

ESTTA Tracking number: **ESTTA596275**

Filing date: **04/02/2014**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE TRADEMARK TRIAL AND APPEAL BOARD

Notice of Opposition

Notice is hereby given that the following party opposes registration of the indicated application.

Opposer Information

Name	Olin Corporation
Granted to Date of previous extension	04/02/2014
Address	7700 Bonhomme, Suite 400 St. Louis, MO 63105 UNITED STATES
Attorney information	Bryan K. Wheelock Harness, Dickey & Pierce, PLC 7700 Bonhomme, Suite 400 St. Louis, MO 63105 UNITED STATES bwheelock@hdp.com, jsamuels@hdp.com, litsupport@hdp.com Phone:314-726-7500

Applicant Information

Application No	85786149	Publication date	12/03/2013
Opposition Filing Date	04/02/2014	Opposition Period Ends	04/02/2014
Applicant	International Watchman, Inc. 4301 Manhattan Ave. Brunswick, OH 44212 OH		

Goods/Services Affected by Opposition

Class 013. First Use: 0 First Use In Commerce: 0 All goods and services in the class are opposed, namely: Firearms; ammunition; explosives; guns;rifles; airsoft rifles and guns not forrecreational use, bb guns; pellet guns;assault rifles; revolvers; hunting rifles; shotguns; magazines for weapons; gun, rifle, shotgun and machine gun cartridges; Loading clips for small arms; hand guns; bullets; fireworks; gun cases; gunbarrels; rifle barrels; bipods for weapons; muskets; holsters
--

Grounds for Opposition

False suggestion of a connection	Trademark Act section 2(a)
The mark is merely descriptive	Trademark Act section 2(e)(1)
The mark is deceptively misdescriptive	Trademark Act section 2(e)(1)

Mark Cited by Opposer as Basis for Opposition

U.S. Application/	NONE	Application Date	NONE
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Registration No.			
Registration Date	NONE		
Word Mark	NATO		
Goods/Services	Ammunition		

Attachments	Notice of Opposition Against Intl Watchman Inc.PDF(10838 bytes) Ex A.PDF(2082332 bytes) Ex B.PDF(1801936 bytes) Ex C.PDF(5738909 bytes) C-1.PDF(5693187 bytes) Ex D.PDF(3976699 bytes) Ex E.PDF(3582221 bytes) Ex F.PDF(1673225 bytes) Ex G.PDF(3730640 bytes)
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Certificate of Service

The undersigned hereby certifies that a copy of this paper has been served upon all parties, at their address record by First Class Mail on this date.

Signature	/Bryan K. Wheelock/
Name	Bryan K. Wheelock
Date	04/02/2014

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE TRADEMARK TRIAL AND APPEAL BOARD**

In re U.S. Trademark Application Serial No. 85/786149 for “NATO” filed
Nov. 23, 2012 and Published in the *Official Gazette* on December 3, 2013

Olin Corporation,)	
)	
Opposer,)	
)	
v.)	Opposition No. _____
)	
International Watchman, Inc.)	
)	
)	
Applicant.)	

NOTICE OF OPPOSITION

Olin Corporation, a corporation of the State of Virginia, having a principal place of business at 190 Carondelet Plaza, Suite 1530, St. Louis, Missouri 63105, (hereinafter “Olin” or “Opposer”), believes that it is being damaged, and will be damaged, by the registration of the mark shown in Application Serial No. 85/786149 (the “‘149 Application”), in International Class 13 by International Watchman, Inc. (“Applicant”), filed on November 23, 2012 and published December 3, 2012, and hereby opposes the same.

The grounds for the opposition are as follows:

1. Opposer is a leading manufacturer of ammunition products and through its Winchester brand, provides a broad range of products, including sporting ammunition, reloading components, small caliber military ammunition and components, and industrial cartridges.
2. Since long prior to the filing date of the ‘149 Application, Opposer has continuously used terms comprising “NATO” in interstate commerce to identify ammunition marketed and sold to its customers, including, to the armed forces of member countries in the

North Atlantic Treaty Organization (commonly referred to as “NATO”) and Opposer intends to continue such use.

3. Opposer uses “NATO” in connection with its sale of ammunitions in International Class 13. *See* Ex. A, B.

4. On November 23, 2012, Applicant filed the ‘149 Application for “NATO” for “Firearms; ammunition; explosives; guns; rifles; airsoft rifles and guns not for recreational use, bb guns; pellet guns; assault rifles; revolvers; hunting rifles; shotguns; magazines for weapons; gun, rifle, shotgun and machine gun cartridges; Loading clips for small arms; hand guns; bullets; fireworks; gun cases; gun barrels; rifle barrels; bipods for weapons; muskets; holsters” in International Class 13, alleging an intent to use under 1(b).

5. Opposer’s use of “NATO” pre-dates the filing date of the ‘149 Application. If Applicant’s mark is allowed to register, Applicant will obtain at least a prima facie exclusive right to use the term in certain contexts, thereby clouding Opposer’s right to continue to use “NATO” in its own endeavors.

6. The primary significance of “NATO” to the relevant public is as an identifier of the North Atlantic Treaty Organization. *See* www.nato.int.

7. The primary significance of “NATO” used on or in connection with ammunition and the other goods and services listed in the ‘149 Application is an indication that the goods and services comply with or meet standards established by the North Atlantic Treaty Organization for such goods and services.

8. NATO is commonly used to designate a specific type of ammunition designed for use by the armed forces of North Atlantic Treaty Organization member countries in the course of their duties under the 1949 North Atlantic Treaty. The purpose of this “NATO designation” is to

standardize calibers for use in specific firearms commissioned by the North Atlantic Treaty Organization member countries. *See* Ex. C, D. For example, ammunition is sold as “9mm NATO,” “7.62 NATO,” “7.62x51mm NATO,” “5.56 NATO,” and “5.56x45mm NATO.” ”*See* Ex. C, D, E, F, G. The significance and meaning of NATO marked ammunition is well understood in the industry to designate ammunition of sizes and quality specified by North Atlantic Treaty Organization member countries for use by NATO armed forces.

9. Upon information and belief, Applicant is not connected to NATO.

10. Applicant’s mark is identical to the famous NATO.

11. Accordingly, Applicant’s mark “[c]onsists of or comprises . . . matter which may . . . falsely suggest a connection with . . . institutions” in violation of Section 2(a) of the Lanham Act (15 U.S.C. §1052(a)). Specifically, registration of the ‘149 Application may lead consumers to inaccurately believe that NATO has some official relationship with a commercial entity making products under the “NATO” name.

12. Further, the ‘149 Application “[c]onsists of a mark which (1) when used on or in connection with the goods of the applicant is merely descriptive or deceptively misdescriptive of them” in violation of Section 2(e)(1) of the Lanham Act.

13. Persons that encounter Applicant’s products marked with NATO will believe that those products meet with or comply with the standards promulgated by NATO, or are otherwise approved by NATO. If this belief is correct, then the term “NATO” is merely descriptive of Applicant’s products. If this belief is incorrect, then the term “NATO” is deceptively misdescriptive of Applicant’s products, which is likely to result in serious injury or death by persons relying on the designation “NATO” to mean that the products comply with NATO standards or are interoperable with products that comply with NATO standards.

14. On information and belief, Applicant does not have any sales of ammunition, and does not have any current plans to produce ammunition, and thus lacks a bona-fide intent to use the NATO mark in interstate commerce for the goods and services identified in the '149 Application.

15. In light of the above facts, registration of the '149 Application should be refused pursuant to Section(s) 2(a) and 2(e)(1) of the Lanham Act, 15 U.S.C. § 1052(a), (e)(1).

WHEREFORE, Olin files this Notice of Opposition and prays that the aforesaid application of International Watchman, Inc., herein opposed; be refused; that no registration be issued thereon to Applicant; and for such other and further relief as may be deemed just and proper.

The Commissioner is hereby authorized to charge Deposit Account No. 08-0750 the amount of \$300 per class to cover the filing fees for this Notice of Opposition against the '149 Application. It is believed that this is the correct fee. However, the Commissioner is authorized to charge any additional fees to Deposit Account No. 08-0750 and requested to address all correspondence regarding this opposition to:

Bryan K. Wheelock
Harness, Dickey & Pierce, P.L.C.
7700 Bonhomme Avenue, Suite 400
St. Louis, Missouri 63105
Telephone: (314)726-7505
Facsimile: (314)726-7501
Email: bwheelock@hdp.com

Dated: April 2, 2014

Respectfully submitted by,

HARNES, DICKEY & PIERCE, P.L.C.

/Bryan K. Wheelock/
Bryan K. Wheelock
Joel R. Samuels
7700 Bonhomme, Suite 400
St. Louis, Missouri 63105
(314) 726-7500
FAX: (314) 726-7501
bwheelock@hdp.com
jsamuels@hdp.com

Attorneys for Opposer

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing was served via U.S. Mail, postage fully pre-paid, on this 2nd day of April, 2014, upon the following:

JOHN D. GUGLIOTTA
Law Offices of John D. Gugliotta, P.E.,
P.O. Box 506
RICHFIELD, OH 44286-9010

Attorney for Applicant

/Bryan K. Wheelock/

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Order today and get up to \$20 off your first order. Just our way of saying "Welcome!".

