



U.S. Army Research, Development and Engineering Command

NATO Small Arms Ammunition Interchangeability via Direct Evidence Testing




Presented by:
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Overview



- 
- NATO Structure
 - Sub-Group 1 Structure
 - Interchangeability
 - Standardization Agreements
 - Manuals of Proof and Inspection
 - NATO Interchangeability Testing
- NATO Test Centers
 - Function & Casualty
 - NATO Nominated Weapons
 - Interchangeability Benefits
 - SG/1 History
 - SG/1 Current Thrusts
 - Conclusion



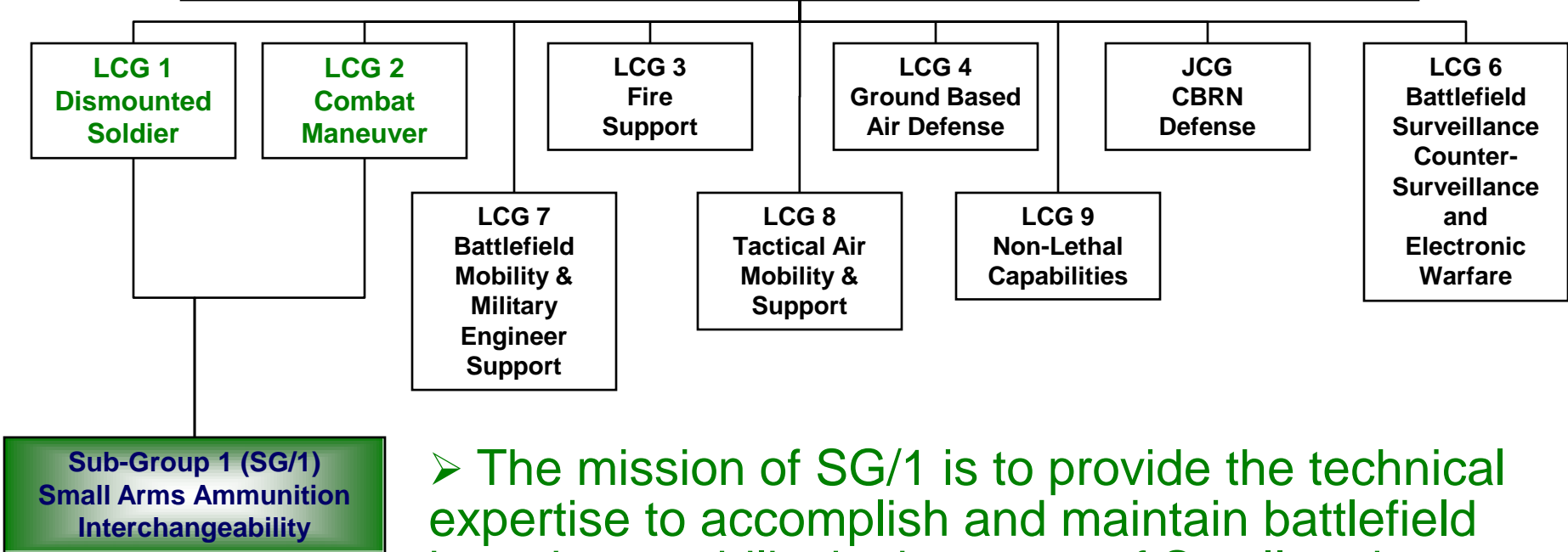
NATO Structure



North Atlantic Council (NAC)

Conference of National Armament Directors (CNAD)

AC/225 - NATO Army Armaments Group (NAAG)



➤ The mission of SG/1 is to provide the technical expertise to accomplish and maintain battlefield interchangeability in the areas of Small and Cannon Calibre Ammunition through direct evidence testing at NATO Certified Test Centers.

