurança Pública considerou não ter sido possível evidenciar irregularidades na compra direta realizada pelo Departamento de Polícia Rodoviária Federal;

os ministros do Tribunal de Contas da União, reunidos em sessão de 2ª Câmara, ACORDAM, por unanimidade, de acordo com os pareceres emitidos nos autos e com fundamento nos arts. 235 e 237, inciso VI, 251 do Regimento Interno deste Tribunal; e 7º da Resolução TCU 265/2014, em conhecer desta representação e considerá-la improcedente, sem prejuízo das determinações e orientações sugeridas.

1. Processo TC-004.207/2018-1 (REPRESENTAÇÃO)

1.1. Classe de Assunto: VI.

1.2. Representante: Secretaria de Controle Externo da Defesa Nacional e da Segurança Pública.

1.3. Unidade: Departamento de Polícia Rodoviária Federal.

1.4. Relatora: ministra Ana Arraes.

1.5. Representante do Ministério Público: não atuou.

1.6. Unidade Técnica: Secretaria de Controle Externo da Defesa Nacional e da Segurança Pública (SecexDefes).

1.7. Representação legal: não há.

1.8. Determinações/Recomendações/Orientações:

1.8.1. determinar ao Ministério da Justiça e Segurança Pública, por intermédio de sua Secretaria Executiva e da Secretaria Nacional de Segurança Pública (Senasp), que, no prazo de 180 (cento e oitenta) dias:

1.8.1.1. estabeleça, por meio de normativos, os requisitos de segurança, operacionais, técnicos e logísticos mínimos necessários para o atendimento do desempenho esperado das armas a serem adquiridas pelas forças de segurança federais, de forma a padronizar as características desejáveis do produto para cada instituição e, desse modo, evitar que se sujeitem a alterações por critérios subjetivos a cada processo compra;

1.8.1.2. nos limites de suas respectivas competências, e tendo por fundamento os arts. 13, inciso I, e 18 da Lei 13.675/2018, fomente a elaboração, por parte das diferentes unidades da federação, de normativos de conteúdo similar ao descrito no item 1.8.1.1. desta deliberação;

1.8.2. determinar ao Departamento de Polícia Rodoviária Federal que:

1.8.2.1. a partir dos requisitos mínimos (doutrinas) que serão estabelecidos pelo Ministério da Justiça e Segurança Pública em atenção ao item 1.8.1.1. desta deliberação, reavalie a exigibilidade de processo licitatório para as próximas aquisições de armas, adotando, inclusive, se for o caso, a licitação internacional prevista no art. 42 da Lei 8.666/1993;

1.8.2.2. ao realizar pesquisa para fins de formulação do preço estimado de contratações, mesmo nos casos de inexigibilidade ou dispensa de licitação, atente para o prazo de 180 dias orientados no art. 2º, incisos II e IV, da Instrução Normativa SLTI 5/2014;

1.8.3. dar ciência ao Departamento de Polícia Rodoviária Federal sobre as seguintes impropriedades para que sejam adotadas medidas internas com vistas à prevenção de ocorrências futuras semelhantes:

1.8.3.1. ausência de retorno do processo administrativo 08650.003489/2017-85 à Consultoria Jurídica para emissão de parecer jurídico conclusivo após o saneamento das pendências apontadas em exame preliminar, em afronta ao disposto no art. 38, parágrafo único, da Lei 8.666/1993 e na jurisprudência desta Corte de Contas;

1.8.3.2. ausência de certificação *NIJ Standard* 0112.03 para o modelo G26 no âmbito do Contrato 29/2017, o que afronta o disposto no art. 3º da Lei 8.666/1993 e o projeto básico que subsidiou a contratação em tela;

1.8.4. encaminhar ao Departamento de Polícia Rodoviária Federal cópia do Acórdão 1.445/2015 - Plenário, de relatoria do Ministro Vital do Rego, para conhecimento do item 9.3;

1.8.5. dar ciência desta deliberação, bem como da instrução da unidade instrutiva à Secretaria Executiva, à Secretaria Nacional de Segurança Pública e ao Departamento de Polícia Rodoviária Federal do Ministério da Justiça e Segurança Pública.

11288907 08000.033523/2019-62

MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA

SECRETARIA NACIONAL DE SEGURANÇA PÚBLICA

DIRETORIA DE POLÍTICAS DE SEGURANÇA PÚBLICA

Nota Técnica n.º 6/2020/CQE/CGISP-DPSP/DPSP/SENASP/MJ

PROCESSO Nº 08020.001354/2019-63

INTERESSADO: SENASP

Assunto: Análise dos encaminhamentos necessários para atendimento das recomendações do Acórdão nº 4369/2019-TCU-Segunda Câmara.

1. INTRODUÇÃO

1.1. A presente Nota Técnica visa a analisar as providências necessárias para atendimento das recomendações do Acórdão nº 4369/2019-TCU-Segunda Câmara no âmbito da SENASP.

2. ANÁLISE DAS RECOMENDAÇÕES DO TCU

2.1. O Acórdão nº 4369/2019-TCU-Segunda Câmara, prolatado no curso do processo de Representação TC 004.207/2018-1, tem como objeto principal de análise a aquisição de pistolas de uso individual, concretizada através do Contrato nº 29/2017, celebrado entre o Departamento de Polícia Rodoviária Federal (DPRF) e Empresa Glock América S.A., após processo de inexigibilidade de licitação.

2.2. Após apuração de eventuais irregularidades, a unidade técnica do Tribunal de Contas da União (TCU) considerou a representação improcedente, contudo propôs a Corte vários encaminhamentos que resultaram nas recomendações do Acórdão em exame:

> "1.8.1. determinar ao Ministério da Justiça e Segurança Pública, por intermédio de sua Secretaria Executiva e da Secretaria Nacional de Segurança Pública (Senasp), que, no prazo de 180 (cento e oitenta) dias:
>
> 1.8.1.1. estabeleça, por meio de normativos, os **requisitos** de segurança, operacionais, técnicos e logísticos **mínimos necessários** para o atendimento do desempenho esperado das armas a serem adquiridas pelas forças de segurança federais, de forma a **padronizar as características desejáveis do produto para cada instituição** e, desse modo, evitar que se sujeitem a alterações por critérios subjetivos a cada processo compra;
>
> 1.8.1.2. nos limites de suas respectivas competências, e tendo por fundamento os arts. 13, inciso I, e 18 da Lei 13.675/2018, fomente a elaboração, por parte das diferentes unidades da federação, de normativos de conteúdo similar ao descrito no item 1.8.1.1. desta deliberação;
>
> 1.8.2. determinar ao Departamento de Polícia Rodoviária Federal que:

1.8.2.1. a partir dos requisitos mínimos (doutrinas) que serão estabelecidos pelo Ministério da Justiça e Segurança Pública em atenção ao item 1.8.1.1. desta deliberação, reavalie a exigibilidade de processo licitatório para as próximas aquisições de armas, adotando, inclusive, se for o caso, a licitação internacional prevista no art. 42 da Lei 8.666/1993" (negrito nosso);

2.3. Da exegese das recomendações contidas nos itens 1.8.1.1 e 1.8.1.2, bem como dos limites das competências da Secretaria Nacional de Segurança Pública (Senasp/MJSP), esta equipe técnica entende que seriam três as ações necessárias ao atendimento do Acórdão:

a) edição de normativo que contemple requisitos técnicos mínimos de desempenho e segurança das armas de porte destinadas às instituições policiais;

b) edição pelas forças policiais federais de normativos de padronização, que evitem alterações subjetivas a cada edital licitatório; e

c) fomento à edição de normativos de padronização pelas instituições de segurança pública e defesa civil estaduais e municipais.

2.4. Outra interpretação não seria conforme, visto que o estabelecimento de requisitos mínimos não se confunde com padronização, sendo aquele um exercício de estipular as características essenciais que o item deverá possuir para ser utilizado profissionalmente (amplo) e este a implantação de um *standard* adequando o mínimo a realidade operacional de cada instituição (restrito).

3. EDIÇÃO DE NORMATIVO QUE CONTEMPLE REQUISITOS TÉCNICOS MÍNIMOS DE DESEMPENHO E SEGURANÇA DAS ARMAS DE PORTE DESTINADAS ÀS INSTITUIÇÕES POLICIAIS

3.1. Entende-se cumprida a primeira ação necessária ao atendimento do Acordão com a edição da Normas Técnicas (NT-Senasp) nº 001/2020 – Pistolas calibre 9x19 mm e .40 S&W (11260154), por intermédio das seguintes diretivas:

3.1.1. O § 3º do art. 17 do Decreto nº 10.030, de 30 de setembro de 2019 facultou ao MJSP o estabelecimento de requisitos adicionais aos Produtos Controlados pelo Exército Brasileiro (PCE) de interesse da segurança pública, com vistas à padronização de equipamentos, de tecnologias e dos procedimentos de avaliação da conformidade, nos termos do disposto na Lei nº 13.675, de 11 de junho de 2018;

3.1.2. Diante da imperiosa necessidade estratégica indentificada, a Secretária Nacional de Segurança Pública, em fevereiro de 2019 deu início ao Plano Nacional de Normalização e Certificação de Produtos de Segurança Pública - Pró-Segurança, implementando paulatinamente estudos técnicos e análise de bases normativas e legais existentes em todo o mundo, visando a construções das Normas Técnicas, sendo um dos planos essenciais do Planejamento Estratégico do Ministério da Justiça e Segurança Pública para o quinquênio 2015-2019 estabelecidos pela Portaria nº 1.684, de 10 de novembro 2017, alterada pela Portaria SE nº 1155, de 28 de maio de 2019, estando plenamente alinhado com tais regramentos legais supracitados.

3.1.3. Materializando tais diretrizes estratégicas, o Ministério da Justiça e Segurança Pública (MJSP) instituiu formalmente o Pró-Segurança, através da Portaria MJSP nº 104/2020 (11162914), tendo como um dos seus objetivos primordiais estabelecer Normas Técnicas que contemplassem requisitos mínimos de segurança, qualidade e desempenho de equipamentos, produtos e serviços de segurança pública de forma a subsidiar as aquisições públicas (art 4º);

3.1.4. A responsabilidade para a edição das Normas Técnicas foi atribuída à Senasp/MJSP pela citada Portaria citada (art 5º);

3.1.5. As Normas Técnicas orientarão as aquisições de equipamentos policiais pelos órgãos do Sistema Único de Segurança Pública (SUSP), possuindo caráter obrigatório quando do emprego de recursos financeiros oriundos do Orçamento Geral da União (art. 7º) e caráter sugestivo na hipótese da utilização de recursos públicos que não tenham origem federal;

3.1.6. As NT-Senasp, portanto, contemplam requisitos mínimos de segurança, qualidade e desempenho de equipamentos para atividade profissional de segurança pública, de forma a proporcionar condições adequadas para a atividade policial em benefício da sociedade atendida por seus serviços;

3.1.7. Dada a natureza participativa e não impositiva na construção de uma Norma Técnica, a NT-Senasp nº 001/2020 – Pistolas calibre 9x19 mm e .40 S&W foi construída através de metodologia construtivista multidisciplinar, através de estudos técnicos desenvolvidos por especialistas das mais diversas áreas da segurança pública de todas as regiões do Brasil, que participaram de câmera técnica específica, congregando experiências de profissionais com expertise consagrada na área, de forma a materializar a cooperação e a colaboração dos órgãos e instituições componentes do SUSP, com posterior realização de audiência pública com mais de 1000 (mil) participantes, contemplando representantes da indústria e comércio mundial, profissionais de segurança pública, usuários do serviço público de segurança e demais partes interessadas no processo, o que robustece a tecnicidade participativa aplicada a edição da Norma;

3.1.8. Por fim, a NT-Senasp nº 001/2020 – Pistolas calibre 9x19 mm e .40 S&W foi submetida a consulta pública, possibilitando que toda a sociedade pudesse contribuir para a redação definitiva do texto; e

3.1.9. A NT-Senasp nº 001/2020 – Pistolas calibre 9x19 mm e .40 S&W materializa o estabelecimento de requisitos técnicos mínimos de desempenho e segurança das armas de porte destinadas às instituições policiais.

3.2. Deste modo, pelo exposto, diante da análise da legislação e normatizações correlacionadas e do desenvolvimento de estudos aprofundados para estabelecimento de requisitos de segurança, operacionais, técnicos e logísticos mínimos necessários para o atendimento do desempenho esperado das pistolas a serem adquiridas pelas instituições de segurança pública no país, atentando, assim, para as determinações e diretrizes trazidas pelo órgão de controle através do acórdão em comento, a equipe técnica no DPSP/Senasp/MJSP, considera atendida à determinação contida na primeira parte do item 1.8.1.1. do Acórdão nº 4369/2019-TCU-Segunda Câmara, que assim dispõe: "estabeleça, por meio de normativos, os requisitos de segurança, operacionais, técnicos e logísticos mínimos necessários para o atendimento do desempenho esperado das armas a serem adquiridas pelas forças de segurança federais.".

3.3. Há de se ressaltar que a NT-Senasp nº 001/2020 – Pistolas calibre 9x19 mm e .40 S&W aborda, primordialmente, questões afetas aos requisitos de segurança, aferição de qualidade e desempenho das pistolas de uso operacional. Conforme detalhado no item 2.4, a referida Norma Técnica foi construída em sentido amplo e podendo ser complementado através de normativo específico emitido por cada uma das forças de segurança federais (Senasp/MJSP, Secretaria de Operações Integradas - Seopi/MJSP, Departamentos de Polícia Federal - DPF/MJ, Polícia Rodoviária Federal - DPRF/MJ e Penitenciário Nacional - DEPEN/MJ), detalhando "os **requisitos** de segurança, operacionais, técnicos e logísticos **mínimos necessários"** conforme demonstrado no item 4.

4. EDIÇÃO PELAS FORÇAS POLICIAIS FEDERAIS DE NORMATIVOS DE PADRONIZAÇÃO, QUE EVITEM ALTERAÇÕES SUBJETIVAS A CADA EDITAL LICITATÓRIO

.

4.1. De modo complementar, atendendo à recomendação contida na segunda parte do item 1.8.1.1, que cita que a edição de normas ainda deverá ser realizada "de forma a **padronizar as características desejáveis do produto para cada instituição** e, desse modo, **evitar que se sujeitem a alterações por critérios subjetivos a cada processo compra**", após a publicação da NT-Senasp nº 001/2020 – Pistolas calibre 9x19 mm e .40 S&W, deverão ser estabelecidos, dentro das respectivas competências das instituições federais, padronizações técnicas, atendendo à doutrina e especificidade das atividades e missões desenvolvidas por estes órgãos de segurança pública da União.

4.2. Neste sentido, no que tange a responsabilidade da Senasp/MJSP, é opinião desta equipe técnica que a prerrogativa de padronizar as características desejáveis das pistolas recai sobre a Diretoria da Força Nacional de Segurança Pública (DFNSP), por se tratar da unidade de emprego operacional da Secretaria.

4.3. Faz-se necessário, portanto, dar ciência ao Diretor da Força Nacional de Segurança Pública das recomendações do Acórdão nº 4369/2019-TCU-Segunda Câmara e orientar que, por intermédio de Portaria, seja concretizada a padronização do armamento de porte da Força Nacional de Segurança Pública, considerando a função, missão, os ambientes operacionais, os tipos de operações, as funcionalidades e doutrina a serem executadas e o desempenho esperado, bem como respeitando os requisitos técnicos mínimos já estabelecidos pela NT-Senasp nº 001/2020 – Pistolas calibre 9x19 mm e .40 S&W.

4.4. Tal padronização poderá estabelecer exigências complementares quanto à Norma Técnica em comento, de acordo com as diretrizes doutrinárias da instituição, nos requisitos adicionais optativos da norma, ou quando esta for silente, justificando-se a motivação de cada alternativa de acordo com as peculiaridades daquela força que opera em todo território nacional.