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Winchester NATO Ammunition 9mm Luger 124 Grain Full Metal Jacket

4.9 [Read 24 Reviews](#) [Write a Review](#)

Product Family #: 2900125956



Quantity:
50 500

\$17.49 -
\$158.99

Status: *Please Select Quantity*

Quantity:

[Add to Cart](#)

8+1 1

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Attention!
You must be 21 years or older to order ammunition. Ammo must ship UPS ground. Due to Department of Transportation regulations, we cannot accept returns on ammo. Please check local laws before ordering.

Product Information

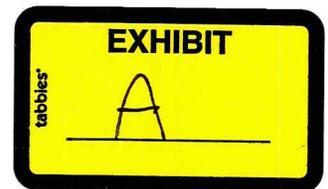
MidwayUSA was able to purchase a limited quantity of US **WINCHESTER** Military 9mm Luger handgun ammunition manufactured by Winchester. This ammunition is known to be extremely reliable and consistent. Loaded to NATO specifications, Q4318 is the same ammunition is currently being shipped to American soldiers overseas. Don't miss your opportunity to purchase this very limited availability ammunition.

Technical Information

- Caliber: 9mm Luger
- Bullet Weight: 124 Grains
- Bullet Style: Full Metal Jacket
- Case Type: Brass

Ballistics Information:

- Muzzle Velocity: 1140 fps
- Muzzle Energy: 358 ft. lbs.
-



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Customer Reviews

REVIEW SUMMARY

4.9 (based on 24 reviews)

100% of respondents would recommend this to a friend.

[Write a Review >>](#)

Reviewed by 24 customers

Sort by **Newest**

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By Jim

from Lake county, FL

5.0 **Quality Practice Ammo at a decent price**

1/14/2014

About Me **Enthusiast, Home Owner, Hunter, Reloader, Rifleman**

I use this ammo to stay sharp with my Beretta PX4 Storm. It's always worked perfectly, never a misfire or a jam.

BOTTOM LINE Yes, I would recommend this to a friend

Was this review helpful? / - You may also flag this review

By John

from Central, IL

5.0 **Winchester NATO 9mm**

1/10/2014

About Me **Casual/ Recreational, Collector, Enthusiast**

Very good practice/plinking ammo. Glock hand guns cycle this ammo very well. It is hotter than other 124gr ammo, similar to +p. Not recommended for cheap or poorly made firearms.

BOTTOM LINE Yes, I would recommend this to a friend

Was this review helpful? / - You may also flag this review

By TXShooter

from San Antonio, TX

5.0 **Excellent reange ammo for picky handguns**

1/10/2014

About Me **Casual/ Recreational, Collector, Home Owner, Hunter**

Solid ammo. Never had any issues with it, and more importantly it fires flawlessly in my Beretta M9 and Nano. Both of those handguns don't do well with the generic 115gr range ammo, needing a little extra power to cycle properly. It also fires clean and performs very similarly to my standard +P SD load.

BOTTOM LINE Yes, I would recommend this to a friend

Was this review helpful? / - You may also flag this review

By Nil Desperandum

from Downers Grove, IL

5.0 **Good stuff**

1/9/2014

About Me **Casual/ Recreational**

I've run two or three hundred rounds through my PX4 Storm without a single malfunction. It is a ever so slightly snappier than than standard 115 grain stuff, but certainly manageable. I did confirm that the Beretta could handle what amounts to a +P charge before I bought it. My son has had the same good experience with this product in his Glock 19.

Substrate Products



CCI Blazer Brass Ammunition 9mm Luger 124 Grain Full Metal Jacket...
\$12.99 - \$252.99

[Select Options](#)



Magtech Sport Ammunition 9mm Luger 124 Grain Full Metal Jacket...
\$12.79 - \$239.99

[Select Options](#)



Remington UMC Ammunition 9mm Luger 124 Grain Full Metal Jacket...
\$16.99 - \$159.99

[Select Options](#)



Winchester USA WinClean Ammunition 9mm Luger 124 Grain Brass...
\$19.49 - \$184.99

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Suggested Products

< 1 2 >



MidwayUSA Compact Competition Range Bag...
\$29.99

[Select Options](#)



MTM Survivor Ammunition Can Plastic Black...
\$21.99

[Add to Cart](#)



Caldwell Orange Peel Target 8" Self-Adhesive Bullseye Package...
\$16.49

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Caldwell Orange Peel Target 12" Self-Adhesive Bullseye...
\$8.69 - \$64.99

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Others Bought

< 1 2 3 >



Fiocchi Shooting Dynamics Ammunition 380 ACP 95 Grain Full...
\$16.79

[Add to Cart](#)



Glock Magazine Gen 4 Glock 17, 34 9mm Luger Polymer Black...
\$24.99

[Select Options](#)



TulAmmo Ammunition 7.62x39mm Russian 124 Grain Hollow Point...
\$6.39 - \$277.99

[Select Options](#)



Weatherby Ammunition 270 Weatherby Magnum 130 Grain Norma...
\$37.49

[Add to Cart](#)

Popular Categories

BOTTOM LINE Yes, I would recommend this to a friend
Was this review helpful? / - You may also flag this review

By Force Multiplier
from Peoples Republic of MD

5.0 **Buy this! Better than the cheap stuff.** 1/9/2014

About Me **Enthusiast**

Ultra reliable, crisp ammo that will help with practice to simulate firing a hot load that is typically used in home defense.

BOTTOM LINE Yes, I would recommend this to a friend

Was this review helpful? / - You may also flag this review



Rifle Ammunition



Handgun Ammunition



Rimfire Ammunition



Shotgun Ammunition

By Guy
from Winthrop WA

5.0 **Winchester NATO 9mm** 12/3/2013

About Me **Casual/ Recreational, Home Owner, Hunter**

This is excellent ammo I have had zero problems every shot on target and it has a good snap to it.

BOTTOM LINE Yes, I would recommend this to a friend

Was this review helpful? / - You may also flag this review

By Old Gray Man
from South Arkansas

5.0 **Best ammo for practice available** 12/2/2013

About Me **Enthusiast, Road Warrior**

This is the best ammo available for practice. Feeds flawlessly, shoots true and leaves the weapon reasonably clean. It does carry some pop so if you have an old firearm that shouldn't handle +P rounds this isn't for you.

BOTTOM LINE Yes, I would recommend this to a friend

Was this review helpful? / - You may also flag this review

By Louis
from Melbourne, FL

(1 of 2 customers found this review helpful) 11/27/2013

5.0 **This NATO is GREAT!**

About Me **Enthusiast, Home Owner, Hunter**

I use this ammo at the range, and sometimes on the range. This is my practice load for my EDC, Baby Desert Eagle II 9mm. It mimics my carry load very closely, Win Ranger T-Series 124 grain +P. The point of impact is virtually identical, as well as the recoil, which is mild for a +P load, just like the Ranger T. I also take this with me when I go hunting, for my sidearm load. It has some velocity behind it, and gives you much better penetration than a hollow point. Of course, that is only in an emergency, as my rifle is my primary weapon while hunting. Just good to know its there if you should need it. Plus, it makes for some fun at camp plinking competitions. Overall this product is a great value, and serves multi purposes. Just make sure your weapon is +P rated. Most newer models can handle it. Although, the parts may wear out slightly faster than with a standard pressure loads.

BOTTOM LINE Yes, I would recommend this to a friend

Was this review helpful? / - You may also flag this review

By kmurray96
from Central Jersey

(4 of 5 customers found this review helpful) 5/3/2013

5.0 **Best ever! 25-year retired LEO**

Best range ammo I ever used. Clean burning and accurate. Never a bobble. I've shot over 1000 rds through a G26 Gen4 and can hit 2 golf balls at 7 yards at least twice out of each mag.

BOTTOM LINE Yes, I would recommend this to a friend

Was this review helpful? / - You may also flag this review

By **Branden**
from **Durham, CA**

(1 of 1 customers found this review helpful)

7/13/2012

5.0 **Does what it is intended ...**

Does what it is intended to do. I'm happy with it.

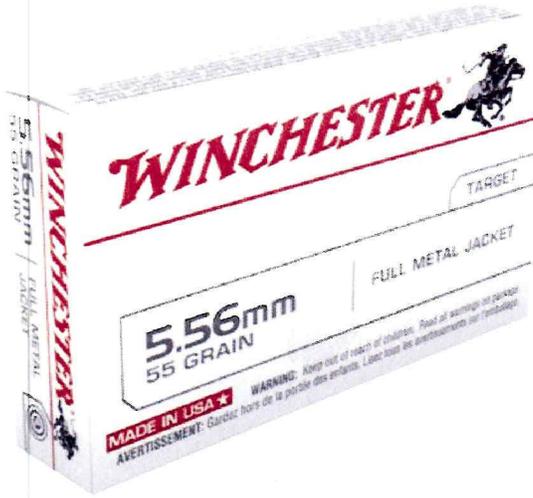
Was this review helpful? / - You may also flag this review

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NOTE: Prices, specifications and availability are subject to change without notice. We reserve the right to correct typographic, photographic and/or descriptive errors.



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Photo may not depict available caliber and quantity. Refer to order chart for available calibers and quantities. Carefully review your final order to ensure you will be receiving your desired caliber and quantity.

[See Select Items on Sale](#)

Regular Price: \$11.99 - \$32.99
Sale Price: \$11.99 - \$32.99

Item: IK-210889

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Shown: 5.56mm 55-Grain FMJ



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Description Product Research Related Items Customer Reviews (105) Q & A



Text Size: [A](#) [A](#) [A](#)

Winchester® USA Rifle Ammunition

- New-manufacture reloadable brass cases
- Noncorrosive boxer primers
- Made in the USA.