LCG = Land Capability Group

JCG = Joint Capability Group



Sub-Group 1 Structure



Austria



Belgium



Canada



Czech Republic



Denmark



Estonia



France



Germany



Greece



Hungary

International Military Staff

Chairman Fritdjof Guth (The NETHERLANDS)

Secretary SG/1
NATO Land Armaments

European Regional Test Center - ERTC
(Pendine, Wales, UK)

ERTC Superintendent

26 Member National Delegates & Several PFP National Delegates

National Support Staff & Ammunition/Weapon Manufacturers

North American Regional Test Center - NARTC
(Independence, Missouri, USA)

NARTC Superintendent



United States



United Kingdom



Turkey



Switzerland



Sweden



Spain



Slovenia



Slovakia



Romania



Norway



Netherlands



Italy



Iceland



Lithuania 4



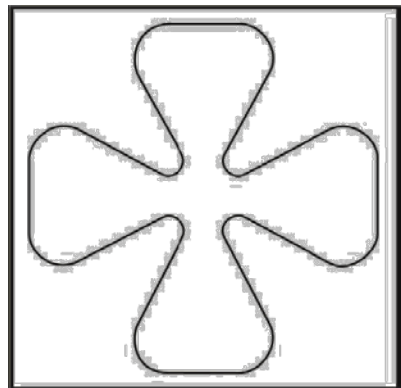
What is Interchangeability?



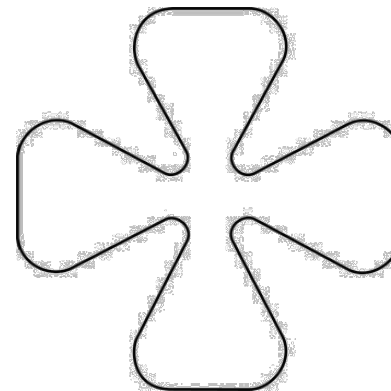
- Interchangeability – Items possessing similar functional and physical characteristics that are equal in performance, and capable of being exchanged one for the other without alteration
 - Interoperability – The ability of systems, units or forces to provide services to and accept services from other systems, units or forces and to use the services so exchanged to enable them to operate effectively together
 - Compatibility – Capability of two or more items or components of equipment or material to exist or function in the same system or environment without mutual interference
 - Standardization - Within NATO, the process of developing concepts, doctrines, procedures, and designs to achieve and maintain the most effective levels of compatibility, interoperability, interchangeability and commonality in the fields of operations, administration and materiel



NATO Symbols of Interchangeability



Cartridge & Link



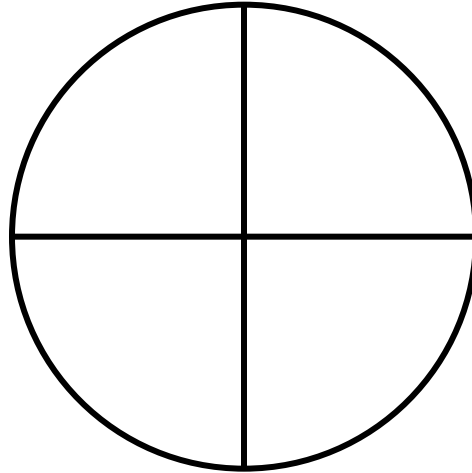
Cartridge Only

The NATO Symbol of Interchangeability is the only symbol that ensures that the packaged ammunition design can be exchanged on the battlefield as evidenced through successful NATO testing





NATO Design Mark



Within NATO small caliber ammunition standardization, the NATO Design Mark has no official significance. It is generally accepted that the ammunition with this mark should, but cannot be guaranteed, to chamber correctly in a weapon. It should not be assumed though, that it will produce the expected performance or necessary level of safety required by the STANAG and MOPI.



Battlefield Interchangeability



Requirements

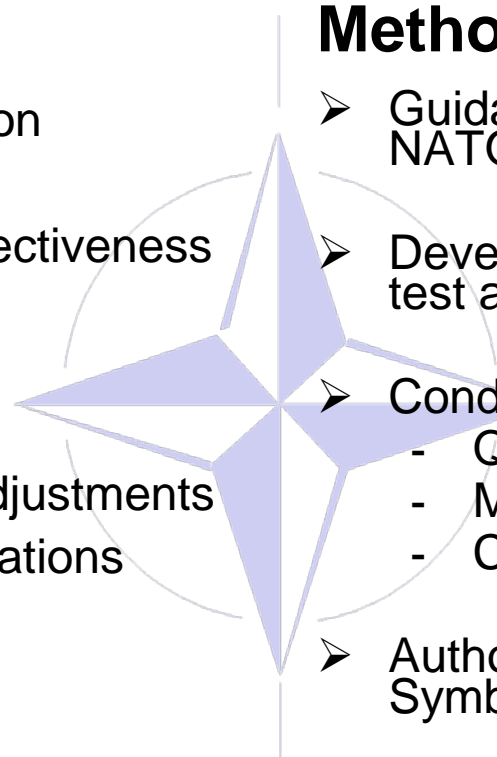
- Proper Weapon Function
- Safety of Gunner
- Adequate Terminal Effectiveness