4.5. Nesse sentido, dimensões, peso, calibre e outras características suplementares aos padrões mínimos estabelecidos na Norma Técnica, serão perenizados de acordo com a necessidade técnico-doutrinária de cada instituição, evitando-se sua alteração a cada aquisição.

4.6. Deste modo, sugere-se que a NT-Senasp nº 001/2020 – Pistolas calibre 9x19 mm e .40 S&W seja encaminhada à Secretaria Executiva do Ministério da Justiça e Segurança Pública e que, por intermédio desta, seja dado ciência às demais forças de segurança pública federais, compreendendo a Seopi/MJSP, os Departamentos de Polícia Federal, Polícia Rodoviária Federal e Penitenciário Nacional, sugerindo a elaboração de Portaria de padronização adequada às suas realidades institucionais e as recomendações acima expostas.

5. FOMENTO À EDIÇÃO DE NORMATIVOS DE PADRONIZAÇÃO PELAS INSTITUIÇÕES POLICIAIS ESTADUAIS E MUNICIPAIS

5.1. Com o objetivo de fomentar boas práticas nos Estados e Municípios, o Ministério da Justiça e Segurança Pública editou a Portaria MJSP nº 104/2020, a qual estabelece, em seu art. 7º:

> "*Art. 7º As aquisições de equipamentos e serviços de segurança realizadas pelas instituições do Sistema Único de Segurança Pública - Susp, no âmbito federal, estadual, ou municipal, que utilizem recursos financeiros oriundos do Orçamento Geral da União, incluindo os do Fundo Nacional de Segurança Pública, deverão observar as Normas Técnicas Senasp, quando existirem.*"

5.2. Com base no artigo supracitado, as Normas Técnicas passarão a orientar as aquisições de equipamentos policiais pelos órgãos do Sistema Único de Segurança Pública (SUSP), possuindo caráter obrigatório quando do emprego de recursos financeiros oriundos do Orçamento Geral da União e caráter sugestivo na hipótese da utilização de recursos públicos que não tenham origem federal.

5.3. Para além dessa iniciativa, entende-se que a edição da NT-Senasp nº 001/2020 – Pistolas calibre 9x19 mm e .40 S&W, bem como a Portaria de Padronização do armamento de porte da Força Nacional de Segurança Pública, sejam o alicerce da estratégia de fomento à edição de normativos de padronização pelas instituições estaduais e municipais de segurança pública, a ser empreendida pela Senasp/MJSP, cumprindo previsão dos arts. 13, inciso I e 18 da Lei 13.675/2018.

5.4. Tal entendimento é decorrente da percepção de que a Força Nacional de Segurança Pública é plural, operando em todas áreas do território nacional e composta de efetivos ostensivos, investigativos e especializados, realidade próxima das instituições estaduais e municipais de segurança pública.

5.5. Acrescenta-se que o efetivo da Força Nacional é composto majoritariamente por servidores mobilizados pertencentes aos efetivos das forças estaduais, os quais se apropriam e transmitem aos colegas dos estados a cultura que vivenciaram quando mobilizados.

5.6. Assim, o fomento para edição dos normativos de padronização pelas instituições estaduais e municipais de segurança pública ocorrerá de forma imediata à publicação da referida Norma Técnica, complementada pela Portaria de Padronização do DFNSP, que serão disponibilizadas, ainda, em sitio digital e amplamente difundida para as forças de segurança pública e defesa civil das Unidades Federadas do país.

6. CONCLUSÃO

6.1. Ante ao exposto, esta Equipe Técnica sugere a implementação das ações abaixo indicadas para o efetivo e regular cumprimento das determinações do Egrégio Tribunal de Constas da União (TCU):

a) publicação da NT-Senasp nº 001/2020 – Pistolas calibre 9x19 mm e .40 S&W através de Portaria do Sr. Secretário Nacional de Segurança Pública;

b) edição de Portaria de Padronização de Armas de Porte da Força Nacional de Segurança Pública;

c) comunicação à Secretaria Executiva do MJSP da edição e publicação da NT-Senasp nº 001/2020 – Pistolas calibre 9x19 mm e .40 S&W, sugerindo a elaboração de Portaria específica de padronização adequada às realidades das demais forças de segurança federais (Seopi/MJSP; DPF/MJ; DPRF/MJ e Depen/MJ); e

d) divulgação às instituições estaduais e municipais de segurança pública do conteúdo da NT-Senasp nº 001/2020 – Pistolas calibre 9x19 mm e .40 S&W, bem como da Portaria de Padronização de Armas de Porte da Força Nacional de Segurança Pública.

6.2. Ressalta-se que as Portarias de Padronização das instituições de segurança pública federais, estaduais e municipais, SMJ, devem atentar para necessária observância dos requisitos técnicos mínimos estabelecidos na Norma Técnica multicitada, adequando objetiva e motivadamente suas necessidades doutrinárias internas, nos requisitos adicionais optativos da norma ou onde ela for silente, atentando para as diretrizes estabelecidas na Lei nº 8.666/93, Decreto nº 10.024/2019 e demais legislações e princípios que norteiam as licitações públicas.

Fabio Ferreira Real
Coordenador de Normatização e Metrologia

Murilo Cangussu Cavalcante
Coordenador de Qualidade e Eficiência

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Documento assinado eletronicamente por **João Carlos Laboissiere Ambrósio**, **Coordenador(a)-Geral de Pesquisa e Inovação**, em 24/03/2020, às 11:28, conforme o § 1º do art. 6º e art. 10 do Decreto nº 8.539/2015.

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Referência: Processo nº 08000.033523/2019-62 SEI nº 11288907

MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIRETORIA DE ADMINISTRAÇÃO E LOGÍSTICA

OFÍCIO Nº 13/2020/DIPRO/CMLOG/CGA/DIRAD

Brasília, 16 de junho de 2020.

Ao Coordenador Geral da UniPRF

Assunto: Padronização do armamento de porte

Senhor Coordenador Geral

1. Com vistas a subsidiar o processo de padronização das armas de porte desta Polícia Rodoviária Federal, em atenção ao Relatório Estratégico RTPRF 02.2019 (SEI nº 19991214), elaborado pelo Projeto Estratégico Armamento institucional - PE-405, solicito as seguintes informações:

1.1. Quantos policiais já foram habilitados nos sistema de armas Glock adquiridos pela PRF? Durante a habilitação, quantos disparos foram dados por cada policial? Qual foi o custo para a realização da habilitação, considerando os custos de diárias e passagens, hora aula dos multiplicadores e custos com insumos (munições, alvos etc)?

1.2. Durante o processo de habilitação do efetivo PRF, foram registradas falhas ou panes nos armamentos utilizados?

1.3. Durante o Curso de Formação Policial realizado em 2019, quantos disparos foram dados por cada aluno? Qual foi o custo para o treinamento em tiro dos alunos, dentro do CFP?

1.4. Durante o Curso de Formação Policial realizado em 2019, foram registradas falhas ou panes nos armamentos utilizados?

2. Caso fosse adquirido uma nova arma de porte que não compõe o sistema Glock, seria necessário realizar nova habilitação? Em caso positivo, quanto tempo seria necessário para preparar e realizar a habilitação de todo o efetivo PRF? Qual seria o custo aproximado da nova habilitação, considerando os custos de diárias e passagens, hora aula dos multiplicadores e custos com insumos (munições, alvos etc)?

3. Foi realizado treinamento com os armeiros da PRF?

Atenciosamente,

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2001, no art. 6º do Decreto nº 8.539, de 8 de outubro de 2015, e no art. 42 da Instrução Normativa nº 116/DG/PRF, de 16 de fevereiro de 2018.

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MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIRETORIA-EXECUTIVA

Despacho nº 902/2020/UNIPRF

Florianópolis, 23 de junho de 2020.

DESTINO(S): EFAP
ASSUNTO: Processo de Habilitação no Sistema Glock.

1. Em alusão aos questionamentos suscitados no Ofício nº 13/2020/DIPRO/CMLOG/CGA/DIRAD (26237942) relativos ao processo de habilitação do efetivo da PRF no sistema de armas Glock.
2. Encaminho os autos para conhecimento e manifestação, conforme tratativas ajustadas entre as respectivas chefias.

DANIEL HENRIQUE MOREIRA GARCIA
Gabinete da UniPRF

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MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIRETORIA-EXECUTIVA

OFÍCIO Nº 110/2020/EFAP/UNIPRF/DIREX

Florianópolis, 23 de junho de 2020.

Ao Coordenador Geral da UniPRF

Assunto: Resposta ao Despacho nº 902/2020/UNIPRF - Padronização do armamento de porte

Senhor Coordenador Geral

1. Versa o presente expediente sobre resposta ao Despacho nº 902/2020/UNIPRF (26341740) o qual solicita manifestação desta Escola de Formação e Aperfeiçoamento com relação aos questionamentos realizados por meio do Ofício Nº 13/2020/DIPRO/CMLOG/CGA/DIRAD (26237942).

2. Neste sentido passamos a elencar as seguintes informações:

2.1. **Quantos policiais já foram habilitados nos sistema de armas Glock adquiridos pela PRF?**

A grande maioria do efetivo, salvo os servidores que por ventura estavam afastados do serviço por motivos diversos.

2.2. **Durante a habilitação, quantos disparos foram dados por cada policial?**

Conforme Plano de Disciplina (14847638), a habilitação no Sistema de Armas Glock foi planejado para um total de 100 disparos por PRF.

2.3. **Qual foi o custo para a realização da habilitação, considerando os custos de diárias e passagens, hora aula dos multiplicadores e custos com insumos (munições, alvos etc)?**

A habilitação foi entendida como Treinamento em Serviço, ainda sob a tutela da Instrução Normativa nº 04 de 10 de outubro de 2010 (atualmente revogada), neste sentido não houve custo com a Gratificação por Encargo de Curso e Concurso - GECC. Esta escola não tem a informação dos custos ***efetivamente realizados*** envolvendo diárias, passagens e materiais na habilitação em tela, tendo em vista que o tema não nos ser afeto.

2.4. **Durante o processo de habilitação do efetivo PRF, foram registradas falhas ou panes nos armamentos utilizados?**

Não houve registro de pane ou falha no funcionamento do armamento, sendo que os únicos apontamentos foram de falhas de munições e de operação por parte dos discentes.

2.5. **Durante o Curso de Formação Policial realizado em 2019, quantos disparos foram dados por cada aluno?**

Cada discente do CFP 2019 realizou 849 tiros de pistola conforme previsto no Plano de Disciplina de Armamento, Munição e Tiro - AMT (20769913).

2.6. **Qual foi o custo para o treinamento em tiro dos alunos, dentro do CFP?**

No que diz respeito ao ***custo previsto*** para a disciplina de AMT no CFP 2019, a qual engloba pistola e armas longas em uma carga horária total de 75 horas aula conforme Projeto Básico (21260010), este foi planejado para um valor em torno de R$ 4.800.000,00. No que se refere aos custos de materiais estes não estão sob a tutela desta escola.

2.7. **Durante o Curso de Formação Policial realizado em 2019, foram registradas falhas ou panes nos armamentos utilizados?**

Não houve registro de panes ou falhas nos armamentos e igualmente ao processo de habilitação do efetivo no novo armamento, somente foram apontadas panes geradas ou por falha de munição ou por falha de empunhadura do atirador.

2.8. **Caso fosse adquirido uma nova arma de porte que não compõe o sistema Glock, seria necessário realizar nova habilitação?**

Sim, por não haver compatibilidade com as armas de porte atualmente adotadas. Além disso entende-se como necessária a elaboração de um novo projeto, com as mesmas proporções e estudos ao que culminou na presente aquisição.

2.9. **Em caso positivo, quanto tempo seria necessário para preparar e realizar a habilitação de todo o efetivo PRF?**

Estima-se que seriam necessários, a partir do recebimento, e não havendo necessidade de formação de instrutores de AMT em todas as regionais, cerca de 12 meses.

2.10. **Qual seria o custo aproximado da nova habilitação, considerando os custos de diárias e passagens, hora aula dos multiplicadores e custos com insumos (munições, alvos etc)?**

Esta escola informa que seria o custo de um Ciclo de Atualização Policial - CAP da disciplina de AMT, estimado em R$ 4.221.731,36 com GECC, diárias e passagens. Quanto aos custos com materiais, no que se refere a munição temos uma previsão para um valor em torno de R$ 2.300.000,00,não sendo incluído neste outros insumos necessários para a instrução.

2.11. **Foi realizado treinamento com os armeiros da PRF?**

Os instrutores participantes do Workshop de Instrutores de AMT - 2018, foram habilitados na mecânica de armamentos do Sistema de Armas Glock, sendo aptos a total desmontagem e montagem do armamento, bem como identificação da necessidade de troca de peças, caso hajam.

3. Por derradeiro cabe destacar que houve apenas referências elogiosas por parte de docentes e discentes ao novo armamento, tanto pela sua simplicidade como pela ausência de problemas, fato que reflete no trabalho e em momentos de folga, sabendo que portam um armamento sem histórico de falhas ou quebras.

Respeitosamente,

WAGNER DE OLIVEIRA E SILVA
Policial Rodoviário Federal

ARMANDO SLOMPO FILHO
Coordenador da EFAP

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MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIRETORIA-EXECUTIVA

Despacho nº 1002/2020/UNIPRF

Florianópolis, 07 de julho de 2020.

DESTINO(S): DIPRO
ASSUNTO: Processo de Habilitação no Sistema Glock.

1. Em resposta ao pleito elencado no Ofício nº 13/2020/DIPRO/CMLOG/CGA/DIRAD (26237942), o qual versa sobre questionamentos acerca do processo de habilitação do efetivo da PRF no sistema de pistolas Glock, encaminhamos manifestação da Escola de Formação e Aperfeiçoamento, através do Ofício nº 110/2020/EFAP/UNIPRF/DIREX (26353867).

2. Insta mencionar ainda que as ações da respectiva habilitação dos servidores no sistema de armas Glock foram executadas, em sua maioria, pelas Superintendências Regionais. Em levantamento realizado através do Sistema Lúmen, obtivemos a informação de que 8.615 (oito mil, seiscentos e quinze) PRF's realizaram a fase prática da habilitação com o armamento em comento, conforme dados abaixo:

Sede	469
UniPRF	26
SPRF AC	47
SPRF AL	158
SPRF AM	59
SPRF AP	59
SPRF BA	514
SPRF CE	386
SPRF ES	241
SPRF GO	364
SPRF MA	199
SPRF MG	748
SPRF MS	352
SPRF MT	325
SPRF PA	271
SPRF PB	228
SPRF PE	364
SPRF PI	292
SPRF PR	751
SPRF RJ	640
SPRF RN	191
SPRF RO	231
SPRF RR	68
SPRF RS	678
SPRF SC	492
SPRF SE	154
SPRF SP	211
SPRF TO	97
TOTAL	**8615**

3.

MARCOS PIERRE VESPERMANN CARVALHO
Coordenador-Geral da UniPRF

MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIRETORIA DE ADMINISTRAÇÃO E LOGÍSTICA

OFÍCIO Nº 152/2020/CMLOG/CGA/DIRAD

Brasília, 10 de julho de 2020.

Ao Senhor Marcos Pierre Vespermann Carvalho
Coordenador-Geral da UniPRF

Assunto: Padronização do Armamento de Porte Individual - Sistema de Armas Glock.

Senhor Coordenador-Geral da UniPRF,

1. No intuito de complementar as informações prestadas no OFÍCIO Nº 110/2020/EFAP/UNIPRF/DIREX (SEI n° 26353867) e Despacho nº 1002/2020/UNIPRF (SEI nº 26577568), solicitamos bons préstimos de Vossa Senhoria para nos informar a quantidade de alunos de CFP que já foram formados à partir da adoção e efetiva implantação do Sistema de Armas Glock pela PRF.

Atenciosamente,

ABDIAS VIEIRA DA COSTA NETO
Coordenador de Mobilização e Logística

De acordo,

MURILO CANGUSSU CAVALCANTE
Diretor de Administração e Logística

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Processo nº 08650.014484/2019-40 SEI nº 26630122

MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIRETORIA-EXECUTIVA

OFÍCIO Nº 323/2020/UNIPRF/DIREX

Florianópolis, 13 de julho de 2020.