Winchester USA ammunition is made for the high-volume shooter who demands consistent accuracy with no barrel leading. All rounds are loaded with new-manufacture reloadable brass cases and noncorrosive boxer primers. Offered in popular calibers for high-volume shooting. **Made in the USA.**

Available:

- **.223 Rem.** – Topped with a 55-gr. FMJ bullet. With a muzzle velocity of 3,240 fps, it's a perfect round for targets, training or plinking.
- **.22-250 Rem.** – A dependable varmint round. Features a jacketed hollow point bullet for explosive fragmentation and pin-point accuracy. 4,000 fps. muzzle velocity.
- **7.62x51 NATO** – You'll enjoy shooting you M1A or AR-10 even more when you're shooting ammo loaded to strict NATO standards. Ideal for use in semi-auto firearms. FMJ bullet produces a muzzle velocity of 2,800 fps.

WARNING: You must be 18 or older to purchase rifle or shotgun ammunition and 21 or older to purchase handgun ammunition. All ammunition will be shipped ground UPS. **For safety reasons, we do not accept returns on ammunition.** Always make sure you use the correct ammunition for your specific firearm. Check your local laws for any other regulations.

Overall Customer Rating:

★★★★☆ 4.6 out of 5

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Product Questions and Answers

7 questions | 28 answers [Read all Q&A](#)

Additional Information

- [Buyer's Guide](#)
- [Ballistics Calculator](#)

[See Product Research >>](#)

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ATTENTION: Residents of CA, CT, DE, DC, IL, KS, MA, NY and OH, please check your local laws for restrictions before ordering any ammunition products.

Winchester® USA Rifle Ammunition

Caliber	Bullet Weight	Bullet Type	Number of Rounds	Velocity (fps)	Quantity	Price
.223 Remington	45 Grain	JHP	Per 20		<input type="text" value="1"/>	Regular Price: \$31.99 In Stock
.223 Remington	55 Grain	FMJ	Per 20	3,240	<input type="text" value="1"/>	Regular Price: \$11.99 In Stock

5.56 NATO	55 Grain	FMJ	Per 20	3,270	<input type="text" value="1"/>	Regular Price: \$12.99 Sale Price: \$11.99 In Stock
5.56 NATO	62 Grain	FMJ (Green Tip-Steel Penetrator)	Per 20	2,900	<input type="text" value="1"/>	Regular Price: \$13.99 Sale Price: \$12.99 In Stock
.22-250 Remington	45 Grain	JHP	Per 40	4,000	<input type="text" value="1"/>	Regular Price: \$32.99 Backorderable

7.62 x 51 NATO	147 Grain	FMJ	Per 20	2,800	<input type="text" value="1"/>	Regular Price: \$20.99 Sale Price: \$16.99 In Stock
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FMJ = Full Metal Jacket, JHP = Jacketed Hollow Point



NATO Army Armaments Group



Weapons & Sensors



Per G. Arvidsson

Chairman

Weapons & Sensors Working Group

Land Capability Group 1 - Dismounted Soldier

NATO Army Armaments Group

Tel: +46-8-782 4181, Fax: +46-8-782 6412

E-mail: per.arvidsson@fmv.se

Web-site: www.fmv.se





Agenda

- History of the two NATO rifle calibers.
- NATO Nominated Weapons.
- STANAG 4694 “NATO Accessory Rail”.
- National programs.
- Small arms lethality.

History of 7.62 NATO

- In WWII the Allies learned that ammunition supply was a nightmare.
- After NATO was founded in 1949, it was therefore decided to standardize calibers.
- USA proposed that the new rifle caliber should be the US developed .30 Light Rifle (7.62x51mm), which was a shortened .30-'06.
- GBR proposed the British 7.1x43mm intermediate caliber.
- In 1953 NATO standardized 7.62x51mm as the new rifle caliber.



History of 5.56 NATO

- In 1970 NATO decided to try to standardize a common rifle and a second rifle caliber.
- During 1977-1980 they therefore performed mutual tests with rifles and ammunition.
- The calibers tested were:
 - 5.56mm rounds with increased penetration from BEL and USA.
 - GBR 4.85mm round.
 - DEU 4.7mm caseless round.



USA
5.56
XM777

GBR
4.85

DEU
4.7

BEL
5.56
SS109

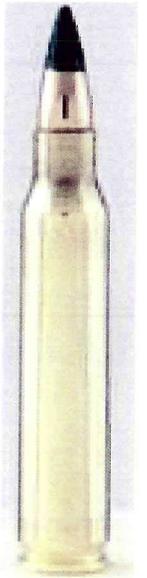
NATO rifle and ammunition trials 1977-1980



Country	Weapon	Caliber (mm)	Ammunition
Germany	G11	4.7	4.7 caseless
United Kingdom	4.85 IW	4.85	4.85
Belgium	FNC	5.56	SS109
Netherlands	MN 1 (Stoner 63)	5.56	M193
United States	M16A1	5.56	XM777
France	FAMAS	5.56	F1 brass and steel cased (M193 type)
United States (control)	M16A1	5.56	M193
Germany (control)	G3	7.62	7.62 NATO

The results

- No weapon could be agreed upon.
- Some were in their prototype status.
- The BEL SS109 round was found to be the best, and was standardized as NATO's second rifle caliber in 1980.



There is no NATO rifle!

- During the tests the US M16A1 was a control weapon.
- You can often see reference to:
 - NATO/STANAG magazine.
 - NATO/STANAG flash hider.
 - NATO/STANAG bayonet.
- There is currently no such thing!





NATO Nominated Weapons

- NNW's are used as reference when new ammunition is standardized.
- As of 2009 the 5.56mm rifles are:
 - FNC, Belgium
 - G36, Germany
 - AR70/90, Italy
 - L85A2, United Kingdom
 - M16A2, USA
- A new NNW must work with all qualified 5.56mm ammunition designs.



5.56mm NATO Ball Qualified Designs

NATO Design Number	Sponsoring Country	Head Stamp Initials	Publication Date	Manufacturer
AC/225-111A	USA	LC	30/06/1987	GOCO, Lake City, USA
		WCC		Olin Winchester USA
		TAA		205th Arsenal, Taiwan
AC/116-112A	BEL	FNB	14/11/1989	Fabrique Nationale, Belgium
AC/225-113A	ITA	SMI	12/04/1990	Europa Metall, Italy
AC/225-114A	GBR	RG	14/08/1995	Royal Ordnance, United Kingdom
AC/225-116A	BEL	FNB	16/11/1995	Giat Industrie, France
AC/225-117A	NLD	HP	15/05/1996	Hirtenberger, Austria
AC/225-118A	CAN	MI	17/01/1997	GD-OTS, Canada
AC/225-120A	PRT	FNM	31/08/1998	Indep, Portugal
AC/225-122A	ITA	GFL	11/01/1999	Fiocchi, Italy
AC/225-124A	GBR	RG	24/02/1999	Royal Ordnance, United Kingdom
AC/225-125A	DEU	DAG	10/03/2000	RUAG, Germany
		MEN		MEN, Germany
AC/225-126A	BEL, FRA	IMI	10/03/2000	IMI, Israel
AC/225-127A	SPA	SB	26/09/2000	Santa Barbara, Spain
AC/225-128A	NOR	CG	6/07/2004	NAMMO, Sweden
AC/225-130A	LIT	GGG	26/05/2005	GGG, Lithuania
AC/225-132A	GBR	RG	27/01/2006	BAE Systems Radway Green, United Kingdom
AC/225-133A	GBR	RG	30/01/2006	BAE Systems Radway Green, United Kingdom



W&S STANAG's

- We are currently updating STANAG's that were created during the cold war to better reflect current and future operation:
 - STANAG 4512 Dismounted Personnel Targets
 - STANAG 4513 Incapacitation & Suppression
 - STANAG 4498 Unarmoured Vehicles, Helicopters & Field Fortification Targets
 - STANAG 4536 Representative Building Targets
- STANAG 2129 - Identification of land forces on the battlefield and in an area of operation.
- STANAG 4694 NATO Accessory Rail.

NATO RTO study

- Ten Nations have under the umbrella of the NATO Research and Technology Organization (RTO) formed a team with the objective to standardize a NATO rail.
- Industry has been heavily involved.



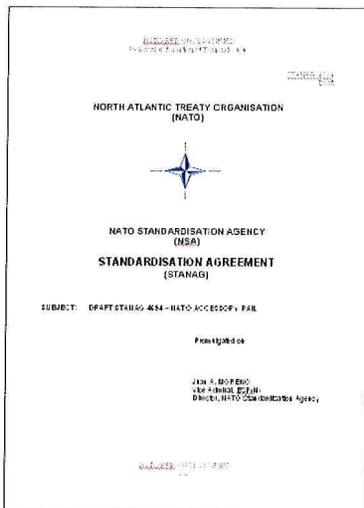
Aimpoint.