Without The Need For :

- Weapon Adjustments
- Sight or Fire Control Adjustments
- Range or Mission Limitations
- Ammunition Repack

Method of Accomplishment

- Guidance from higher levels within NATO (NAAG, LCG/1 & 2)
- Develop technical requirements, test and inspection methods
- Conduct direct evidence testing to:
 - Qualify ammunition designs
 - Monitor designs in production
 - Check designs in storage
- Authorize the use of the NATO Symbol of Interchangeability
- Develop solutions to technical and procedural problems within the ammunition community





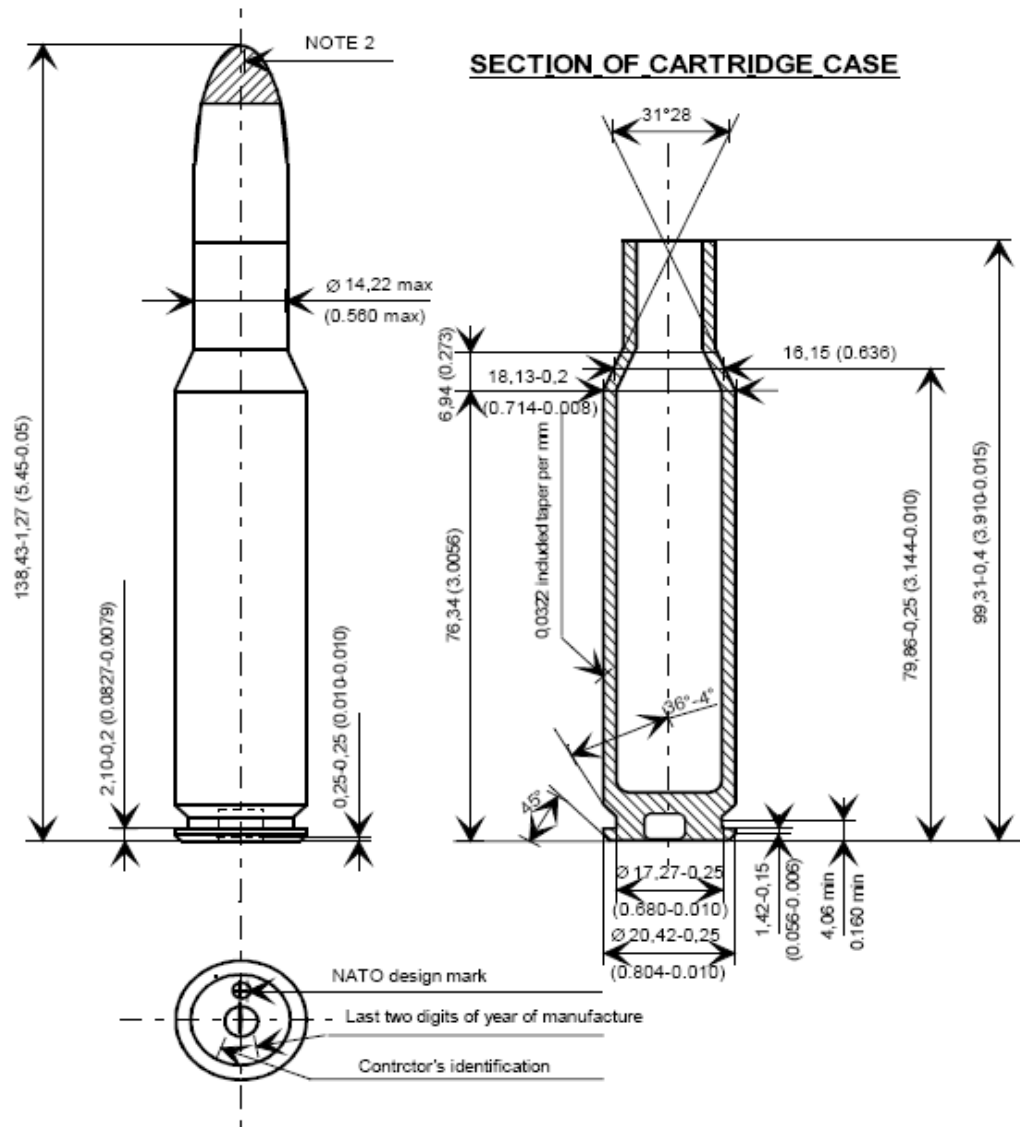
NATO Standardization Agreement (STANAG)