1. Em resposta ao pleito elencado no OFÍCIO Nº 152/2020/CMLOG/CGA/DIRAD, o qual versa sobre questionamentos acerca do processo de habilitação do efetivo da PRF no sistema de pistolas Glock, informamos que, durante a realização do Curso de Formação Policial - CFP 2019, realizado nas dependências dessa Universidade Corporativa da PRF, foram habilitados no referido armamento o total de 1.156 (mil cento e cinquenta e seis) alunos que concluíram o referido curso.

2.

MARCOS PIERRE VESPERMANN CARVALHO
Coordenador-Geral da UniPRF

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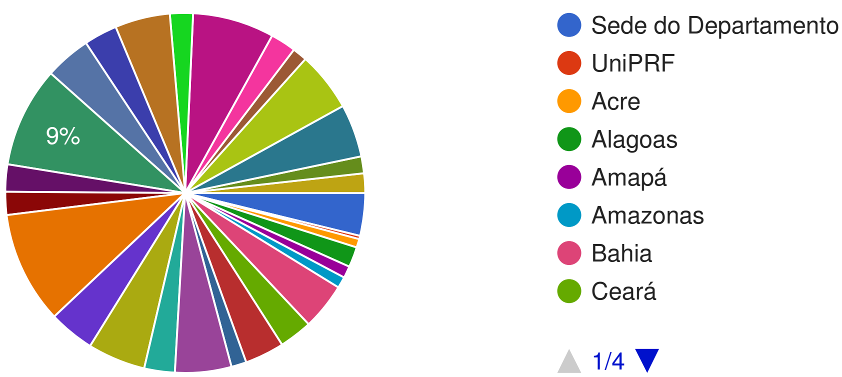
Telefone: (48) 2106-1200 - E-mail: uniprf@prf.gov.br

Pesquisa de satisfação Glock G17

1.309 respostas

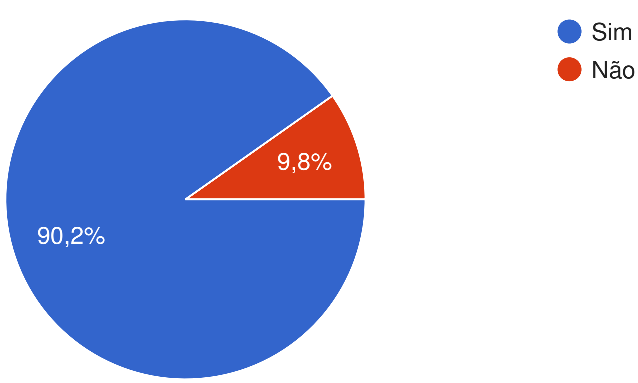
Qual a sua lotação?

1.309 respostas



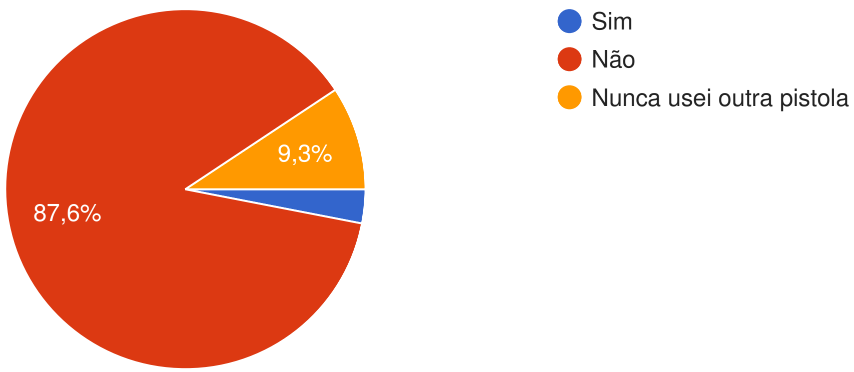
Já utilizou outra pistola, além da Glock G17?

1.309 respostas



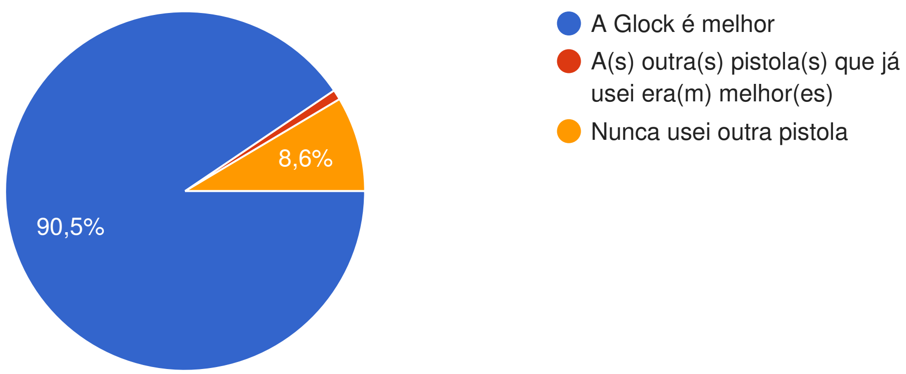
Caso já tenha utilizado outra pistola, achou difícil a adaptação com esta arma?

1.309 respostas



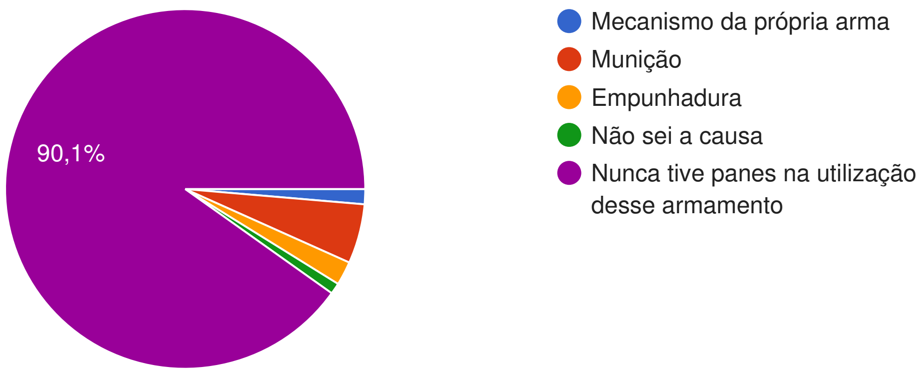
Você considera a Glock G17 melhor ou pior que as outras pistolas que já utilizou na atividade operacional?

1.309 respostas



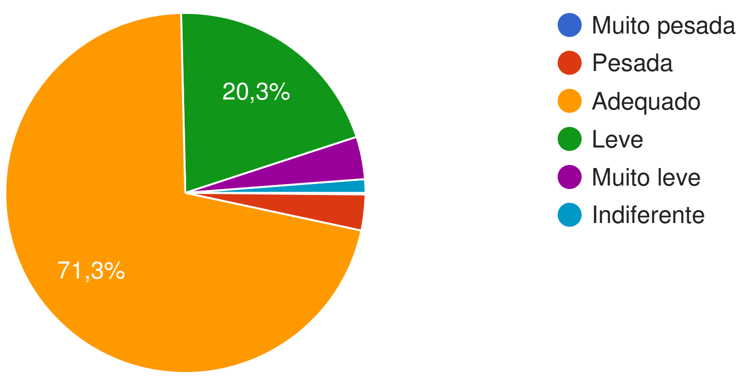
Já experimentou alguma pane utilizando essa pistola? Qual foi a causa desta pane?

1.309 respostas



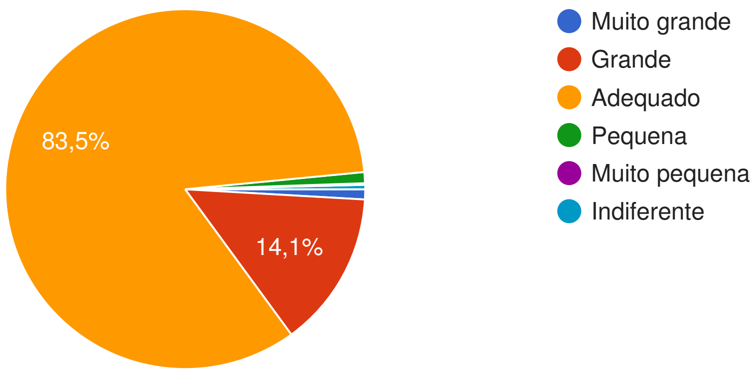
Qual sua opinião sobre o peso da arma?

1.309 respostas



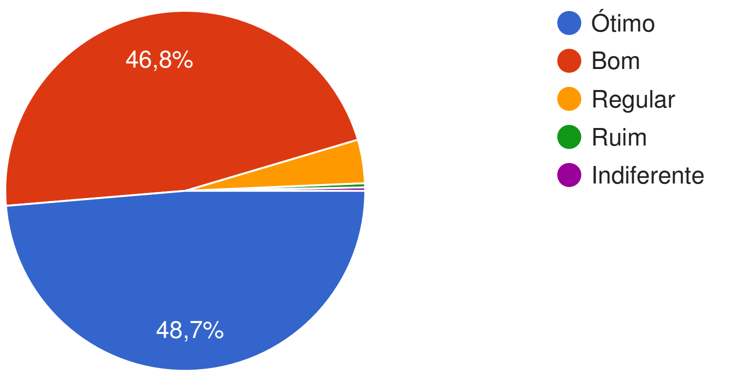
Qual sua opinião sobre o tamanho da arma?

1.309 respostas



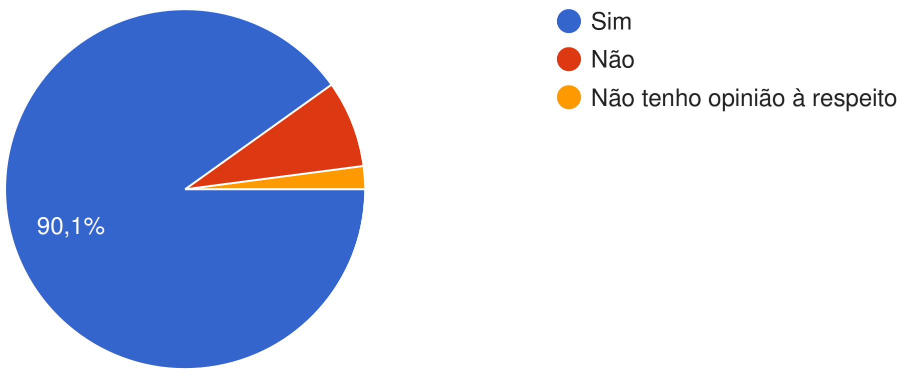
Qual sua opinião sobre a empunhadura da arma?

1.309 respostas



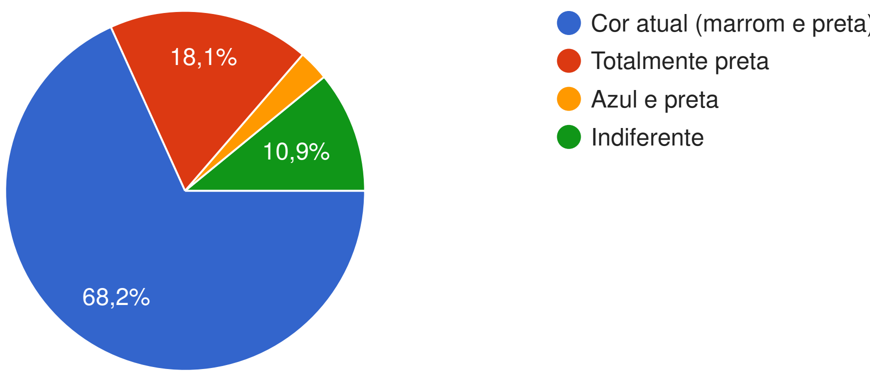
A quantidade de carregadores atende à necessidade do serviço?

1.309 respostas



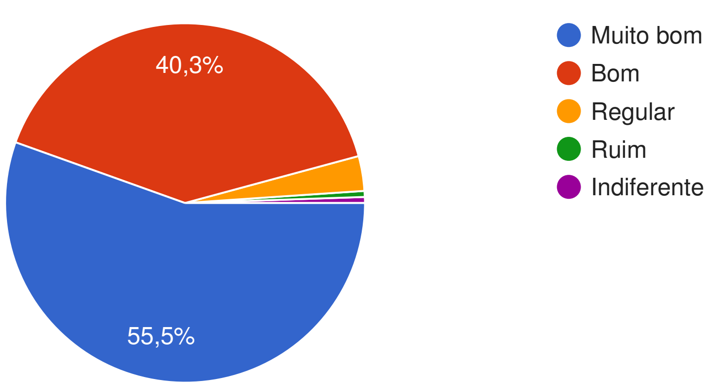
Na sua opinião qual deveria ser a cor padrão da pistola?

1.309 respostas



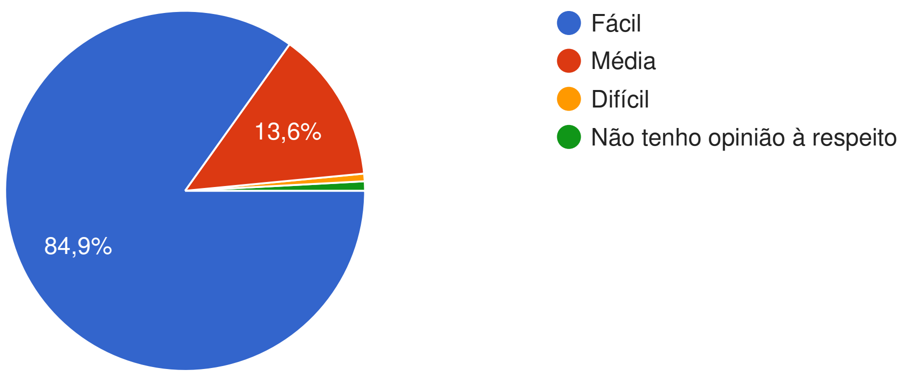
Qual sua opinião sobre o conjunto de mira do armamento?

1.309 respostas



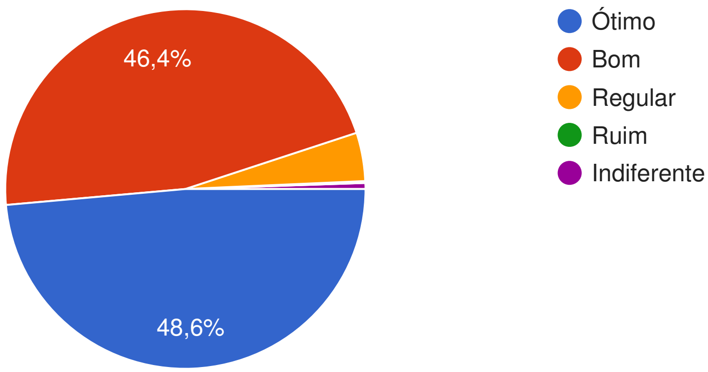
Qual sua opinião sobre a dificuldade de desmontagem de 1° escalão?

1.309 respostas



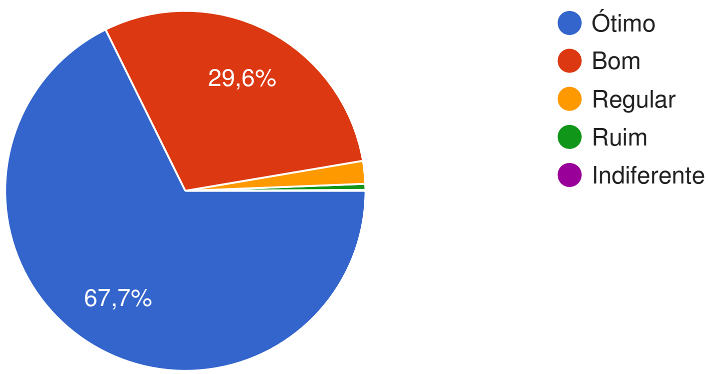
Qual sua opinião sobre o recuo da arma?