 BERETTA



STANAG 4694 “NATO Accessory Rail”

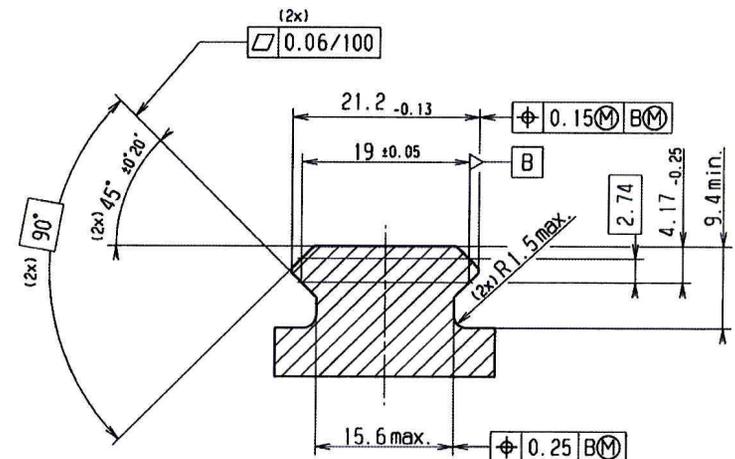
- Approved by NATO on May 8.
- The NATO Accessory Rail has full backwards compatibility with MIL-STD-1913 rail grabbers/mounts.
- Recommendation on how to attach rail grabbers/mounts to the NATO Accessory Rail.



MIL-STD-1913 / STANAG 4694

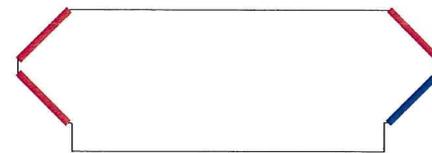
The differences between MIL-STD-1913 and STANAG 4694 are:

- Metric drawing.
- Added some new necessary measurements and tolerances.
- Adjustment of some measurements.
- Reduction of straightness tolerances with approx 50%.



Recommendations

- On a typical Mil-Std-1913 rail the grabber is clamping the rail on the v-angles.
- Our tests have shown that this does not provide good repeatability.
- We recommend instead that the top surface is used as a reference and alignment of the grabbers.
- Our tests have shown that this provides excellent repeatability.



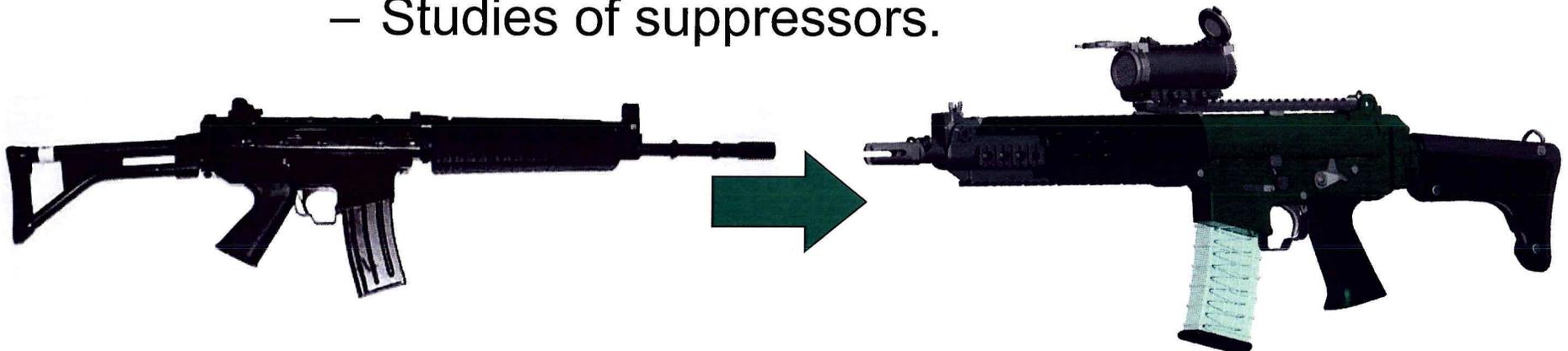
Typical US MIL-STD-1913
Rail/Grabber Interface



NATO Rail/Grabber
Interface

National programs

- Information exchange is an important issue.
- This has shown that there are many similar programs among the nations:
 - Upgrade of rifles.
 - Procurement of the same type of accessories (sights, laser pointers and magnification devices).
 - Studies of light weight fire control systems.
 - Studies of suppressors.



Assault rifle development



1942
MKb 42 (H)



2009
FN Mk 16 (SCAR-L)

What has happened in the last 67 years?

- Reduced caliber
- Rails
- Foldable and adjustable butt stock
- Reduced weight

Accessories that were not available 30 years ago

- Good electro-optic day and night sights.
- Laser pointers
- Overhead weapon stations
- Compact fire control systems
- LED flash lights



Aimpoint CompM4



ITT AN/PVS-14



Raytheon AN/PVS-13 TWS



Laser Devices DBAL-A2



Rheinmetall LLM 01

Kongsberg Protector



Aimpoint FCS BR8



Streamlight TLR-1



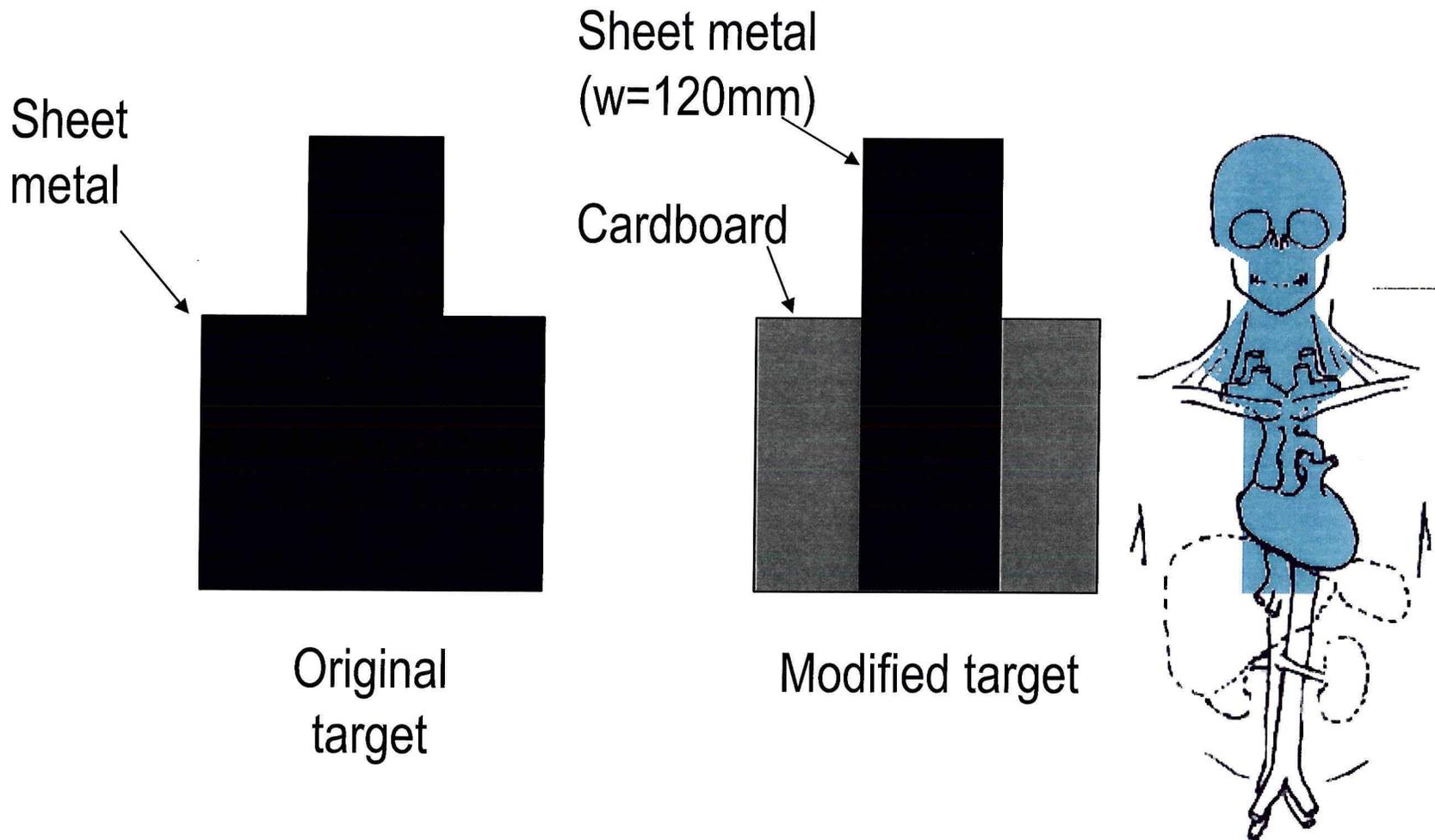
IT AN/PAQ-4C



Small Arms Lethality

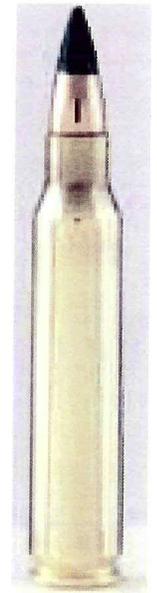
- There has previously been many discussions about small arms lethality.
- GBR therefore hosted a two day "Workshop on Small Arms Lethality" on February 18-19 at the Defence Academy of the United Kingdom in Shrivenham.
- The group agrees that shot placement is the most important parameter.
- This is achieved through good and realistic training.
- We have included this topic in our agenda.

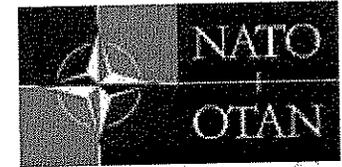
Modification of Swedish pop-up target





Questions?