- A STANAG is an agreement among several or all member nations to adopt like or similar military equipment, ammunition, supplies and stores, as well as operational, logistic and administrative procedures
- SG/1 standardizes the essential characteristics of various small and medium caliber ammunition to ensure interchangeability on the battlefield
- Each STANAG contains performance requirements only, it does not address sample sizes or accept/reject criteria
- Each STANAG contains drawings outlining the exterior cartridge and case dimensions and characteristics
- STANAGs are NOT intended to be utilized for acquisition and are NOT intended to take the place of a national specification



Standardization Drawing





Manual Of Proof & Inspection (MOPI) and Multi-Caliber MOPI



- The MOPI details the testing to be conducted to ensure that the ammunition meets the requirements of the appropriate STANAG
 - The MOPI prescribes test methods, inspection procedures and equipment needed to perform the subject testing/inspection
 - The MOPI includes sample sizes and accept/reject criteria for each test/inspection
- Sub-Group 1 is the only group within NATO to create and utilize these manuals to ensure functional interchangeability on the battlefield
- The NATO MOPIs are used throughout government/industry and have become THE standard for test procedures in the ammunition community
- The M-C MOPI was developed to prescribe uniform test procedures across 5.56mm, 7.62mm, 9mm and 12.7mm ammunition in order to eliminate/reduce inconsistencies and to clarify/simplify procedures.



NATO Qualification Approval (QA)



- Conducted once for each ammunition design (and link if applicable) to confirm compliance with the STANAG & MOPI
- The submitting NATO nation shall have declared the ammunition design safe and suitable for use by their armed forces and have already procured or produced the ammunition
- After successful completion, a NATO design number is assigned to identify the qualified design. The submitting NATO nation then is granted authority to apply the NATO Symbol of Interchangeability to the outer pack of all ammunition
- It is NOT possible for manufacturers or non-NATO nations to submit ammunition independently for NATO QA testing



NATO Production Test (PT)



- Conducted annually to ensure that production of qualified designs continues to comply with the STANAG
- If a sample is not submitted, current/future production cannot be marked with the NATO Symbol
- When more than one manufacturer produces the same qualified design, a sample from each manufacturer must be submitted for separate PTs
- SG/1 maintains an official list of qualified designs which also shows when the last successful PT was completed
- It is NOT possible for manufacturers or non-NATO nations to independently submit ammunition for NATO Production Testing



NATO Production Test Failures



- Suspend the NATO qualified status of the ammunition produced since the last successful PT
- Prohibit the use of the NATO Symbol of Interchangeability until a new sample has passed the PT
- Remove the NATO Symbol of Interchangeability or constrain/ quarantine the affected ammunition from issue to any NATO multi-national forces
- Present the results of the failed PT to SG/1 for a decision on the acceptability of previous production and use of the NATO Symbol of Interchangeability on following production
- Submit a new PT sample when issue has been resolved/corrected



NATO Surveillance Test



- Conducted after specified storage intervals (10, 15, 20 years) to ensure that ammunition bearing the NATO Symbol of Interchangeability continues to meet NATO requirements
- Acceptance criteria is the same (with the exception of tracer performance) as for new production.
- Failure of the ammunition to meet the NATO requirements requires the NATO nation to remove the NATO Symbol of Interchangeability or constrain/quarantine the affected ammunition from issue to any NATO coalition forces