1.309 respostas



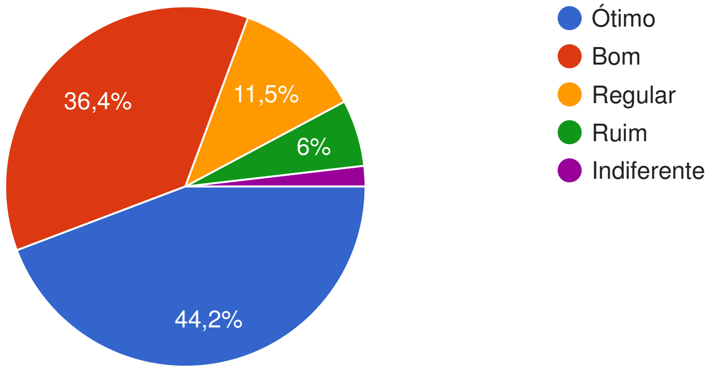
Qual sua opinião sobre o acabamento da arma?

1.309 respostas



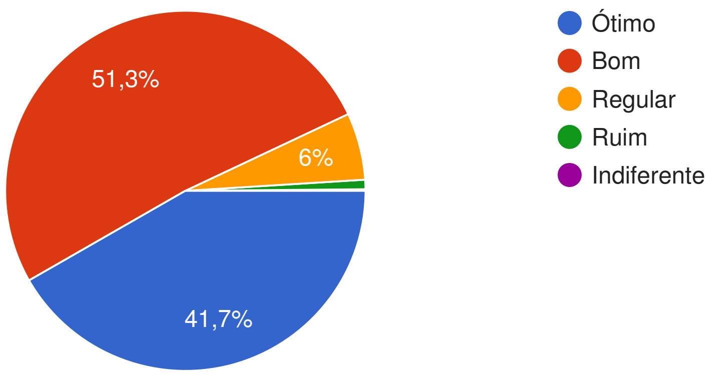
Qual sua opinião sobre o sistema de trava de segurança da arma?

1.309 respostas



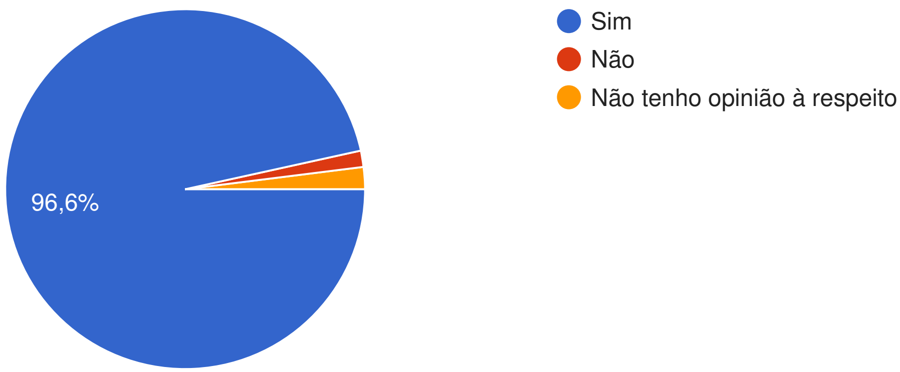
Qual sua opinião sobre o peso do gatilho da arma?

1.309 respostas



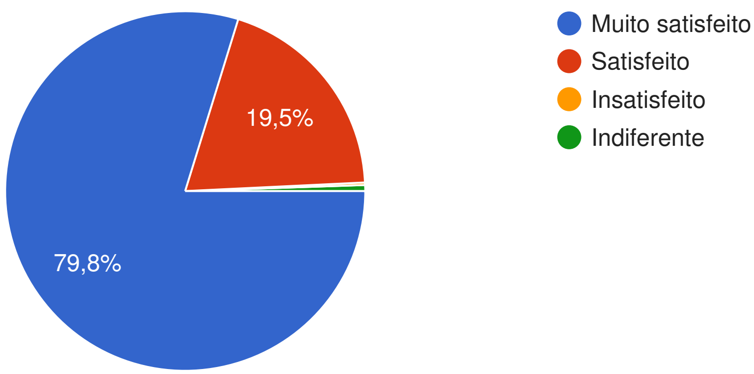
Na sua opinião, a pistola adquirida pela PRF atende plenamente às necessidades operacionais?

1.309 respostas



O quão satisfeito você ficou com o fornecimento da Glock G17 para as atividades operacionais da PRF?

1.309 respostas



MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIRETORIA DE ADMINISTRAÇÃO E LOGÍSTICA

NOTA TÉCNICA Nº 7/2020/DIPRO/CMLOG/CGA/DIRAD

PROCESSO Nº 08650.014484/2019-40

INTERESSADO: DIRETORIA-EXECUTIVA, DIREÇÃO-GERAL, PROJETO ESTRATÉGICO ARMAMENTO INSTITUCIONAL, DIRETORIA DE ADMINISTRAÇÃO E LOGÍSTICA, COORDENAÇÃO-GERAL DE ADMINISTRAÇÃO, COORDENAÇÃO DE MOBILIZAÇÃO E LOGÍSTICA

RECOMENDAÇÃO DE PADRONIZAÇÃO DE ARMAS DE PORTE

1. **INTRODUÇÃO**

Os estudos da Polícia Rodoviária Federal conduzidos pela equipe do projeto ARM - Armamentos Institucionais, foram iniciados ainda no segundo semestre de 2015, objetivando estabelecer critérios rígidos e bem definidos para a escolha e aprovação de arma de fogo e munição para o quadro de dotação da PRF, que viabilizasse a aquisição de equipamento com elevado nível de qualidade, segurança e confiança e que o alto investimento realizado fosse corretamente aplicado. Os estudos foram amparados em pesquisas e testes realizados que que culminou, no final de 2017, com o processo de aquisição do Sistema de Armas Glock.

2. **CONTEXTUALIZAÇÃO DA ETAPA DE ESTUDOS TÉCNICOS**

No ano de 1996 o Departamento de Polícia Rodoviária Federal foi a primeira força de segurança pública nacional a adquirir pistolas no calibre .40 S&W, calibre este que mais tarde se tornaria um dos mais utilizados pelas forças policiais em todo o mundo.

Com o desgaste natural do armamento adquirido, a PRF buscou modernizar seu parque de armamentos, quando, entre os anos de 2009 e 2012, foram adquiridas 3.000 mil unidades de pistolas do modelo PT-840, fabricante TAURUS. Porém, no ano de 2010, após a compra e distribuição das primeiras armas, as pistolas passaram a apresentar problemas recorrentes e variados, que deixavam as armas inoperantes para o uso, expondo ao risco não só os PRF, mas a sociedade.

Devido a gravidade do constatado, no ano de 2015 a PRF instituiu o Projeto ARM - Armamentos Institucionais para, entre outros objetivos:

a) Realizar pesquisas, levantamentos e estudos sobre segurança, confiabilidade, efetividade, performance, capacidade, precisão, modularidade, ergonomia, durabilidade e empregabilidade dos armamentos empregados pela PRF;

b) Apresentar proposta de normatização do protocolo de registro e controle das panes, quebras, falhas, defeitos e quaisquer outros problemas relacionados às armas de fogo e munições em qualquer que seja a situação no âmbito da PRF; e

c) propor melhorias, otimizações, mudanças, substituições, padronizações e possíveis aquisições com base nos estudos.

Na fase de estudos relativos às armas de porte, foram confeccionados cerca de 10 relatórios técnicos contendo pesquisas junto ao efetivo da PRF e a outras instituições policiais; análises de estudos de outras instituições; testes de campo, entre outros. Os estudos identificaram a necessidade de substituição de 100% das armas antes empregadas pela PRF, devido ao desgaste de suas peças e/ou por falha de projeto que, em ambos os casos tornavam as armas inseguras para a atividade desenvolvidas pela Policia Rodoviário Federal.

Ademais, **os estudos permitiram à PRF definir as características técnicas necessárias e desejáveis para suas novas armas de porte**, garantindo qualidade, segurança e confiança no emprego desses equipamentos. Desta forma, ao final do ano de 2017 a PRF iniciou seu processo de compra de 12.565 unidades de pistolas Glock, o que permitiu a substituição integral das armas então adotadas.

3. **DOCUMENTAÇÃO PRODUZIDA**

Estabelecidas as atribuições e objetivos do projeto ARM, bem como a definição das prioridades, os especialistas em armamento da PRF passaram a iniciaram os estudos para as armas de porte. Diante disso, foram definidos os aspectos que deveriam ser abrangidos pelos trabalhos da equipe.

Os resultados das pesquisas, testes balísticos, aplicações de protocolos, dentre outros, foram condensados no Relatório Técnico RTPRF 02.2019, (SEI nº 19991214), que apresentou as premissas de padronização do armamento.

Além do Relatório Técnico RTPRF 02.2019, a equipe do projeto ARM produziu farta documentação sobre o armamento utilizado à época. Cumpre ressaltar que a documentação elencada abaixo remonta a data anterior a aquisição do sistema de armas GLOCK, quais sejam:

Análise das armas da PRF

Relatórios sobre o tema:

- RTPRF 04.2016 - Situação atual das armas da PRF - (SEI nº 4081870);
- RTPRF 05.2016 - Panes nas armas da PRF - (SEI nº 4081879); e
- RTPRF 05.2017 - Análise descritiva dos problemas apresentados nas pistolas PT-840 - (SEI

nº 7748235)

Pesquisa junto aos PRFs e instrutores de armamento e tiro

Relatórios sobre o tema:

- RTPRF 03.2016 - Pesquisa de satisfação na PRF - (SEI nº 4081867)

Compilação de Panes em armamentos nacionais, na mídia e em outras instituições

Relatórios sobre o tema:

- RTPRF 07.2016 - Panes em armamentos de uso policial divulgadas na mídia - (SEI nº 4081917) e;
- RTPRF 08.2016 - Panes em pistolas de instituições policiais diversas - (SEI nº 4081921)

Requisitos técnicos das Pistolas da PRF

Relatórios sobre o tema:

- RTPRF 01.2016 - Relatório das áreas especializadas da PRF - (SEI nº 4104909) e;
- RTPRF 02.2016 - Indicação da arma de porte da PRF - (SEI nº 4081820)

4. METODOLOGIA EMPREGADA NA ESPECIFICAÇÃO DO SISTEMA DE ARMAS

Constatada pela equipe do Projeto ARM que seria necessária a substituição de todas as armas de porte da PRF, a equipe passou então a buscar a especificação de quais seriam os requisitos técnicos necessários ao equipamento, para atendimento das demandas dos mais diversos ambientes operativo da PRF.

Para que isso fosse possível, a equipe do Projeto ARM estabeleceu três linhas de pesquisas:

1. Consulta às áreas especializadas da PRF, para identificar as características e requisitos técnicos aderentes às particularidades de cada atividade, carreando as respectivas justificativas;
2. Consulta a instituições de segurança pública no Brasil e no Mundo acerca das características definidas como necessárias para suas armas de porte e as rezões correspondentes, a fim de avaliar a viabilidade e adequação com a atividade da PRF; e
3. Apresentação, aos especialistas em armamento e tiro da PRF, das necessidades das áreas especializadas, das informações colhidas junto a outras instituições de segurança, dos resultados das pesquisas com os Policiais e Instrutores da PRF e demais aspectos levantados pelo projeto ARM para, a partir destes, definir os requisitos técnicos do sistema de armas adequado à PRF.

5. ELABORAÇÃO DAS CARACTERÍSTICAS TÉCNICAS NECESSÁRIAS

Com as informações produzidas nos relatórios e objetivando garantir que a busca em todo o mercado de armas, nacional e internacional, atendesse as necessidades da PRF, foi elaborada uma relação de características necessárias ao novo armamento, que, transmitissem confiabilidade e segurança ao operador policial. O detalhamento dessas especificações consta nos relatórios técnicos e foram utilizadas para a definição do sistema de armamento.

Importante destacar que o novo sistema de armas não contempla somente um modelo de arma de porte, mas equipamentos de diferentes dimensões, de simulação de combate para treinamento (simulacro) e de instrução quanto à mecânica.

Esse sistema permite que sejam empregados simulacros de mesma plataforma, dimensões e funcionamento que o modelo operacional (real), bem como condições mais seguras de treinamento. O uso de simulacros com mesmas dimensões, mecanismos e forma de funcionamento, porém inertes e incapazes de efetuar disparos com munição real, são imprescindíveis, pois impossibilitam os acidentes e incidentes relacionados ao uso de armas reais durante treinamentos simulados.

A seguir estão relacionadas as características técnicas definidas pela equipe do projeto ARM como **ESSENCIAIS** ao novo sistema de armas da PRF de forma a atender as peculiaridades das atividades do órgão.

1. **Tipo de ação: dupla com semi-engatilhamento**

Sistema de percussor lançado, de ação dupla, com semi-engatilhamento do percussor, por apresentar todas as vantagens do sistema de ação dupla e sem suas desvantagens, permitindo que se tenha um sistema que apresente um peso e um curso de gatilho que permita ao policial desistir do acionamento caso seja necessário, e simplifique o treinamento em virtude deste sistema apresentar peso e curso de gatilho constante e relativamente leve.

2. **Sistema de percussão**

Sistema de percussor lançado (striker-fired), com semi-engatilhamento e com travas automáticas passivas por apresentar as seguintes vantagens: menos peças envolvidas no funcionamento, facilitando a manutenção da arma, maior ergonomia por não apresentar recortes e frestas para acomodação de martelo, diminuindo a incidência de acúmulo de sujeira e outros motivos conforme descrito no RTPRF 02/2016, (SEI nº 4081820).

3. **Tipo e comprimento do cano**

O comprimento do cano interfere diretamente na precisão e recuo do armamento, além de interferir na ergonomia do porte, pois influencia no tamanho final da arma. Sendo assim, para a arma de uso ostensivo, que precisa priorizar ao máximo à precisão do disparo, sem prejudicar à ergonomia da empunhadura, o comprimento do cano da versão ostensiva deve ser entre 110mm e 115mm, já para a versão subcompacta, onde seu uso efetivo é destinado apenas para casos extremos de legítima defesa, devendo ser priorizado o conforto e a capacidade de permanecer dissimulada junto ao corpo, sem prejudicar em demasia sua empunhadura, o comprimento do cano deve ser entre 85mm e 90mm.

Além disso, chegou-se à conclusão que o cano deveria ser confeccionado em aço forjado por martelamento a frio, com raiamento de perfil poligonal, com acabamento interno e externo em tenifer ou acabamento que ofereça proteção similar ou superior.

4. **Mínimo de teclas externas**

Considerando os níveis de estresse e adrenalina a que se submete o policial durante um confronto armado, sua arma deve ser a mais simples possível, de forma a possuir o mínimo de obstáculos para a realização de um disparo com segurança, desta forma, para que haja o disparo deve haver apenas o simples pressionar do gatilho. Com isso, a existência de teclas e registros externos deve ser minimizado ao máximo, bem como botões, protuberâncias, saliências e quinas, o que resulta num uso simples e confortável do armamento, reduzindo o risco de acionamentos acidentais durante o confronto, o que pode provocar o travamento ou pane do armamento, deixando tanto o policial quanto a sociedade mais vulneráveis. Uma arma com esta configuração proporciona ainda maior conforto, segurança e estabilidade seja para o uso ostensivo ou uso dissimulado, pois tem a possibilidade mínima de enroscar em vestimentas, vegetação e capas táticas, além de simplificar o processo de ensino aprendizagem, coadunando com a ideia de que arma de uso policial deve ser o mais simples possível.

5. **Tratamento das partes metálicas**

Considerando a grande capilaridade da PRF, bem como a exposição do armamento as mais diversas condições climáticas (regiões com alta umidade e temperatura, regiões litorâneas com alto índice de salinidade, regiões frias e secas etc.), torna-se imperativo que o tratamento das partes metálicas possua a melhor resistência não apenas as intempéries supramencionadas, mas também ao desgaste natural decorrente do uso na atividade policial (quedas, arranhões, exposições a chuva, poeira, fuligem etc.). Sendo assim, é necessário que a arma possua o acabamento externo da superfície do ferrolho e do cano em tenifer ou acabamento que ofereça proteção equivalente ou superior com acabamento preto fosco.