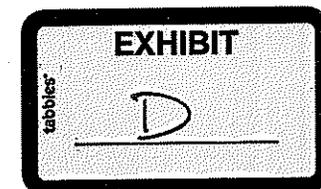


U.S. Army Research, Development and
Engineering Command

NATO Small Arms Ammunition Interchangeability via Direct Evidence Testing



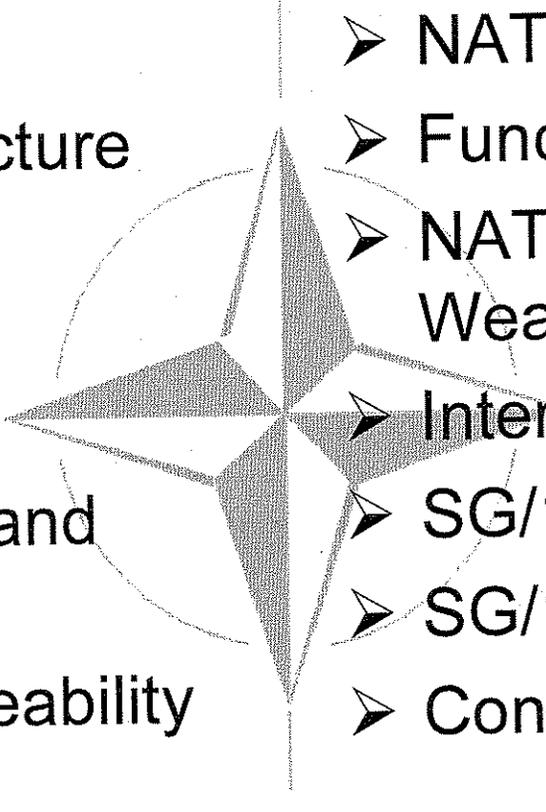
Presented by:
Dominic Pellegrino and Charles "Tim" Kirkman
25 May 2011





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)

**LCG 1
Dismounted
Soldier**

**LCG 2
Combat
Maneuver**

**LCG 3
Fire
Support**

**LCG 4
Ground Based
Air Defense**

**JCG
CBRN
Defense**

**LCG 6
Battlefield
Surveillance
Counter-
Surveillance
and
Electronic
Warfare**

**LCG 7
Battlefield
Mobility &
Military
Engineer
Support**

**LCG 8
Tactical Air
Mobility &
Support**

**LCG 9
Non-Lethal
Capabilities**

**Sub-Group 1 (SG/1)
Small Arms Ammunition
Interchangeability**

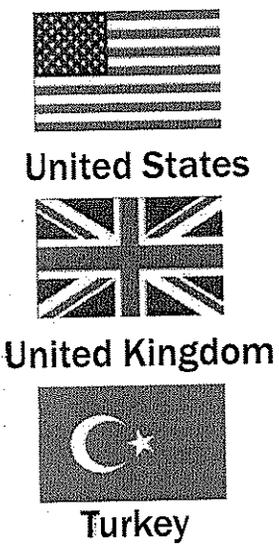
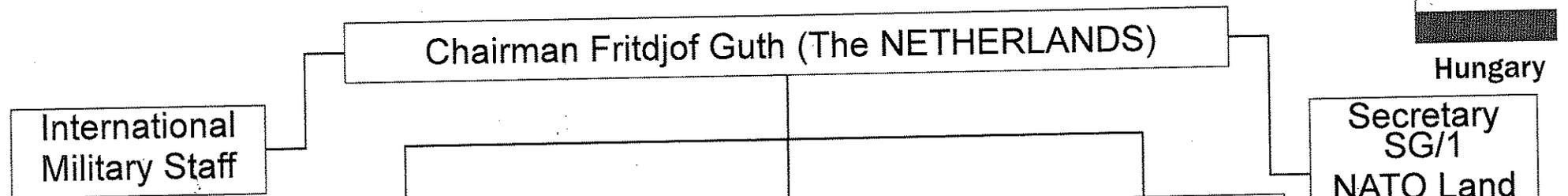
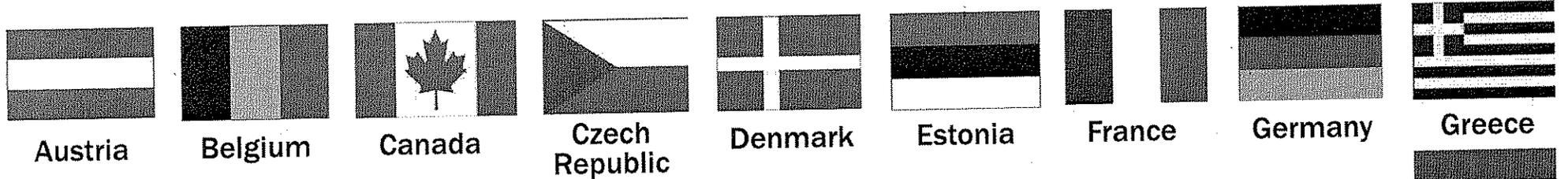
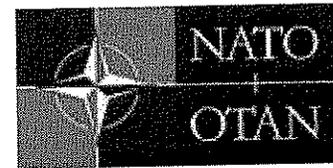
➤ The mission of SG/1 is to provide the technical expertise to accomplish and maintain battlefield interchangeability in the areas of Small and Cannon Calibre Ammunition through direct evidence testing at NATO Certified Test Centers.

LCG = Land Capability Group

JCG = Joint Capability Group



Sub-Group 1 Structure

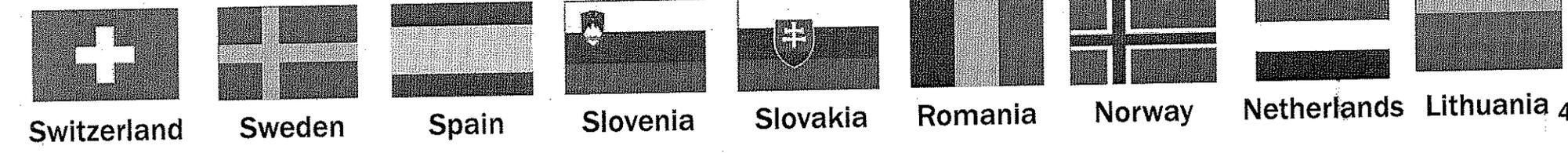
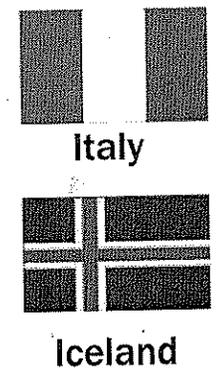


European Regional Test Center - ERTC (Pendine, Wales, UK)
ERTC Superintendent

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

Secretary SG/1 NATO Land Armaments





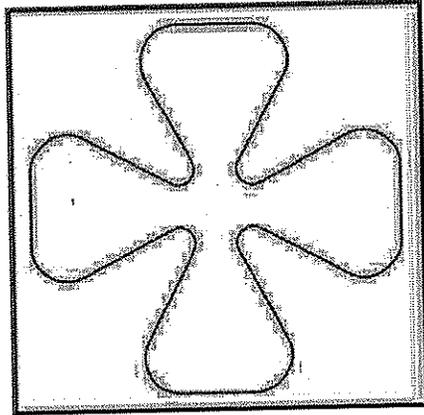
What is Interchangeability?



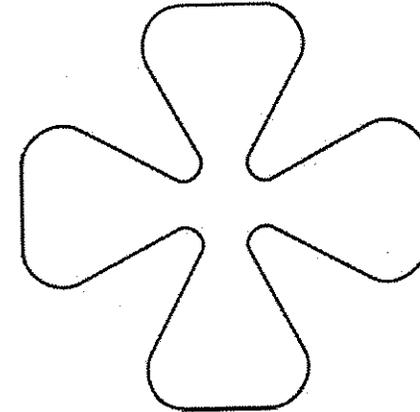
- Interchangeability – Items possessing similar functional and physical characteristics that are equal in performance, and capable of being exchanged one for the other without alteration
 - Interoperability – The ability of systems, units or forces to provide services to and accept services from other 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

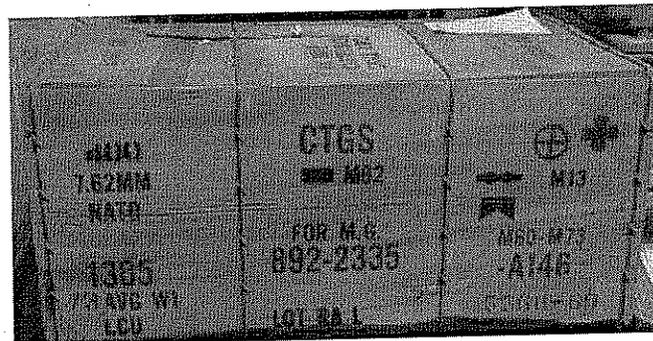
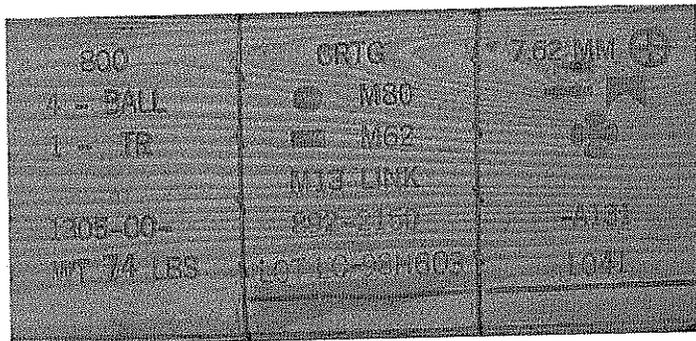