Tests Conducted For NATO Small Caliber Ammunition



QUALIFICATION

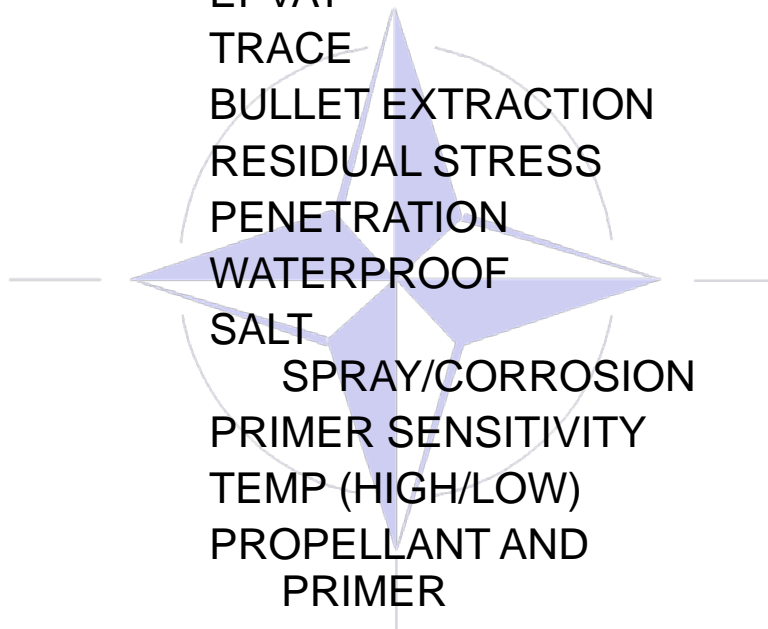
PRECISION
FUNCTION & CASUALTY
EPVAT
TRACE
BULLET EXTRACTION
RESIDUAL STRESS
PENETRATION
WATERPROOF
SALT
 SPRAY/CORROSION
PRIMER SENSITIVITY
TEMP (HIGH/LOW)
PROPELLANT AND
 PRIMER
 ANALYSIS
SMOKE AND FLASH
TRAJECTORY MATCH
BARREL EROSION
CLIMATIC STORAGE

PRODUCTION

PRECISION
FUNCTION & CASUALTY
EPVAT
TRACE
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PRIMER SENSITIVITY
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 PRIMER
 ANALYSIS
SMOKE AND FLASH
TRAJECTORY MATCH

SURVEILLANCE

PRECISION
FUNCTION & CASUALTY
EPVAT
TRACE
SMOKE AND FLASH
TRAJECTORY MATCH





NATO Regional Test Centers



- The NATO Regional Test Centers (RTC) are considered Centers Of Excellence within the NATO Community
- The RTCs The United Kingdom and United States fund, staff, equip, maintain and manage the ERTC and NARTC respectively
- The NATO RTCs are the only two facilities alike in the world
 - Unique with respect to test facilities (equipment/trained personnel)
 - Act as an independent tester/evaluator
 - Settle international testing issues and disputes
- The NATO RTCs perform the following:
 - Qualification, Production, and Surveillance Testing
 - Conduct NATO National Test Center certification/inspection
 - Range Standardization Testing
 - New/Replacement Equipment Evaluations
 - STANAG/MOPI Development
 - Reference Ammunition Assessment
 - NATO Nominated Weapon Evaluations
 - Engineering Studies



NATO National Test Centers



- National Test Centers (NTCs) are certified by caliber
- NTCs are inspected by the RTC Superintendents & staff
- NTCs are approved by SG/1
- NTCs may conduct the following:
 - Range Standardization Testing
 - New/Replacement Equipment Evaluations
 - New National Design verification against STANAG & MOPI criteria
 - Existing design verification prior to PT submission to RTC
 - NATO Surveillance Testing
- There are currently 10 NATO Certified National Test Centers
 - Belgium (5.56mm/7.62mm/9mm/12.7mm)
 - Greece (5.56mm/7.62mm/12.7mm)
 - Canada (5.56mm/7.62mm/9mm/12.7mm)
 - France (5.56mm/7.62mm/9mm/12.7mm)
 - Germany (5.56mm/7.62mm/9mm)
 - Italy (5.56mm/7.62mm/9mm)
 - Norway (7.62mm/12.7mm)
 - Spain (7.62mm/9mm)
 - United Kingdom (5.56mm/7.62mm/9mm)
 - United States (5.56mm/7.62mm/9mm/12.7mm)



Function & Casualty Test



- One of the most important, informative tests for SG/1
- Proves that a foreign ammunition design will work in foreign weapon systems
- Conducted with NATO Nominated Weapons (NNW)
 - Weapon must function with all Qualified Designs to be considered for a NNW
 - NNWs represent currently fielded weapons, each NATO nation completes a National Fielded Weapon Survey to ensure
- Test samples are fired through each NNW at cold, hot, and ambient temperatures
- Test samples are fired in both semi-auto and automatic mode (where applicable)