6. **Chassi em polímero com insertos em aço**

A pistola deve possuir chassi fabricado em polímero de alta resistência, sem reforço de fibra de vidro e com insertos de aço que funcionam como trilhos do ferrolho. Os chassis das armas G17 (tamanho padrão) devem ser de polímero de cor coyote e as das G26 (tamanho subcompacto) em polímero preto. As armas destinadas ao ensino da PRF nos modelos G17 e G26 deverão ser com chassi na cor preta.

O chassi de polímero de alta resistência é o mais indicado, por proporcionar a arma um menor peso e ter alta resistência à corrosão, seja por suor, maresia, umidade ou poeira. O polímero também é muito pouco afetado pelas variações de temperatura e tem excelente resistência mecânica (atrito, choque, quedas, tração e pressão), mantendo-se as características físicas inalteradas. É um ser material leve que proporciona conforto em termo de portabilidade e dissimulação em várias situações de trabalho.

7. **Carregadores bifilares em aço com revestimento em polímero e intercambiáveis**

A proteção contra as intempéries climáticas extremas e condições de trabalho com risco de quedas, abrasividades e arranhões não se restringe apenas a arma, mas também ao carregador, que muitas vezes é renegado pelo policial. Os carregadores das pistolas devem bifilares e confeccionados em aço recoberto com polímero para conferir uma maior proteção aos mesmos, e ainda, os carregadores devem ser compatíveis entre armas do mesmo modelo e entre as do modelo ostensivo para dissimulado, proporcionando maior mobilidade e apoio tático em situações de emergência das unidades que trabalham à "paisana". Os carregadores das armas subcompactas (G26), devem ser compatíveis com a utilização de prolongadores anatômicos na base do carregador que permite o apoio do dedo mínimo da mão forte na empunhadura, aumentando capacidade de munição e melhorando a empunhadura da arma.

8. **Retém do carregador ambidestro ou reversível**

As pistolas armas G17 e G26 devem ter retém do carregador ambidestro ou reversível visando a fácil utilização das armas por policiais destros e sinistros.

9. **Intercambiabilidade de peças**

A fim de facilitar a aquisição de peças de reposição e a manutenção das pistolas a equipe do Projeto decidiu que as armas G17 e G26 devem ser de mesma plataforma de funcionamento e apresentar um índice de intercambiabilidade de peças de no mínimo 60%.

10. **Empunhadura ajustável**

As pistolas G17 e G26 devem possuir ao menos a porção anterior da empunhadura (backstrap) em pelo menos 3 tamanhos distintos (P, M e G) para atender as demandas referentes às diferentes compleições físicas dos policiais da PRF, devendo a troca dessas peças ser de forma simples e rápida.

11. **Sistemas de segurança**

A exposição a quedas está presente nos mais variados ambientes, seja durante uma perseguição a pé, no embarque/desembarque da viatura (duas ou quatro rodas) ou aeronave, durante a transposição de obstáculos (Muretas de contenção, muros, barrancos etc.) entre outros casos. Desta forma, as armas devem prover essa segurança e confiança sem dificultar ou aumentar a complexidade do uso de uma arma de fogo.

Considerando a doutrina de uso da arma na PRF, bem como a dinâmica dos confrontos policiais, onde o nível de estresse/adrenalina reduz consideravelmente a coordenação motora fina, nessas situações, deve-se exigir do policial o mínimo de movimento para que ele possa empregar o seu armamento com segurança. Sendo assim, o armamento deve permitir o disparo com o simples pressionamento do gatilho, sem a necessidade do acionamento de outras teclas, seja para o início dos disparos, seja para o retorno ao coldre.

As pistolas devem ter ao menos 3 travas distintas em seu sistema de segurança, que funcionam de forma passiva e automática, sendo estes: trava de percussor, trava inercial do gatilho e trava de queda e as pistolas devem ser capazes de resistir a quedas em piso rígido (concreto, aço etc.) de alturas de 1,5m em qualquer posição, e, após as quedas, mesmo que alguma peça não estrutural da arma venha quebrar, as armas devem ser capazes de efetuar disparos com segurança.

12. **Sistema de funcionamento**

As pistolas G17 e G26 devem operar pelo princípio de funcionamento de ação direta dos gases com trancamento com curto recuo do cano, através do sistema conhecido por Colt-Browning modificado, por ser um sistema simples, confiável e amplamente utilizado pela grande maioria dos fabricantes de pistolas.

13. **Trilho para acessórios**

Considerando a vantagem tática fornecida pelo uso de equipamentos e acessórios (lanternas, miras laser e miras infravermelhas), a arma deve possuir um trilho compatível com os acessórios que utilizem o padrão picatinny na parte frontal da armação, mas que tenha os cantos arredondados e mais suaves ao manuseio, a fim de evitar abrasões ou lesões ao operador.

Existência de armas com tamanhos distintos (standard e subcompacta) com mesma plataforma.

Dentro de qualquer instituição policial, o investimento de tempo e recursos no treinamento é substancial. Além de necessário, é obrigatório o treinamento para a habilitação e renovação anual da habilitação em todo tipo de arma de fogo, conforme preceitua as diretrizes da Portaria Interministerial nº 4.226/2010.

Dessa forma o uso de armas de plataformas diferentes enseja a necessidade de treinamentos também diferentes, muitas vezes dobrando os custos com instrução. Sendo assim, considerando o emprego de armamentos em tamanhos distintos, para as mais diversas aplicações na PRF, torna-se necessário que esses modelos de armas, embora com tamanho distintos, possuam mesma plataforma, ou seja, mesmo tipo funcionamento, teclas de operação e manejo, de forma a reduzir os custos com reposição de peças, manutenção e treinamento/capacitação.

14. **Possibilidade de uso de aparelho óptico.**

Considerando o avanço tecnológico no setor de armamentos, que passou a trazer o uso de miras ópticas para as pistolas e revólveres, as chamadas Miras Mini Reflex - MRS. Com isso, o enquadramento dos alvos precisa de apenas um ponto de foco em vez de uma massa e uma alça de mira, trazendo muito mais velocidade dos disparos.

Desta forma, o modelo ostensivo precisa dispor de uma variação com a possibilidade de utilização de miras MRS. Essas armas devem possibilitar o uso das principais miras mini reflex - MRS disponíveis no mercado internacional, bastando para isso a substituição de peças originais no modelo de serviço ostensivo além de possuir a disponibilidade de coldre ostensivo com no mínimo 1 grau de retenção e que possua o sistema modular QLS.

15. **Existência de versões para treinamento**

Com a finalidade de realizar treinamentos minimizando riscos tanto aos instrutores quanto aos instruendos, a PRF necessita de armas específicas para essa finalidade. O uso de simulacros com mesmas dimensões, mecanismos e formas de funcionamento, que são inertes e incapazes de efetuar disparos com munição real são extremamente úteis, pois garantem a segurança dos treinamento e minimiza os acidentes e confusões que podem ser gerados com o uso de armas reais durante treinamento simulados.

O sistema de armas deve possuir modelos semelhantes ao modelo operacional padrão, idênticos em funcionamento, mas na cor vermelha, mas que sejam capazes de se realizar treinamento em seco, que realizem de forma automática o reset do gatilho, que mesmo se colocando munição real a arma seja incapaz de realizar disparos, mas que tenham o cano aberto para que seja possível a colocação de sistemas de treinamento a laser. Devem também possuir modelos semelhantes e funcionais na cor azul que permitam a utilização de munição de treinamento (projéteis marcadores com tinta). Por fim, devem possuir ainda um modelo semelhante, com cortes para visualização do funcionamento do mecanismo, também impossibilitada de realizar disparos com munição real. Esses modelos de treinamento devem manter dimensões, peso e funcionalidades (peso e curso do gatilho, carregador, teclas externas ...) similares ao modelo operacional padrão.

16. **Peso e curso do gatilho**

A fim de propiciar o treinamento do policial em um menor espaço de tempo, gerando economia de tempo e investimento além de minimizar um dos motivos que mais ensejam erros nos direcionamentos dos disparos durante os confrontos armados (pesos e cursos diferentes do gatilho quando em ação simples ou dupla), as pistolas devem possuir um peso e um curso constante do gatilho. Esse peso não pode ser demasiado grande e nem o curso muito longo, o que geraria uma dificuldade excessiva aos policiais do sexo feminino e/ou com menores compleições físicas, nem demasiado leve e com curso muito curto como em ação simples, o que poderia gerar a ocorrência de disparos acidentais provocados pelos próprios policiais devido à alta carga de estresse e adrenalina durante os confrontos armados, devendo então possuir o peso com variação entre 2,5 a 3,5 Kg.

17. **Raiamento poligonal**

O tipo de raiamento do cano irá definir, entre outras coisas a durabilidade do mesmo e à precisão dos disparos. Confeccionado em aço forjado por martelamento a frio, polido internamente com raiamento de perfil poligonal, possibilitará uma maior durabilidade, menos arrasto, maior velocidade do projétil e maior facilidade de limpeza. Esse tipo de raiamento proporciona uma melhor vedação dos gases em torno do projétil, isso repercute em velocidades ligeiramente maiores e mais consistentes. Há também ganho na menor deformação de projétil, resultando em arrasto reduzido, o que ajuda a aumentar a velocidade do projétil. Isso redunda na redução do acúmulo de cobre ou chumbo dentro do cano, o que resulta em características de manutenção mais fáceis. Todas essas características acabam por representar uma menor sensibilidade à falha e por conseguinte, o prolongamento de sua vida útil do cano.

18. **Possibilidade de fixação do fiel**

Por solicitação unânime de todas as unidades especializadas da PRF, devido a atuação em cenários e missões específicas (operações aéreas, Operações com cães, Motopoliciamento, adentramento em regiões de mata etc), que muitas vezes fogem do cotidiano da maioria dos policiais, o uso do "fiel" para impedir a perda do armamento e caso de queda torna-se imprescindível.

Sendo assim, a arma deve possuir zarelho ou orifício para fixação de fiel na base da empunhadura.

19. **Existência de sistema de identificação por rádio frequência**

Buscando garantir um controle real sobre os armamentos institucionais e a garantia da possibilidade de rastrear e identificar armamentos eventualmente extraviados ou roubados, os armamentos devem ser dotados de RFid - "Radio-Frequency IDentification", ou seja, identificação por rádio frequência, em Conformidade com a norma EPCglobal ISO 18000-63, numa frequência entre 860 MHz - 960 MHz Type C. Que utilizem marcadores passivos, que respondem a um sinal enviado por uma unidade transmissora/leitora, colocados em local discreto, de forma a dificultar/impossibilitar sua retirada por terceiros, e de modo que não alterem o funcionamento e/ou sua aparência/anatomia externa, devendo os marcadores estarem injetados no polímero.

20. **Assistência técnica no brasil**

A fabricante deve possuir unidade próprio ou empresa representante no Brasil, capaz de garantir a reposição de peças por período mínimo de 10 anos, com capacidade de honrar a garantia de fábrica e possibilidade de prestar assistência técnica em todo território nacional quando solicitado.

21. **Aparelho de pontaria**

Tendo em vista que a PRF se envolve em muitas ações noturnas e de baixa luminosidade, as pistolas devem possuir aparelho de pontaria metálico de 3 pontos com insertos auto luminescentes em Trítio, afixados de maneira a garantir sua devida inamovibilidade durante o uso policial.

22. **Da confiabilidade - maturidade do projeto - histórico de utilização**

Os dicionários geralmente definem o termo “confiabilidade" como algo que é seguro, fidedigno, consistente e genuíno. Quando falamos na confiabilidade de uma arma de fogo, esperamos que esses adjetivos se apliquem. Sendo assim, o termo confiabilidade assume um caráter mais definitivo: a confiabilidade é definida como a probabilidade de um determinado dispositivo desempenhar a função pretendida por um período especificado sob condições estabelecidas. O "desempenho em condições estabelecidas" refere-se às condições operacionais e ambientais, ou estresses, que o equipamento pode experimentar durante a sua vida útil.

As pistolas devem possuir a comprovação de utilização, sem ocorrências de graves problemas, há pelo menos 03 anos, por 5 (cinco) órgãos policiais e/ou militares, em 3 países distintos e em dois continentes diferentes. Conforme restou provado durante os estudos e pesquisas, inclusive na consulta realizada a vários órgãos de segurança pública, a aprovação em protocolos de teste e resistência, por mais completos que sejam, são impossíveis de conter a gama de variedade de situações as quais a rotina operativa de um policial está submetida. Sendo assim, essa exigência de maturidade e tempo de exposição se torna imprescindível para reduzir a probabilidade do projeto em apresentar falhas, zelando pela vida da sociedade e dos próprios policiais.

O próprio TCU - Tribunal de Contas da União, durante uma auditoria alertou a PRF sobre o fato de adquirirmos essas armas de forma pioneira, se expondo a riscos advindo com o desconhecido.

Assim, a comprovação de emprego do armamento por outras instituições policiais no Brasil e no mundo tem por finalidade evitar que a Administração Pública seja utilizada como cobaia para testes de um equipamento que pode expor a risco a vida desses servidores e da sociedade, trazendo dissabores e prejuízos futuros, que podem estender-se para além das questões financeiras e comprometer a vida, a saúde e integridade física dos policiais e de terceiros.

23. **Da confiabilidade - aprovação em protocolos internacionais**

Seguindo a mesma linha de raciocínio sobre a confiabilidade aplicada ao histórico de batalha, é premente que a confiabilidade possa ser determinada, computada, testada e comprovada. Portanto, faz-se necessário o emprego de protocolos consolidados para que seja possível testar, sob diferentes condições operacionais, os complexos sistemas das armas de fogo.

Diante dos diversos problemas enfrentados pela PRF e por diversas outras instituições policiais nacionais e de fora e, seguindo ainda a orientação do próprio órgão de controle de produtos controlados do Exército Brasileiro, em que sugeriu que as instituições de polícia deveriam adotar protocolos de testes adequados a suas atividades, os técnico da PRF estabeleceram como parâmetro base dois protocolos de testes internacionalmente conhecidos, sendo publicada a portaria 104 de 30 de março de 2017 do Diretor Geral da PRF, estabelecendo a exigência das certificações nos seguintes testes:

- OTAN - AC/225 (LG/3-SG/1) D14 e
- NIJ Standard - 0112.03 (*Autoloading Pistols for Police Officers*)

A fim de evitar possíveis erros de interpretação, deixamos claro que, conforme consta no próprio Sumário Executivo do Protocolo NIJ Standard - 0112.03 (*Autoloading Pistols for Police Officers*), os requerimentos de performance e os métodos ali estabelecidos são designados para pistolas utilizadas por Oficiais de segurança pública como sua **"arma de serviço."**

> "Recognizing that the vast majority of law enforcement agencies today use autoloading pistols as their issued **duty weapon**, the National Institute of Justice (NIJ), through its National Law Enforcement and Corrections Technology Center (NLECTC) system, recently performed a series of tests for autoloading pistols."

"Reconhecendo que a vasta maioria das Agências de Aplicação da Lei atualmente utilizam pistolas semiautomáticas como **Armas de Serviço** padronizadas, o Instituto Nacional de Justiça (NIJ), através de sistemática do seu Centro Tecnológico Nacional de Aplicação da Lei e Correção (NLECTC), recentemente realizou uma série de testes para pistolas semiautomáticas."(tradução nossa)

O conceito de "duty weapon" ou "Arma de serviço", empregado pelo próprio Protocolo são os modelos que descrevemos como arma destinada ao serviço ostensivo, que citamos acima.

Desta forma, o Protocolo da NIJ Standard - 0112.03 (*Autoloading Pistols for Police Officers*) se aplica tão somente ao modelo G17, haja vista ser a G26 uma arma de uso dissimulado, não ostensivo.

Destacamos ainda que esses testes, também não se aplicam às versões de treinamento, haja vista que as mesmas não são empregadas com munições letais reais, muito menos em situações operacionais, não necessitando, portanto de teses de simulam essas situações.