Cartridge & Link



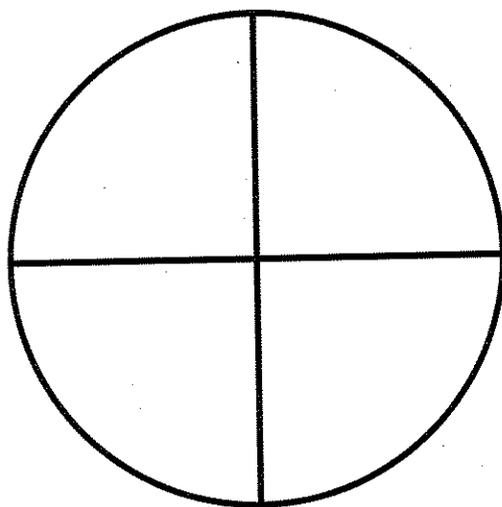
Cartridge Only

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





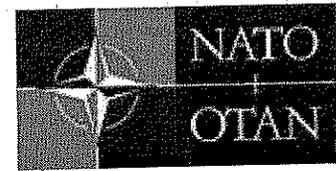
NATO Design Mark



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

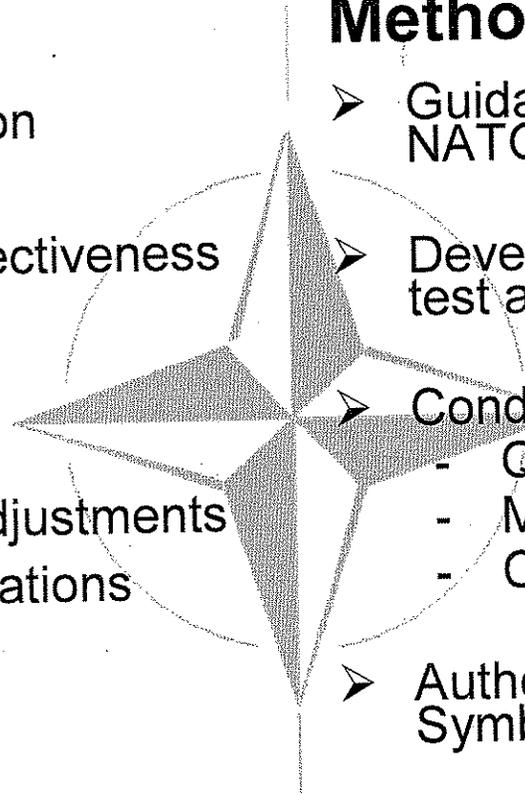
- Proper Weapon Function
- Safety of Gunner
- Adequate Terminal Effectiveness

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





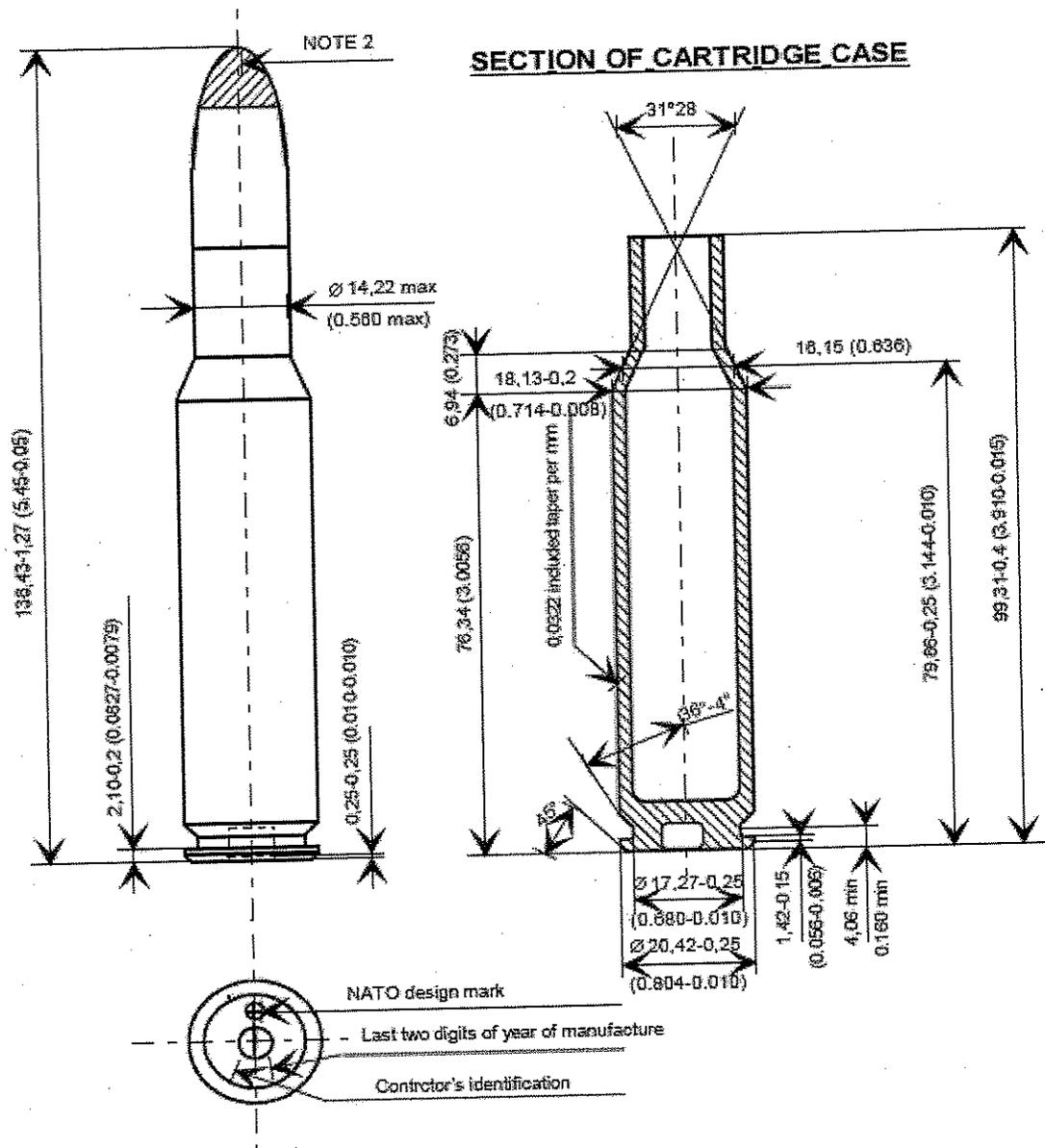
NATO Standardization Agreement (STANAG)



- 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

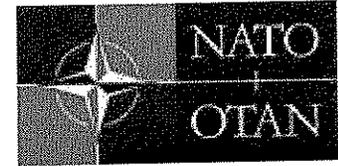


Standardization Drawing





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.



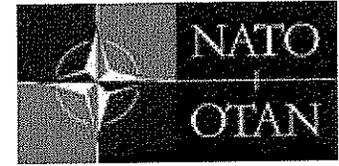
NATO Qualification Approval (QA)



- 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)



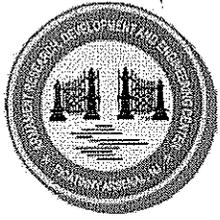
- Conducted annually to ensure that production of qualified designs continues to comply with the STANAG
- If a sample is not submitted, current/future production cannot be marked with the NATO Symbol
- When more than one manufacturer produces the same qualified design, a sample from each manufacturer 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



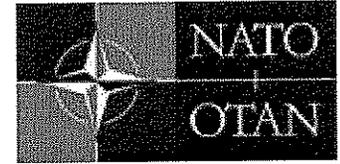
NATO Production Test Failures



- 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



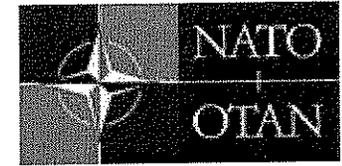
NATO Surveillance Test



- 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
BULLET EXTRACTION
RESIDUAL STRESS
PENETRATION
WATERPROOF
SALT
 SPRAY/CORROSION
PRIMER SENSITIVITY
TEMP (HIGH/LOW)
PROPELLANT AND
 PRIMER
 ANALYSIS
SMOKE AND FLASH
TRAJECTORY MATCH

SURVEILLANCE

PRECISION
FUNCTION & CASUALTY
EPVAT
TRACE
SMOKE AND FLASH
TRAJECTORY MATCH



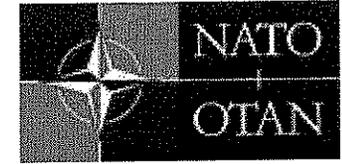
NATO Regional Test Centers



- 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)



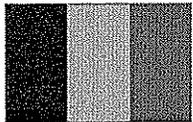
Function & Casualty Test



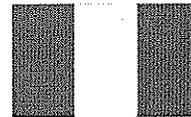
- One of the most important, informative tests for SG/1
- Proves that a foreign ammunition design will work in foreign weapon systems
- Conducted with NATO Nominated Weapons (NNW)
 - Weapon must function with all Qualified Designs to be considered for a NNW
 - NNWs represent currently fielded weapons, 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)