9mm NATO Nominated Weapons



Belgium – FN Browning Hi Power Pistol



Italy – Beretta 92F Pistol



Italy – Beretta 12S Sub Machine Gun



5.56mm NATO Nominated Weapons



Belgium – FN Minimi Machine Gun



Belgium – FN FNC Rifle



Italy – Beretta AR 70/90 Rifle



5.56mm NATO Nominated Weapons (cont.)



Germany – H&K G36 Rifle



United States – Colt M16A2/A4 Rifle



United Kingdom – H&K L85A2 Rifle



7.62mm NATO Nominated Weapons



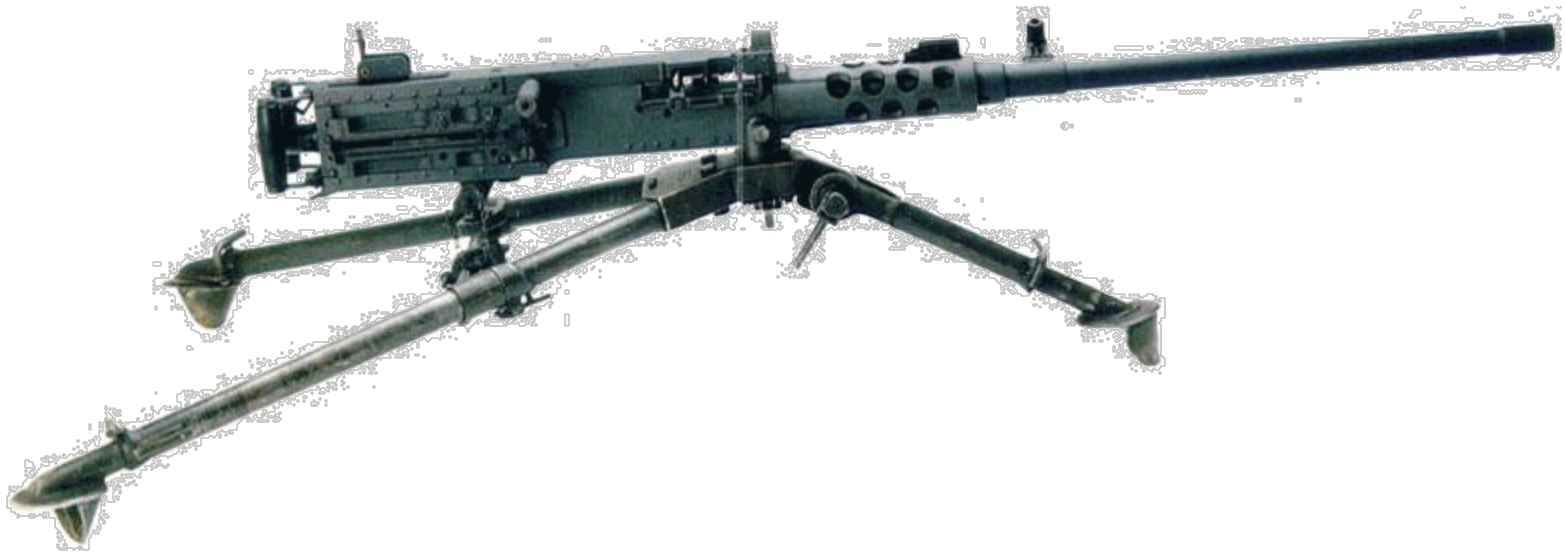
United States – M240B Machine Gun



United Kingdom – Enfield L7A2 General Purpose Machine Gun



12.7mm NATO Nominated Weapon



United States – General Dynamics M2 Heavy Barrel Machine Gun



Potential NATO Nominated Weapons



- 30mm x 173
 - United States - ATK MK44 Bushmaster II Automatic Cannon
 - Germany - Mauser MK30-2 Automatic Cannon
- 40mm x 46 LV
 - United States - Colt M203 Launcher (12" Barrel)
 - Canada - Colt Canada M203A1 Launcher (9" Barrel)
 - Germany - H&K AG36 Launcher
- 40mm x 53 HV
 - United States – GD MK19 MOD3 Automatic Grenade Launcher
 - United States – GD MK47 Advanced Lightweight Grenade Launcher
 - Germany – H&K 40 x 53mm Grenade Machine Gun (GMG)
 - Spain – Santa Barbara SB LAG-40 M2 Automatic Grenade Launcher