Podem ser aceitos testes de outros protocolos diferentes, desde que realizem os mesmos testes aqui descritos nas mesmas condições ou em condições mais rigorosas.

As certificações mínimas necessárias para aquisição das referidas armas de porte de uso ostensivo e/ou dissimulado, dentre os testes pertencentes ao Protocolo OTAN - AC/225 (LG/3-SG/1) D14 (SEI nº 20664052) são:

- Intercambiabilidade de peças - Método 2.18.3;
- Inspeção preliminar, características das armas e dos disparos - Método 2.1;
- Disparo em Seco (Resistência) - Método 2.5.2.2;
- Verificação da precisão (Precisão e dispersão) - Método 2.4.2;
- Teste de temperatura extrema e condições agravadas - Método 2.9.1.2 (Teste de frio); Método 2.9.2.2 (Teste de alta temperatura); Método 2.13.1.2 (Sem lubrificação);
- Teste de temperatura e umidade - Método 2.9.3.2
- Teste de imersão em água salina - Método 2.13.4
- Teste de névoa salina - Método 2.13.3
- Teste de arrasto em areia - Método 2.13.6
- Teste dinâmico de poeira e areia - Método 2.13.5.2.2
- Teste de lama - Método 2.13.7
- Teste de pulverização acelerada com água Método 2.13.2
- Teste de congelamento Método 2.9.4
- Teste de resistência Método 2.5.3
- Teste de queda Método 2.15.3
- Teste de obstrução por projétil Método 2.10.3.2.1, no que for aplicável.

De maneira complementar, para aquisição das referidas armas de porte de uso ostensivo, é necessária a certificação do atendimento ao Protocolo:

- NIJ Standard - 0112.03 (Autoloading Pistols For Police Officers) SEI nº (20664058):

6. SUBSTITUIÇÃO DAS ARMAS DE PORTE

Com a definição dos requisitos necessários ao novo armamento, validação das pesquisas efetuadas, e aplicação dos protocolos internacionais vigentes, a equipe do projeto ARM elaborou o Projeto Básico PE-405 (9093847), insculpido no bojo do processo de aquisição do armamento (08650.003489/2017-85). Referido projeto básico foi o resultado do trabalho de pesquisa da equipe, que culminou com as especificações das características necessárias ao novo sistema de armas da PRF.

O armamento foi adquirido por inexigibilidade, com a fundamentação, trazida à época:

> *Nos casos de inexigibilidade, como o presente, não há possibilidade de competição,*

porque só existe um objeto que atenda às necessidades da Administração; a licitação é, portanto, inviável.

Ademais, quanto à inexigibilidade de licitação, a própria redação do artigo 25 tem implícita a possibilidade de ampliação, vejamos:

"Art. 25. É inexigível a licitação quando houver inviabilidade de competição, em especial:

I – para aquisição de materiais, equipamentos, ou gêneros que só possam ser fornecidos por produtor, empresa ou representante comercial exclusivo, vedada a preferência de marca, devendo a comprovação de exclusividade ser feita através de atestado fornecido pelo órgão de registro do comércio do local em que se realizaria a licitação ou a obra ou o serviço, pelo Sindicato, Federação ou Confederação Patronal, ou, ainda, pelas entidades equivalentes;"

Com efeito, a inexigibilidade é decorrência da inviabilidade de competição; o próprio dispositivo prevê algumas hipóteses, o que não impede que outras surjam na prática. Se a competição inexiste, não há que se falar em licitação.

Relevante sopesar a lição de Hely Lopes Meirelles (1996:257), que distingue a exclusividade industrial da exclusividade comercial, para dizer que aquela é a do produtor privativo no país e esta é a dos vendedores e representantes da praça. Acrescenta que, "quando se trata de produtor, não há dúvida possível: se só ele produz um determinado material, equipamento ou gênero, só dele a Administração pode adquirir tais coisas."

Destarte, somente nos últimos dois anos, pelo menos 07 instituições de segurança pública (Polícias Militares do Paraná, Rio de Janeiro, Mato-Grosso, Polícia Civil do Rio de Janeiro e Sergipe, Polícia Legislativa do DF, Secretaria de Segurança Pública e Departamento de Polícia Federal) adquiriram o mesmo armamento especificado pela PRF, sendo que todos os processos foram instruídos para contratação via inexigibilidade de licitação com amparo legal no artigo 25, inciso I da Lei n° 8.666, de 1993, conforme publicações anexas (Anexo 17 - Publicações de Extratos de Inexigibilidade - 9081160).

A quantidade adquirida, por item/modelo, foi:

Item	Descrição	Elemento de despesa	Unidade	Quantidade
1	GLOCK 17, Gen4 'Safe Action' pistola semi-automática	44.90.52.14	Unidade	11.200
2	GLOCK 26, Gen4 'Safe Action' pistola semi-automática	44.90.52.14	Unidade	615
3	GLOCK 17P, 'Safe Action' pistola semi-automática	44.90.52.14	Unidade	570
4	GLOCK 17T Gen4, 'Safe Action' pistola semi-automática	44.90.52.14	Unidade	50
5	GLOCK 17 Cutway Gen4, 'Safe Action' pistola semi-automática	44.90.52.14	Unidade	30
6	GLOCK 17, Gen4 MOS 'Safe Action' pistola semi-automática	44.90.52.14	Unidade	100

O contrato foi celebrado em 20 de novembro de 2017 (Contrato n° 29/2017 - 9123992), e o recebimento definitivo dos armamentos ocorreu no dia 30 de agosto de 2018, conforme Termo de Recebimento Definitivo PE-405 (14167003)

7. HABILITAÇÃO DE TODO O EFETIVO

7.1. Após a aquisição do sistemas de armas Glock, foi realizado habilitação do efetivo para utilização do novo armamento, sendo 8.615 policias do quadro da PRF e 1.156 alunos do Curso de Formação Policial - CFP - 2019, hoje já no quadro funcional da Instituição. Atualmente, encontram-se em formação no CFP 2020 aproximadamente 700 alunos que serão capacitados no uso do sistema de armas adquirido.

7.2. A habilitação realizada no sistema de armas adquirido foi composto de instrução teórica, via EAD, com carga horária de 20 horas-aula e instrução prática de mais 10 horas-aula. Na fase prática cada policial realizou 100 disparos, ao custo aproximado de R$ 2,50 por munição, além de outros insumos, como alvos e produtos para a limpeza das armas. Apenas o custo das munições foi de aproximadamente 2 milhões de reais. Durante os CFPs realizados nos anos de 2019 e 2020 cada discente efetuou 849 disparos de pistola, gerando um custo de aproximadamente 4 milhões de reais em munições de treinamento.

7.3. Friza-se que tanto a capacitação quanto a habilitação realizadas se restringiram ao modelo G17, devido ao fato de possuir funcionamento idêntico ao dos demais modelos que compõem o sistema, tornando dispensável a capacitação nestes. A título de exemplo, os policiais lotados na inteligência e corregedoria que se utilizam do modelo G26, tornaram-se aptos a empregá-los assim que habilitados no modelo G17.

7.4. Em armas que não são agrupadas em sistemas, por usarem mecanismos distintos e não possuírem intercambiabilidade de peças, os custos de habilitação seriam multiplicados pela quantidade de modelos. O sistema adquirido também possui modelos específicos para treinamento, o que aumenta a qualidade e reduz os custos da capacitação, além de evitar acidentes e incidentes.

8. AVALIAÇÃO DOS MODELOS ATUALMENTE ADOTADOS

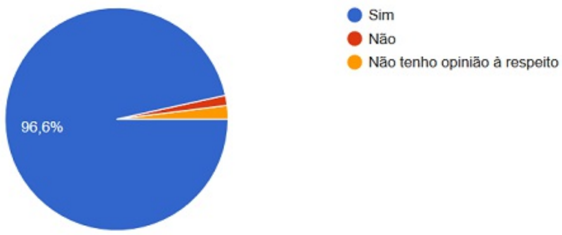
8.1. Durante o processo de habilitação dos policiais e durante todo o CFP foram realizados aproximadamente 1,5 milhão de disparos e não foi registrada nenhuma pane no armamento. As panes registradas se deram por conta da munição ou por falha na empunhadura do atirador, conforme Ofício 110/2020/EFAP/UniPRF/DIREX (26353867)

8.2. Ainda com o objetivo de avaliar o desempenho do equipamento adquirido, foi realizada pesquisa junto ao efetivo sobre a adequação do novo equipamento para as atividades da PRF, entre outros aspectos. Os resultados da pesquisa podem ser vistos no link: https://docs.google.com/forms/d/1iPbPX1SL2gcvzq_ci43qWBZkANBtLbE8YdxsZJMidW4/viewanalytics e foram anexados ao processo, sob o documento Formulário Pesquisa de Satisfação Glock G17 - Resultados (26990296).

8.3. Dentre as questões mais relevantes destaca-se que 96,6% dos respondentes consideram que a pistola adquirida pela PRF atende plenamente às necessidades operacionais. Retirando os respondentes que declaram não ter opinião à respeito (2%) e recalculando os totais, esse valor sobre para 98,5%. Também destaca-se que 99,3% dos respondentes se declara <u>Satisfeito</u> ou <u>Muito Satisfeito</u> com o fornecimento da Glock G17 para as atividades operacionais da PRF. Apenas 3 respondentes se declararam insatisfeitos com o fornecimento da Glock G17.

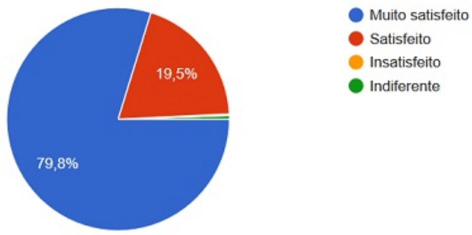
Na sua opinião, a pistola adquirida pela PRF atende plenamente às necessidades operacionais?

1.309 respostas



O quão satisfeito você ficou com o fornecimento da Glock G17 para as atividades operacionais da PRF?

1.309 respostas



9. COMPATIBILIDADE DO PROJETO COM A NORMA TÉCNICA Nº 001/2019/SENASP/MJ

9.1. Em análise ao processo de aquisição que culminou com a substituição de todas as armas de porte da Polícia Rodoviária Federal foi publicada o Acórdão Nº 4369/2019 - TCU - 2ª Câmara (26135371), sobre o qual o Ministério da Justiça se posicionou conforme Nota Técnica Nº 6/2020/CQE/CGISP-DPSP/DPSP/SENASP/MJ (26134616).

9.2. O Acórdão aponta, no item 1.8.3.2 a ausência da certificação NIJ *Standard* 0112.03 para o modelo G26, porém essa certificação só se aplica a armamentos ostensivos, no caso, apenas à G17.

9.3. Também foi publicada pela SENASP a Norma Técnica Nº 001/2019/SENASP (26134763) juntamente ao Guia de Aplicação da Norma Técnica Nº 001/2019/SENASP (26134025).

9.4. Do citado acórdão emana a deliberação:

> "1.8.2. determinar ao Departamento de Polícia Rodoviária Federal que:
> 1.8.2.1. a partir dos requisitos mínimos (doutrinas) que serão estabelecidos pelo Ministério da Justiça e Segurança Pública em atenção ao item 1.8.1.1. desta deliberação, reavalie a exigibilidade de processo licitatório para as próximas aquisições de armas, adotando, inclusive, se for o caso, a licitação internacional prevista no art. 42 da Lei 8.666/1993;"

9.5. Em análise à Norma Técnica Nº 001/2019/SENASP/MJ juntamente ao Guia de Aplicação da Norma Técnica Nº 001/2019/SENASP/MJ, segue quadro com análise dos requisitos e características do sistemas de armas Glock

REQUISITOS DA NT Nº 001/2019/SENASP	AVALIAÇÃO
Tipo de ação: dupla com semi-engatilhamento	Sistema de armas Glock atende o requisito apresentado
Sistema de percussão	Sistema de armas Glock atende o requisito apresentado
Tipo e comprimento do cano	Sistema de armas Glock atende o requisito apresentado
Tratamento das partes metálicas (resistência à intempéries)	Sistema de armas Glock atende o requisito apresentado
Retém do carregador ambidestro ou reversível	Sistema de armas Glock atende o requisito apresentado
Empunhadura ajustável	Sistema de armas Glock atende o requisito apresentado
Sistemas de segurança (ao menos 3 travas distintas)	Sistema de armas Glock atende o requisito apresentado
Peso e curso do gatilho	Sistema de armas Glock atende o requisito apresentado
Raiamento poligonal	Sistema de armas Glock atende o requisito apresentado
Aptidão para munições nacionais e importadas	Sistema de armas Glock atende o requisito apresentado
Acabamento em primeira linha	Sistema de armas Glock atende o requisito apresentado
Manutenção de 1° escalão de fácil realização	Sistema de armas Glock atende o requisito apresentado
Indicador de munição na câmara	Sistema de armas Glock atende o requisito apresentado
Não produzir tiro em uma queda de 2m com munição na câmara	Sistema de armas Glock atende o requisito apresentado
Câmara	Sistema de armas Glock atende o requisito apresentado
Trancamento	Sistema de armas Glock atende o requisito apresentado
Retém do ferrolho	Sistema de armas Glock atende o requisito apresentado
Capacidade de operação e disparos	Sistema de armas Glock atende o requisito apresentado
	Sistema de armas Glock atende o requisito

Ferrolho	Sistema de armas Glock atende o requisito apresentado

9.6. Os ensaios, definidos no item 6 da referido Norma Técnica, serão observados nas futuras aquisições, como parte dos procedimentos de recebimento definitivo. **Sugerimos que as novas contratações prevejam que as despesas relativas aos testes e às unidades que serão destruídas nos ensaios sejam arcados pela contratada**.

10. PADRONIZAÇÃO

10.1. Com a conclusão do estudo técnico realizado, que culminou na substituição integral das armas de porte da PRF pelo Sistema da fabricante Glock, que contempla não apenas os três modelos operacionais, mas ainda 03 versões exclusivas para treinamento, totalizando 06 modelos de pistolas compatíveis entre si, permitindo que foi possível uma redução significativa de custos com instrução, além de evitar erros de execução decorrente da utilização de diferentes modelo, torna-se premente examinar a pertinência de se avaliar a conveniência e oportunidade de padronizar o referido sistema para subsidiar as futuras aquisições da PRF.

10.2. A respeito do tema, cita-se a lição Marcal Justen Filho, em seu "Comentários a Lei de Licitações e Contratos Administrativos", 12ª edição:

> "A padronização será promovida pela Administração como pressuposto de futuras contratações. Influirá sobre o conteúdo da atividade administrativa futura, inclusive a possibilidade de resultar em contratações diretas. **É perfeitamente possível que a padronização conclua pela seleção de objeto que pode ser prestado por um único fornecedor, tornando-se inviável a competição**. **Nenhum vício ocorrerá nessa hipótese, desde que a padronização tenha sido conduzida de modo adequado, com observância das formalidades cabíveis e respeitados os princípios fundamentais**" (Grifo nosso)

10.3. Também nessa direção vale citar **Decisão nº 1.196/2002, Plenário, do Tribunal de Contas a União:**

> "**A indicação de marca na especificação de produtos de informática pode se aceita frente ao princípio da padronização previsto no art. 15, inciso I, da Lei nº 8.666/1993, desde que a decisão administrativa que venha a identificar o produto pela marca seja circunstanciadamente motivada e demonstre se essa a opção, em termos técnicos e econômicos, mais vantajosos para a Administração**." (Acórdão nº 2.376/2006, Plenário, Rel. Min. Marcos Vinícius Vilaça) (Grifo nosso)

10.4. Com base nesse princípio, a Polícia Federal padronizou, por meio da Portaria n° 458/07-DG/DPF, publicada no Diário Oficial da União n° 208, de 29/10/07, os modelos G17, G19 e G26 das pistolas Glock, como armamento leve de porte no âmbito da Polícia Federal. Essa informação encontra-se no Anexo 22 da referida portaria.