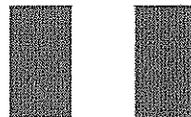
9mm NATO Nominated Weapons



Belgium – FN Browning Hi Power Pistol



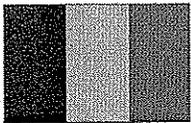
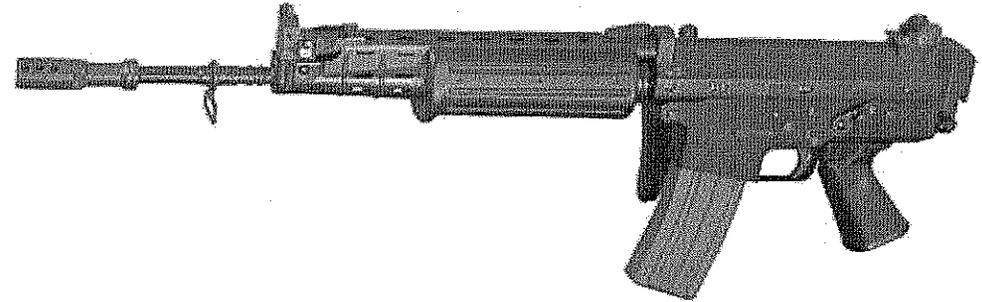
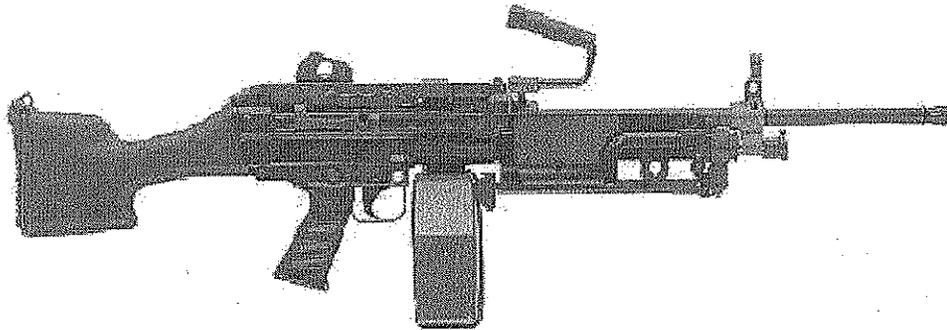
Italy – Beretta 92F Pistol



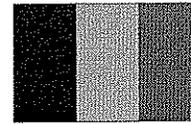
Italy – Beretta 12S Sub Machine Gun



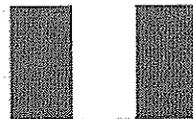
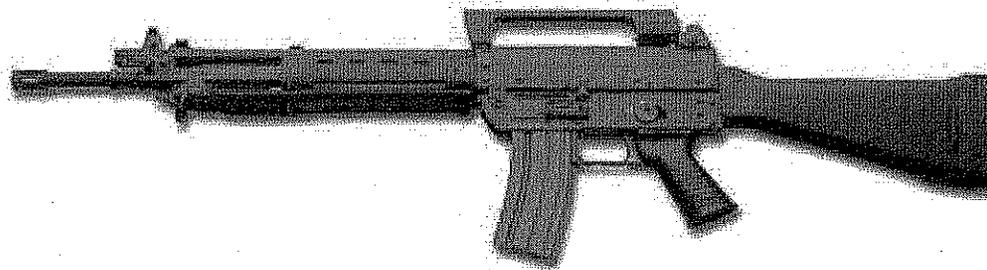
5.56mm NATO Nominated Weapons



Belgium – FN Minimi Machine Gun



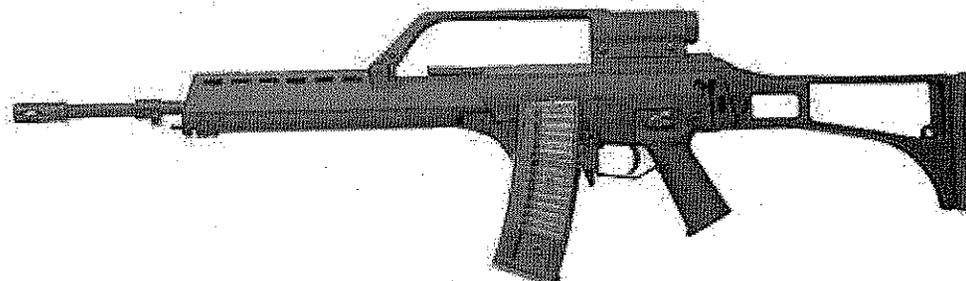
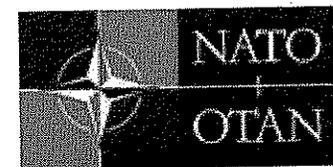
Belgium – FN FNC Rifle



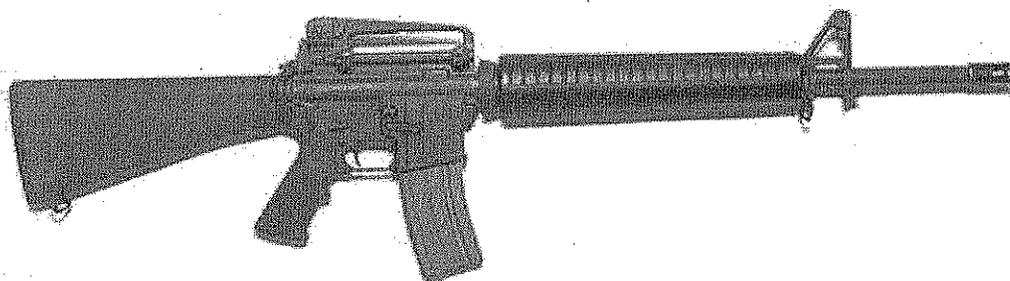
Italy – Beretta AR 70/90 Rifle



5.56mm NATO Nominated Weapons (cont.)



Germany – H&K G36 Rifle



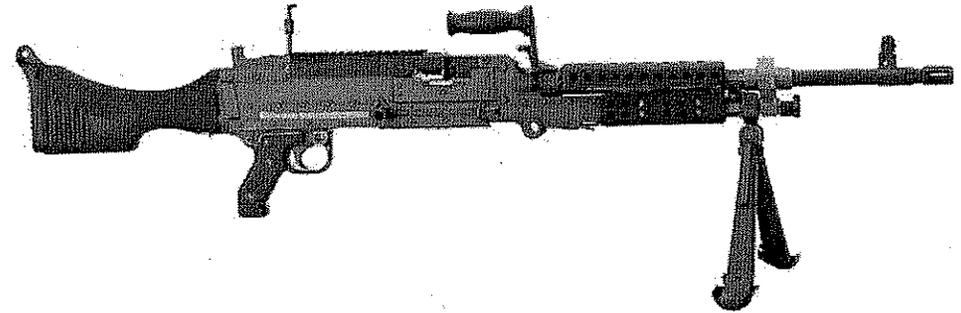
United States – Colt M16A2/A4 Rifle



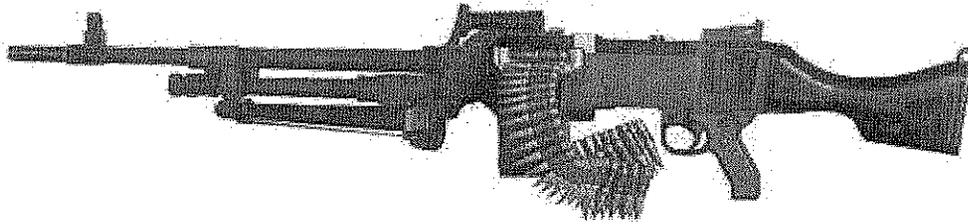
United Kingdom – H&K L85A2 Rifle



7.62mm NATO Nominated Weapons



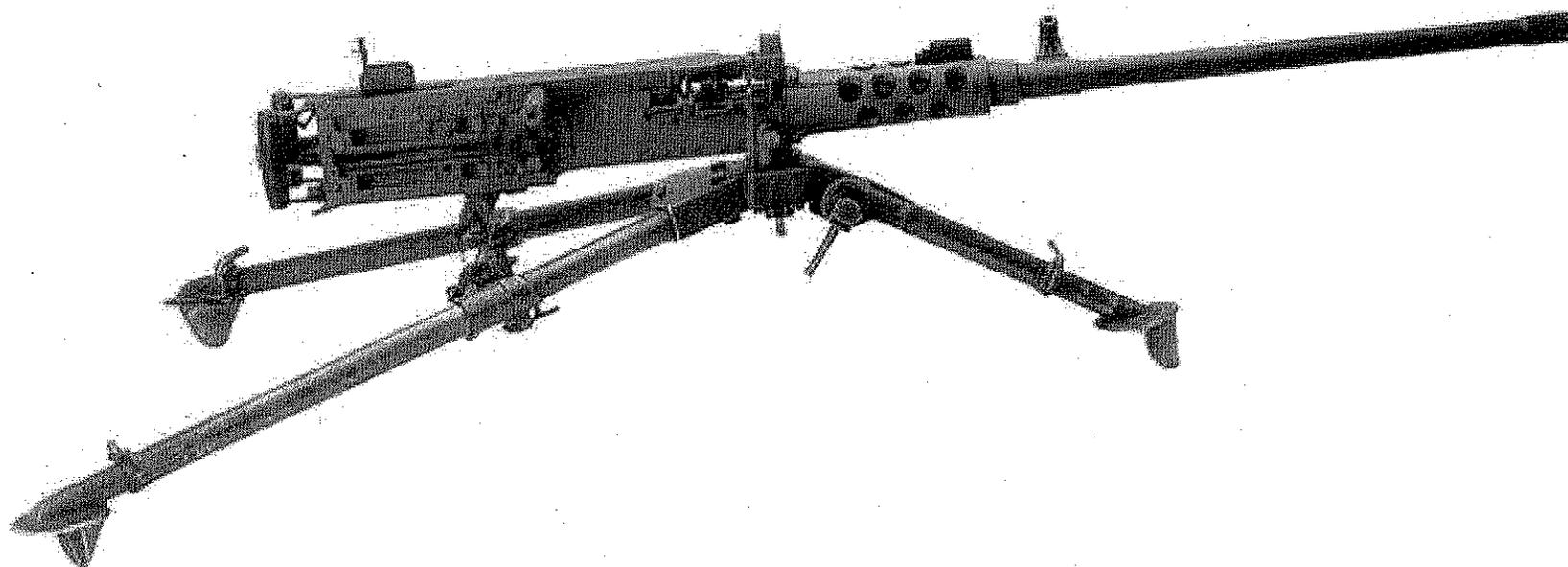
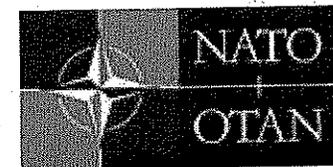
United States – M240B Machine Gun