NATO Interchangeability Benefits



- Supports NATO and Coalition Warfare – Forces operate side by side more than ever before
- Supports the need for small arms ammunition which is integral in current operations
- Provides significant ammunition stockpile multiplier - The available world market for small arms ammunition is becoming increasingly smaller
 - Significant participation from non-NATO nation ammunition manufacturers
- Provides Logistic, Strategic and Tactical Advantages
 - NATO Nations Do Use Each Other's Ammunition Successfully as Evidenced Through Experience in Bosnia / Afghanistan / Iraq
- Many nations only purchase NATO Qualified Ammunition Designs and NATO Nominated Weapon Systems



Sub-Group 1 (SG/1) History



- 1957 – 7.62mm ammunition STANAG 2310 ratified
- 1959 – 1st NATO Qualification of 7.62mm Ball (Canada)
- 1962 – 9mm ammunition STANAG 4090 ratified
- 1964 – 1st NATO Qualification of 9mm Ball (Belgium)
- 1969 – 7.62mm link STANAG 2329 ratified
- 1981 – 5.56mm ammunition STANAG 4172 ratified
- 1985 – 25mm x 137 ammunition STANAG 4173 ratified (*no longer active*)
- 1987 – 1st NATO Qualification of 5.56mm Ball (U.S.)
- 1991 – 40mm x 53 High Velocity Grenade Ammunition efforts initiated
- 1993 – 1st NATO Qualification of 25mm HEI-T/TP-T (U.S.)
- 1997 – 12.7mm (Caliber .50) ammunition STANAG 4383 ratified
- 2000 – 30mm x 173 ammunition efforts initiated
- 2001 – 40mm x 46 Low Velocity Grenade Ammunition efforts initiated
- 2007 – 1st NATO Qualification of 12.7mm Ball and Trace (Canada)
- 2008 – 25mm x 137 ammunition activities no longer supported
- 2010 – 30mm x 173 ammunition STANAG 4624 distributed for ratification



SG/1 Record Of Activity



- To date 97 ammunition designs have been NATO Qualified submitted by 13 different NATO nations

- 5.56mm – 22 Designs
- 7.62mm – 47 Designs
- 12.7mm – 4 Designs
- 9mm – 22 Designs
- 25mm – 2 Designs



- 12 NATO small caliber NNW systems from 5 different NATO nations (many of these weapons are utilized in many other armed forces around the world)





SG/1 Current Thrusts



- NATO QA Testing Pending on five (5) 5.56mm Ball, two (2) 5.56mm Trace, two (2) 7.62mm Trace, one (1) 7.62mm AP and one (1) 9mm Ball designs
- 30mm x 173 STANAG & MOPI distributed for approval and ratification
- MOPI for 40mm Low Velocity Grenade Ammunition Standardization nearly complete, reference lot to be produced in 2012.
- Development of a Multi-Caliber MOPI for 5.56mm, 7.62mm, 9mm and 12.7mm near completion. STANAGs will be updated accordingly.
- Resolving technical issues with 40mm High Velocity STANAG and MOPI
- ERTC facilitization for 12.7mm and NTC facilitization for all calibers ongoing
- National Fielded Weapon Surveys to ensure that the family of NATO Nominated Weapons is well represented with weapons currently in the field
- Coordinate efforts with NSA-AWG* and SG/1 to increase validity of AOP-6
- Development of requirements and creation of new NATO Reference Lots for 5.56mm, 9mm and 40mm LV
- Updating RTC test equipment – digital data collection (Precision and TM, F&C, Trace)



Conclusion



- NATO Small Arms Ammunition – one of the most important and widely used items on the battlefield and in peace-keeping operations
- SG/1 is the only group within NATO which actually demonstrates the ability of a foreign weapon system to function safely and satisfactorily with another nation's ammunition
- SG/1 offers continuous proof through direct evidence testing of the ability to interchange ammunition between NATO soldiers on the battlefield



Questions?





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