10.5. Conforme demonstrado na presente Nota Técnica, os estudos realizados pela Polícia Rodoviária Federal e por outras instituições pesquisadas ao longo dos anos de 2015 a 2018, permitiram a aquisição de um sistema de armas pela PRF que tem apresentado excelente resultado em uso operacional e durante as instruções de habilitação, sem que se tenha qualquer registro de incidente, pane ou problema com o treinamento de quase 10.000 mil PRFs.

10.6. Restou claro que as especificações definidas atenderam às necessidades da PRF, garantindo qualidade, segurança e confiança dos armamentos, demonstrando sua perfeita adequação às atividades e atribuições da instituição, desde o emprego pelo efetivo ordinário até as áreas especializadas e o ensino.

10.7. Ao planejar as futuras aquisições de pistolas, imprescindível ponderar que o investimento de tempo e recursos no treinamento é substancial, sendo, além de necessário, obrigatório, em decorrência de disposição normativa, conforme preceitua as diretrizes da Portaria Interministerial nº 4226/2010, destacadas abaixo:

> "16. Deverão ser elaborados procedimentos de habilitação para o uso de cada tipo de arma de fogo e instrumento de menor potencial ofensivo que incluam avaliação técnica, psicológica, física e treinamento específico, com previsão de revisão periódica mínima.
>
> 17. Nenhum agente de segurança pública deverá portar armas de fogo ou instrumento de menor potencial ofensivo para o qual não esteja devidamente habilitado e sempre que um novo tipo de arma ou instrumento de menor potencial ofensivo for introduzido na instituição deverá ser estabelecido um módulo de treinamento específico com vistas à habilitação do agente.
>
> 18. A renovação da habilitação para uso de armas de fogo em serviço deve ser feita com periodicidade mínima de 1 (um) ano."

10.8. Nesta senda, o uso de armas com mesma plataforma, funcionamento e teclas de operação faz com que os recursos com as instruções caiam significativamente, especialmente quando comparados a instruções com armas de plataformas diferentes, que ensejam necessidades de treinamentos igualmente diferentes, multiplicando os investimentos com instrução.

10.9. Nessa linha, sensato que as futuras aquisições apresentem como requisito que as pistolas ofertadas sejam integralmente compatíveis com o sistema atualmente adotado por 100% do efetivo. Vale dizer que os policiais que necessitam utilizar armas subcompactas são os lotados nos serviços de inteligência, corregedoria, operações especiais e cargos com função comissionada, sendo que essas armas se destinam a outra dinâmica de atuação e são usadas seletivamente a depender da atuação, ou seja, esses policiais precisam ter a sua disposição armas de tamanho "Standard" e "subcompacta". Nesses casos, o uso de armas com mesma plataforma ajuda a otimizar os investimentos com as instruções, facilitando a capacitação/habilitação do policial no manuseio (montagem, desmontagem, teclas de operação, sistema de funcionamento etc.) de ambos os modelos de pistolas (Standard e subcompacta). De outra forma, toda vez que um servidor fosse lotado em um setor onde o uso de outra arma fosse necessário a PRF teria um novo gasto com instrução.

10.10. Além disso, considerando que subsidiariamente à aquisição das armas a PRF adquiriu um conjunto de "spare parts" (peças de reposição), que garantirá a manutenção de todo esse armamento adquirido pelos próximos 20 anos, aproximadamente, e como as armas utilizam a mesma plataforma, facilita-se e reduz-se o custo com manutenção de segundo escalão, a cargo de servidores especializados, haja vista que as ferramentas e peças de reposição utilizadas são as mesmas.

10.11. Pertinente destacar que as 11.200 unidades do modelo Standard G17 e 615 unidades do modelo subcompacto G26, quando adquiridos em 2018, atendiam à plenitude do efetivo existente, contudo, com o ingresso de quase 2000 novos servidores em 2019 e 2020, a perspectiva de ingresso de mais 2000 servidores em concurso público previsto para 2021 e o incremento da nova estrutura organizacional instituída pelo Decreto nº 9.662/2019, que ampliou o número de servidores que fazem jus às armas subcompactas, mostra-se iminente a necessidade de ampliar o acervo de pistolas.

10.12. Frente a demanda por ampliação da disponibilidade dos armamentos, vislumbra-se duas opções:

a) a deflagração de novos estudos com vistas à identificar eventuais sistemas de armamento que atendam aos requisitos estabelecidos na NT nº 001/2019/SENASP e nos RTPRF; ou

b) padronizar o sistema atualmente utilizado.

10.13. Adotando-se a opção "a", ainda que identificados sistemas diversos do utilizado pela PRF compatíveis com as normas citadas, ter-se-ia que habilitar os 2.000 novos policiais (previstos para ingressarem em 2021) nos dois sistemas de armamento, duplicando-se os custos com treinamento, que envolvem hora-aula, diárias dos instrutores, munições, alvos, obreas, entre outros insumos. A título de exemplo, somente com munições, as despesas sofreriam um incremento de R$ 4.228.020,00 (considerando o custo unitário de R$ 2,49, extraído do Contrato nº 27 /2019, SEI! nº 20577714, e a quantidade de 849 disparos por pistola, informada no Ofício nº 110/2020/EFAP/UNIPRF/DIREX, 26353867).

10.14. Cristalino que essa despesa será dobrada em todos os futuros Cursos de Formação Policial, em outras palavras, o investimento em um sistema diverso do atualmente adotado implica em dobrar as despesas de custeio.

10.15. Se considerarmos a necessidade de ampliar a habilitação do suposto novo sistema para todo o efetivo, de aproximadamente 11.000 policiais, incorreríamos em uma despesa da ordem de R$ 2.739.000 (considerando os mesmos R$ 2,49 por munição e 100 disparos por policial, informados no Ofício nº 110/2020/EFAP/UNIPRF/DIREX, 26353867).

10.16. Vale dizer que a aquisição de 2.000 novas armas, se considerado o valor de U$ 425,00 a unidade, à taxa de câmbio de R$ 5,61, exigiria um investimento de R$ 4.664.025,55.

10.17. Os número apresentados evidenciam que as despesas acrescidas ao curso de formação em razão da necessidade de qualificação dos futuros policiais em dois sistemas de armamento, quando comparado a um único sistema, são próximos ao valor das armas adquiridas para esses mesmos policiais. Em outras palavras, a escolha pela opção "b" - padronizar o sistema atualmente utilizado, permite que o investimento se pague após a conclusão de um único curso de formação.

10.18. Desta forma, após os estudos que culminaram com a substituição dos 03 modelos de armas distintos e não compatíveis antes empregados pela PRF, por um único Sistema de armas, confiável, seguro e de qualidade, com funcionamento, teclas de operação, montagem e desmontagem e demais itens compatíveis entre si, permitindo a uniformidade de procedimentos, instrução e operação, independente da área na qual o policial atue, especializada ou não, resta à PRF padronizar esse sistema de armas, a fim de que as futuras aquisições estejam plenamente compatíveis com o sistema atualmente adotado.

10.19. Além de se apresentar como a melhor solução técnica e econômica para atendimento das necessidade internas do órgão, a padronização permite à PRF ganhos com integrações interinstitucionais, pois mantém o alinhamento com o armamento utilizado pelas forças federais de segurança, medida relevante ante as constantes operações conjuntas entre estas, além de ser corriqueiro que servidores dessas organizações atuem em conjunto na segurança presidencial e de ministros de estado. Tendo em vista que a Brigada de Forças Especiais do Exercito Brasileiro, o Batalhão de Guarda Presidencial e o Departamento de Polícia Federal utilizam o sistema de armamento adquirido pela PRF, atinge-se a racionalização de recursos, considerando a possibilidade de integração logística de partes e peças do armamento além de redução de custos com capacitações e alinhamento de doutrinas e procedimentos.

11. CONCLUSÃO

11.1. Considerando o que prescreve o artigo 15 da Lei 8666, de 21 de junho de 1993, em seu inciso I, que estabelece que "As compras, sempre que possível, deverão: I - atender ao princípio da padronização, que imponha compatibilidade de especificações técnicas e de desempenho, observadas, quando for o caso, as condições de manutenção, assistência técnica e garantia oferecidas".

11.2. Considerando os relatórios constantes nos processos 08650.025836/2016-40, 08650.019721/2017-05 e 08650.006431/2018-74, confeccionados pela Equipe de técnicos do Projeto Estratégico ARM - Armamentos Institucionais, criado através das Portarias da Direção da PRF Nº 329, de 16 de outubro de 2015 e Nº 144 de 19 de maio de 2017 com a função de, entre outras atribuições: “propor melhorias, otimizações, mudanças, substituições, padronizações e possíveis aquisições com base nos estudos realizados.”

11.3. Considerando a aquisição e distribuição, para todas as unidades da Polícia Rodoviária Federal em todo o Brasil, de 12.565 unidades de pistolas do Sistema de armas Glock, no calibre 9x19mm, incluindo 11.300 unidades do modelo G17 para uso ostensivo e 615 do modelo G26 para uso dissimulado, que tornou as pistolas da fabricante Glock, nos modelos G17 e G26, como sendo o único sistema de armas de porte atualmente empregada pela PRF, substituindo os 3 modelos de armas de porte, no calibre .40 S&W, pertencentes a fabricante Taurus, anteriormente empregados pela PRF. Fazendo com que, independentemente da área em que atuem, todos os PRFs possuam armas de mesma plataforma, com peças e carregadores intercambiáveis entre os modelos.

11.4. Considerando a aquisição e distribuição de simulacros para treinamento do efetivo em todos os estados, que são idênticos às armas reais, o que tornou mais seguro e eficiente as capacitações dos policiais.

11.5. Considerando o resultados satisfatório obtido durante os eventos de capacitações com aproximadamente 10.000 PRFs que receberam o armamento, onde nenhuma pane, incidente ou problema foi relatado.

11.6. Considerando o treinamento realizado com os armeiros da PRF (os instrutores participantes do Workshop de Instrutores de AMT - 2018, foram habilitados na mecânica de armamentos do Sistema de Armas Glock, sendo aptos a total desmontagem e montagem do armamento, bem como identificação da necessidade de troca de peças), bem como a existência de estoque de peças sobressalentes existentes para pistolas da marca Glock (adquiridas em conjunto com as armas) e a intercambialidade de peças entre os modelos do referido sistema.

11.7. Considerando a convergência entre outros órgãos de segurança pública nacionais e internacionais que realizaram estudos, laudos, perícias, pareceres técnicos, atestados e relatórios sobre padronização de armamento.

11.8. Considerando que as Glocks adquiridas possuem vida útil prevista de aproximadamente 20 anos, sendo que nesse período só haverá aquisições para substituição dos equipamentos danificados ou extraviados e para complementar o quadro de Policiais Rodoviárias Federais, hoje limitado a cerca de 13 mil servidores. Assim, projeta-se que até o ano de 2040 não serão adquiridos mais que 27% do total de armas já disponíveis no patrimônio da instituição (17% para dotar os possíveis dois mil policiais que a instituição pode acomodar, somados a 10% de pistolas eventualmente extraviadas e danificadas nos próximos 20 anos). **Dessa maneira, se, ao invés de adquirir 27% do total de armas** (R$ 7.407.569,00)**, fosse necessário substituir todas as armas** (100% existentes + os 27% apontados na frase anterior, totalizando 127% da quantidade atual de armas = R$ 26.226.750,00) e ainda somar o custo de uma nova habilitação (R$ 2.739.000,00) **seria necessário realizar investimento 3,9 vezes superior** (R$ 28.965.750,00 ÷ R$ 7.407.569,00).

11.9. Ante o exposto, a Divisão de Prospecção e Desenvolvimento de Produtos recomenda **PADRONIZAR** no âmbito da Polícia Rodoviária Federal, como Sistema de Armas de Porte, as pistolas calibre 9 x 19 mm, da fabricante GLOCK Ges.m.b.H; e **DEFINIR os modelos G17, G17 MOS e G26 e suas versões de treinamento (G17 R, G17 T, G17 Cutaway)** como os únicos modelos de arma de porte a serem adquiridos para uso ostensivo e dissimulado pela PRF, nos termos do § 5° do art. 7° da lei 8.666/93, até que não se esgote a vida útil das pistolas fornecidas ao efetivo em 2018.

VINICIUS RENATO MARTINI
Chefe da Divisão de Prospecção de Desenvolvimento de Produtos

De acordo:

ABDIAS VIEIRA DA COSTA NETO
Coordenador de Mobilização e Logística

De acordo:

PAULO R. CUNHA FIGUEIREDO SOUSA
Coordenador Geral de Administração

Aprovo a presente Nota Técnica:

MURILO CANGUSSU CAVALCANTE
Diretor de Administração e Logística

Documento assinado eletronicamente por **MURILO CANGUSSU CAVALCANTE**, **Diretor(a) de Administração e Logística**, em 16/09/2020, às 03:14, horário oficial de Brasília, com fundamento no art. 10, § 2º, da Medida Provisória nº 2.200-2, de 24 de agosto de 2001, no art. 6º do Decreto nº 8.539, de 8 de outubro de 2015, e no art. 42 da Instrução Normativa nº 116/DG/PRF, de 16 de fevereiro de 2018.

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MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIRETORIA DE ADMINISTRAÇÃO E LOGÍSTICA

PORTARIA Nº XXX/2020-DG, DE XX DE XXXXXXXXXX DE 2020

O DIRETOR-GERAL DO DEPARTAMENTO DE POLÍCIA RODOVIÁRIA FEDERAL, no uso das atribuições que lhe confere o inciso IV do artigo 28, do Regimento Interno da PRF, aprovado pela Portaria n°. XXX, de XX de XXXXXXXX de 20XX, do Excelentíssimo Senhor Ministro de Estado da Justiça, publicada na Seção 1 do DOU n°. 198, de 16 de outubro de 2006.

CONSIDERANDO o que prescreve o artigo 15 da Lei 8666, de 21 de junho de 1993, em seu inciso I, que estabelece que “As compras, sempre que possível, deverão: I - atender ao princípio da padronização, que imponha compatibilidade de especificações técnicas e de desempenho, observadas, quando for o caso, as condições de manutenção, assistência técnica e garantia oferecidas;”

CONSIDERANDO os Relatórios do Projeto ARM constituído pela Portaria nº 239 de 16 de outubro de 2015, com a incumbência de efetuar estudos visando à padronização de armamento a ser adotado na Polícia Rodoviária Federal;

CONSIDERANDO o resultado dos estudos, laudos, perícias, pareceres técnicos, atestados e relatórios recomendando a padronização do armamento leve de porte a ser utilizado no âmbito do Departamento de Polícia Rodoviária Federal;

CONSIDERANDO que no ano de 2017 foram adquiridas um total de 12.565 unidades de pistolas semi-automáticas da marca Glock, calibre 9 X 19mm para suprir a troca de amamento individual de 100% do efetivo da PRF;

CONSIDERANDO o nível de treinamento dos armeiros da PRF, o estoque de peças sobressalentes existentes para pistolas da marca Glock e a intercambiabilidade de peças, no emprego operacional, entre um modelo e outro das referidas pistolas e, também, a utilização das referidas armas nos cursos de formação e especialização ministrados pela UniPRF;

CONSIDERANDO a articulação com outros órgãos que já realizaram estudos, laudos, perícias, pareceres técnicos, atestados e relatórios sobre padronização de armamento; e

CONSIDERANDO os demais elementos explicitados na Nota Técnica 7/2020/DIPRO/CMLOG/CGA/DIRAD (27759555);

R E S O L V E:

Art. 1°. Padronizar, no âmbito do Departamento de Polícia Rodoviária Federal DPRF, como armamento leve de porte as pistolas calibre 9 x 19 mm, do fabricante GLOCK Ges.m.b.H.

Art. 2°. Definir os modelos G17 e G26 como os que devem ser adquiridos nas próximas aquisições a serem realizadas pela PRF.

Art. 3°. Esta Portaria entra em vigor na data de sua publicação.

Documento assinado eletronicamente por **VINICIUS RENATO MARTINI**, **Chefe da Divisão de Prospecção e Desenvolvimento de Produtos**, em 22/09/2020, às 14:22, horário oficial de

Brasília, com fundamento no art. 10, § 2º, da Medida Provisória nº 2.200-2, de 24 de agosto de 2001, no art. 6º do Decreto nº 8.539, de 8 de outubro de 2015, e no art. 42 da Instrução Normativa nº 116/DG/PRF, de 16 de fevereiro de 2018.

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MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIRETORIA DE ADMINISTRAÇÃO E LOGÍSTICA

PORTARIA NORMATIVA Nº XXX/2020-DG, DE XX DE XXXXXXXXXX DE 2020

O DIRETOR-GERAL DO DEPARTAMENTO DE POLÍCIA RODOVIÁRIA FEDERAL, no uso das atribuições que lhe confere o DECRETO Nº 9.662, DE 1º DE JANEIRO DE 2019, publicado na D.O.U de 2.1.2019 - Edição extra Nº 1-A.

CONSIDERANDO o que prescreve o artigo 15 da Lei 8666, de 21 de junho de 1993, em seu inciso I, que estabelece que "As compras, sempre que possível, deverão: I - atender ao princípio da padronização, que imponha compatibilidade de especificações técnicas e de desempenho, observadas, quando for o caso, as condições de manutenção, assistência técnica e garantia oferecidas;"

CONSIDERANDO os Relatórios do Projeto ARM constituído pela Portaria nº 239 de 16 de outubro de 2015, com a incumbência de efetuar estudos visando à padronização de armamento a ser adotado na Polícia Rodoviária Federal;

CONSIDERANDO o resultado dos estudos, laudos, perícias, pareceres técnicos, atestados e relatórios recomendando a padronização do armamento leve de porte a ser utilizado no âmbito do Departamento de Polícia Rodoviária Federal;

CONSIDERANDO que no ano de 2017 foram adquiridas um total de 12.565 unidades de pistolas semi-automáticas da marca Glock, calibre 9 X 19mm para suprir a troca de amamento individual de 100% do efetivo da PRF;

CONSIDERANDO o nível de treinamento dos armeiros da PRF, o estoque de peças sobressalentes existentes para pistolas da marca Glock e a intercambiabilidade de peças, no emprego operacional, entre um modelo e outro das referidas pistolas e, também, a utilização das referidas armas nos cursos de formação e especialização ministrados pela UniPRF;

CONSIDERANDO a articulação com outros órgãos que já realizaram estudos, laudos, perícias, pareceres técnicos, atestados e relatórios sobre padronização de armamento; e

CONSIDERANDO os demais elementos explicitados na Nota Técnica 7/2020/DIPRO/CMLOG/CGA/DIRAD (27759555), nos autos do Processo nº 08650.014484/2019-40;

R E S O L V E:

Art. 1°. Padronizar, no âmbito da Polícia Rodoviária Federal, como armamento leve de porte, o sistema de armas das pistolas calibre 9 x 19 mm, do fabricante GLOCK Ges.m.b.H., compatível com os modelos G17 e G26.

Art. 2°. Estabelecer que as aquisições de pistolas pela PRF restrinjam-se ao sistema de armas GLOCK padronizado por esta portaria.

Art. 3°. Esta Portaria entra em vigor na data de sua publicação.

Documento assinado eletronicamente por **MURILO CANGUSSU CAVALCANTE**, **Diretor(a) de Administração e Logística**, em 25/09/2020, às 14:29, horário oficial de Brasília, com fundamento no art. 10, § 2º, da Medida Provisória nº 2.200-2, de 24 de agosto de 2001, no art. 6º do Decreto nº 8.539, de 8 de outubro de 2015, e no art. 42 da Instrução Normativa nº 116/DG/PRF, de 16 de fevereiro de 2018.

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MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIRETORIA DE ADMINISTRAÇÃO E LOGÍSTICA

DESPACHO Nº 1694/2020/DIRAD

Brasília, 25 de setembro de 2020.

DESTINO(S): Diretor-Geral
ASSUNTO: Padronização do sistema de armas de porte da PRF

1. Tratam, os autos, de estudos para identificar a estratégia de aquisição de armas pela Polícia Rodoviária Federal.

2. Consoante demonstrado na Nota Técnica n 7 (27759555), é recomendável **PADRONIZAR,** no âmbito da Polícia Rodoviária Federal, como Sistema de Armas de Porte, as pistolas calibre 9 x 19 mm, da fabricante GLOCK Ges.m.b.H; e **DEFINIR os modelos G17, G17 MOS e G26 e suas versões de treinamento (G17 R, G17 T, G17 Cutaway,)**como os modelos de arma de porte a serem adquiridos para uso ostensivo e dissimulado pela PRF, nos termos do § 5° do art. 7° da lei 8.666/93, até que não se esgote a vida útil das pistolas fornecidas ao efetivo em 2018.

3. Salienta-se que a padronização se mostra necessária devido à comprovada adequação dos equipamentos às atividades desenvolvidas pela PRF, à adequação e qualidade demonstrada durante sua operacionalização e à vantajosidade econômica decorrente da aquisição de modelos que compõem um mesmo sistema.

4. Ante o exposto, submeto a minuta de portaria normativa SEI! número 27996244 com vistas à Padronização requerida.

MURILO CANGUSSU CAVALCANTE
Diretor de Administração e Logística

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MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIRETORIA-EXECUTIVA

DESPACHO Nº 347/2020/COAT

Brasília, 05 de outubro de 2020.

DESTINO(S): **DIREX**

ASSUNTO: Padronização do Sistema de armas Glock.

1. Trata-se de proposta apresentada pela equipe do Projeto Estratégico Armamento institucional - PE-405, nos termos do OFÍCIO Nº 21/2019/PE-405/DIROP (SEI Nº 20664400) e do do RTPRF 02.2019 (SEI Nº 19991214), objetivando a padronização do sistema de armas GLOCK para a Polícia Rodoviária Federal (PRF).

2. Chegados os autos a essa DIREX, Vossa Senhoria, por meio do DESPACHO Nº 277/2019-DIREX (SEI Nº 20706684), deliberou pela preparação de uma minuta de Catálogo de Armamento da PRF, em caráter prioritário.

3. Ato contínuo, o presente processo foi encaminhado à DIRAD para conhecimento, análise e providências necessárias ao atendimento do pleito, a qual, através do DESPACHO Nº 1694/2020-DIRAD (SEI Nº 27997303), recomendou a edição de uma **Portaria Normativa** para padronizar, no âmbito da PRF, o sistema de armas das pistolas calibre 9 x 19 mm, do fabricante GLOCK, compatível com os modelos G17 e G26, como armamento leve de porte, conforme consta da Minuta de portaria - padronização pistolas (SEI Nº 27996244).

4. Assim, diante da sensibilidade do pleito sob apreço, tendo em conta as competências reservadas a essa Diretoria, restituímos o presente processo para conhecimento dos termos do **DESPACHO Nº 1694/2020-DIRAD** (SEI Nº 27997303) e da **Minuta de portaria - padronização pistolas** (SEI Nº 27996244) e verificação quanto ao efetivo atendimento no disposto no DESPACHO Nº 277/2019-DIREX.

Respeitosamente,

ELISVERSO DA SILVA LOUZINO
Coordenador de Apoio Técnico

De acordo,

EDUARDO AMARAL BERTÃO
Coordenador-Geral de Análise Técnica

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MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIRETORIA-EXECUTIVA

DESPACHO Nº 505/2020/DIREX

Brasília, 07 de outubro de 2020.

DESTINO(S): **GAB-DG**

ASSUNTO: Padronização do Sistema de armas Glock.

1. Trata-se de recomendação, apresentada pela Diretoria de Administração - DIRAD, de edição de uma **Portaria Normativa** para padronizar, no âmbito da PRF, o sistema de armas das pistolas calibre 9 x 19 mm, do fabricante GLOCK, compatível com os modelos G17 e G26, como armamento leve de porte, conforme consta da Minuta de portaria - padronização pistolas (SEI Nº 27996244).

2. Encaminho a este GAB-DG para conhecimento e deliberação quanto ao texto junto ao senhor Diretor-Geral, sugerindo que a versão final seja previamente encaminhada para apreciação pela CONJUR, uma vez que gera impacto nas contratações futuras para fornecimento de armamento.

Atenciosamente,

JOSE LOPES HOTT JUNIOR
Diretor-Executivo

MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIREÇÃO-GERAL

MINUTA DE PORTARIA DG

Padroniza o sistema de armas das pistolas calibre 9 mm x 19 mm no âmbito da Polícia Rodoviária Federal.

O DIRETOR-GERAL DA POLÍCIA RODOVIÁRIA FEDERAL, no uso das atribuições que lhe foram conferidas pelo Decreto nº 9.662, de 1º de janeiro de 2019, pelo Regimento Interno aprovado pela Portaria nº 224, de 5 de dezembro de 2018, do Ministro de Estado da Segurança Pública, e pela Portaria nº 32, de 17 de janeiro de 2020, do Ministro de Estado da Justiça e Segurança Pública, com fulcro no disposto no Processo nº 08650.014484/2019-40, resolve:

Art. 1º Padronizar como armamento de leve porte, no âmbito da Polícia Rodoviária Federal, o sistema de armas das pistolas calibre 9 mm x 19 mm, da fabricante Glock Ges.m.b.H., compatível com os modelos G17 e G26.

Art. 2º Estabelecer que as aquisições de pistolas pela Polícia Rodoviária Federal são restritas ao sistema de armas Glock padronizado por esta Portaria.

Art. 3º Esta Portaria entra em vigor em 3 de novembro de 2020.

EDUARDO AGGIO DE SÁ

MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIREÇÃO-GERAL

DESPACHO Nº 493/2020/GAB-DG

Brasília, 20 de outubro de 2020.

DESTINO(S): **Diretor-Geral**

ASSUNTO: **Padronização do Sistema de armas Glock.**

1. Versam os presentes autos acerca de recomendação, apresentada pela Diretoria de Administração e Logística - Dirad, sobre a edição de um ato normativo para padronizar, no âmbito da Polícia Rodoviária Federal - PRF, o sistema de armas das pistolas calibre 9 x 19 mm, do fabricante Glock, compatível com os modelos G17 e G26, como armamento leve de porte, conforme demonstrado na Nota Técnica nº 7/2020/DIPRO/CMLOG/CGA/DIRAD (SEI nº 27759555).

2. Isto posto, após a devida instrução processual e tendo em vista as razões técnicas e financeiras constantes do bojo processual, encaminho para conhecimento e deliberação a Minuta de Portaria DG (SEI nº 28403661), que padroniza o sistema de armas das pistolas calibre 9 x 19 mm no âmbito da Polícia Rodoviária Federal.

3. Por fim, opino pela desnecessidade de submeter-se a Minuta de Portaria DG (SEI nº 28403661) ao crivo da Consultoria Jurídica, junto ao Ministério da Justiça e Segurança Pública - CONJUR/MJSP, uma vez que todas as futuras contratações devem ser objeto de avaliação individual por parte daquela e que o referido ato normativo está assentado nos aspectos da oportunidade e conveniência do interesse público, cuja liberdade de definição advém da sua discricionariedade.

Respeitosamente,

STEFANI JULIANA VOGEL
Chefe de Gabinete

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Boletim de Serviço Eletrônico em 28/10/2020
DOU de 28/10/2020, seção 1, página 94

MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIREÇÃO-GERAL

PORTARIA NORMATIVA PRF Nº 8, DE 23 DE OUTUBRO DE 2020

Padronizar o armamento de leve porte no âmbito da Polícia Rodoviária Federal.

O DIRETOR-GERAL DA POLÍCIA RODOVIÁRIA FEDERAL, no uso das atribuições que lhe foram conferidas pelo Decreto nº 9.662, de 1º de janeiro de 2019, pelo Regimento Interno aprovado pela Portaria nº 224, de 5 de dezembro de 2018, do Ministro de Estado da Segurança Pública, e pelo disposto no art. 15, I da Lei nº 8.666, de 21 de junho de 1993, com fulcro no disposto no Processo nº 08650.014484/2019-40, resolve:

Art. 1º Padronizar como armamento leve de porte, no âmbito da Polícia Rodoviária Federal, o sistema de armas das pistolas calibre 9 x 19 mm, da fabricante Glock Ges.m.b.H.

Art. 2º Estabelecer que as aquisições de pistolas pela Polícia Rodoviária Federal fiquem restritas ao sistema de armas padronizado por esta Portaria.

Art. 3º Esta Portaria Normativa entra em vigor em 3 de novembro de 2020.

EDUARDO AGGIO DE SÁ

Imprimir Recibo | Página Principal

Presidência da República
Imprensa Nacional

Envio Eletrônico de Matérias
Comprovante de Recebimento

A Imprensa Nacional recebeu Ofício Eletrônico com a solicitação de publicação de matérias com as seguintes características:

Data de envio: 27/10/2020 10:28:11
Origem do Ofício: Polícia Rodoviária Federal
Operador: Fabricio Masson Vieira
Ofício: 6089803
Data prevista de publicação: 28/10/2020
Local de publicação: Diário Oficial - Seção 1
Forma de pagamento: Isento

As matérias enviadas somente serão publicadas na data e jornal indicados no Ofício Eletrônico após validação e análise de adequação à legislação que disciplina a publicação de matérias nos Jornais Oficiais.

Matérias

Sequencial	Arquivo(s)	MD5	Tamanho (cm)	Valor
13036303	Portaria Normativa 8.rtf	b2256115b667c180 7d47e02e10d5536b	5,00	R$ 165,20
TOTAL DO OFICIO			**5,00**	**R$ 165,20**

DIÁRIO OFICIAL DA UNIÃO

Publicado em: 28/10/2020 | Edição: 207 | Seção: 1 | Página: 94

Órgão: Ministério da Justiça e Segurança Pública/Polícia Rodoviária Federal

PORTARIA NORMATIVA PRF Nº 8, DE 23 DE OUTUBRO DE 2020

O DIRETOR-GERAL DA POLÍCIA RODOVIÁRIA FEDERAL, no uso das atribuições que lhe foram conferidas pelo Decreto nº 9.662, de 1º de janeiro de 2019, pelo Regimento Interno aprovado pela Portaria nº 224, de 5 de dezembro de 2018, do Ministro de Estado da Segurança Pública, e pelo disposto no art. 15, I da Lei nº 8.666, de 21 de junho de 1993, com fulcro no disposto no Processo nº 08650.014484/2019-40, resolve:

Art. 1º Padronizar como armamento leve de porte, no âmbito da Polícia Rodoviária Federal, o sistema de armas das pistolas calibre 9 x 19 mm, da fabricante Glock Ges.m.b.H.

Art. 2º Estabelecer que as aquisições de pistolas pela Polícia Rodoviária Federal fiquem restritas ao sistema de armas padronizado por esta Portaria.

Art. 3º Esta Portaria Normativa entra em vigor em 3 de novembro de 2020.

EDUARDO AGGIO DE SÁ

MINISTÉRIO DA JUSTIÇA E SEGURANÇA PÚBLICA
POLÍCIA RODOVIÁRIA FEDERAL
DIRETORIA DE ADMINISTRAÇÃO E LOGÍSTICA

DESPACHO Nº 1897/2020/DIRAD

Brasília, 28 de outubro de 2020.

DESTINO(S): Coordenação de Mobilização e Logística - CMLOG
Divisão de Prospecção e Desenvolvimento de Produtos - DIPRO
c/c Coordenação-Geral de Administração-CGA
Coordenação de Contratações Públicas - CCP

ASSUNTO: Padronização do Sistema de armas Glock.

Encaminho, de Ordem do Senhor Diretor de Administração e Logística, a PORTARIA NORMATIVA PRF Nº 8, DE 23 DE OUTUBRO DE 2020 (SEI 28588156) devidamente publicada no Diário Oficial da União na data de 28/10/2020, para conhecimento.

FELIPE LINHARES LUSTOSA DA COSTA
Chefe da Divisão de Apoio à Gestão

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