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

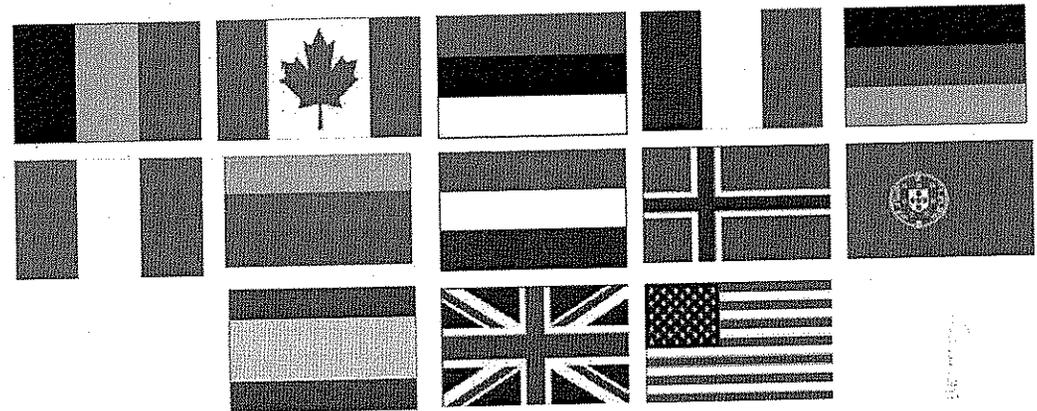


SG/1 Record Of Activity

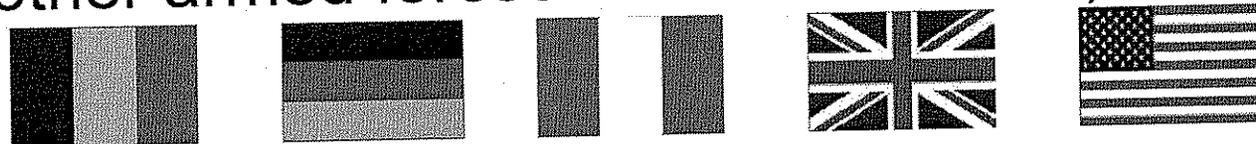


- To date 97 ammunition designs have been NATO Qualified submitted by 13 different NATO nations

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

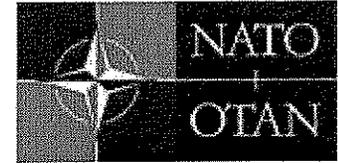


- 12 NATO small caliber NNW systems from 5 different NATO nations (many of these weapons are utilized in many other armed forces around the world)





SG/1 Current Thrusts



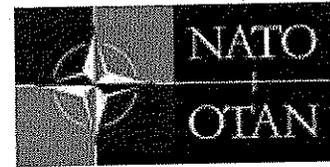
- NATO QA Testing Pending on five (5) 5.56mm Ball, two (2) 5.56mm Trace, two (2) 7.62mm Trace, one (1) 7.62mm AP and one (1) 9mm Ball designs
- 30mm x 173 STANAG & MOPI distributed for approval and ratification
- MOPI for 40mm Low Velocity Grenade Ammunition Standardization nearly complete, reference 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)

AWG – Ammo Working Group under the NATO Standardization Agency (NSA)

AOP-6 – Catalogue of Ammunition Held by Nations That Satisfy Interchangeability Criteria of Form, Fit and Function Only



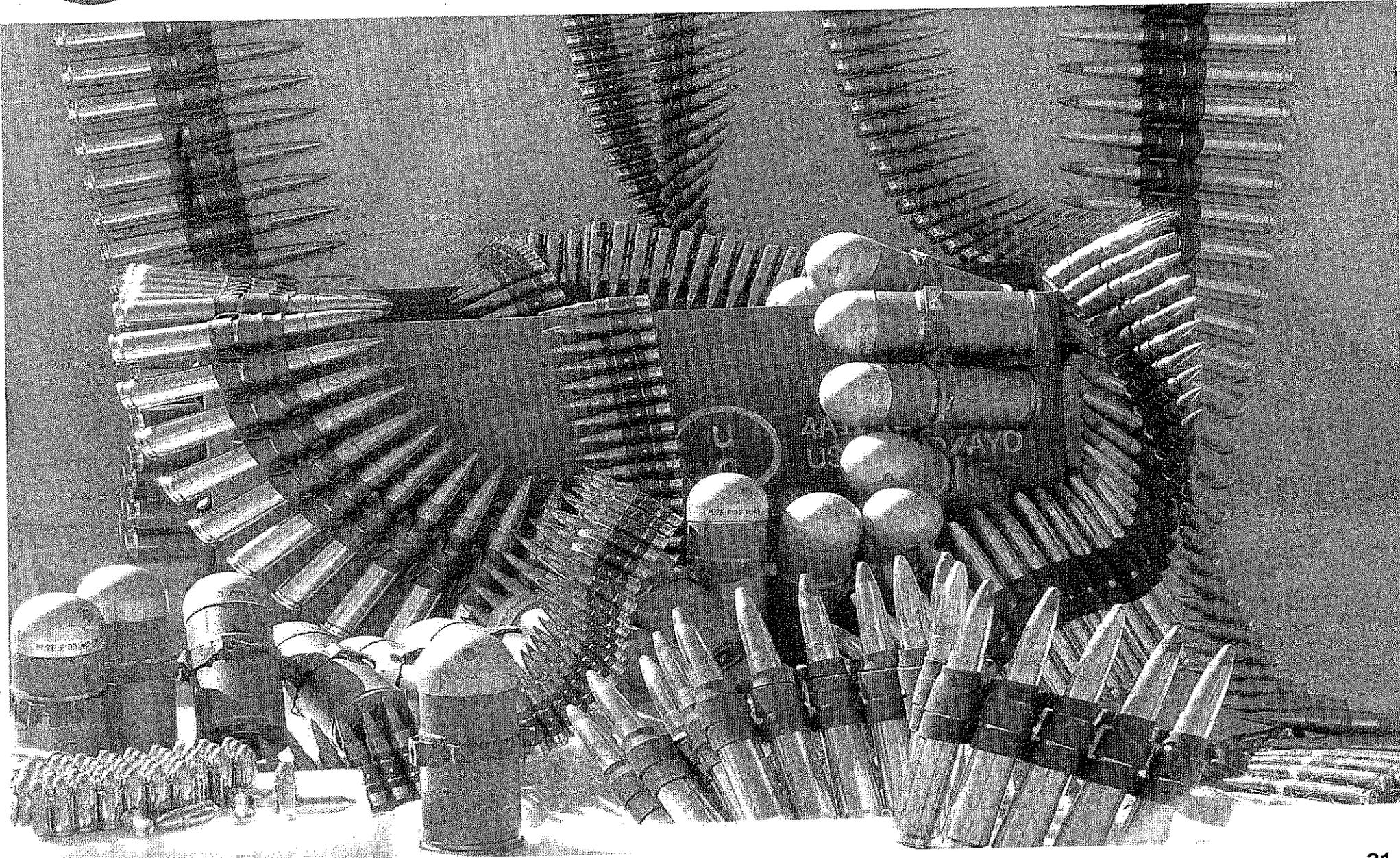
Conclusion



- 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

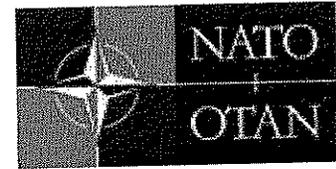


Questions?





Contact Information



Dominic Pellegrino

Superintendent, NARTC

NATO Army Armaments Group

AC/225 (LCG/1-SG/1)

dominic.pellegrino@us.army.mil

(973) 724-7961

Charles T. Kirkman "Tim"

NATO NARTC Proof Officer

NATO Army Armaments Group

AC/225 (LCG/1-SG/1)

charles.t.kirkman.civ@mail.mil

(816) 796-7181

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AMMO

9mm NATO vs. 9mm Luger

by [Caleb](#) • April 3, 2009

Now that's a fun topic right there – as in, what's the difference between ammo that's loaded to 9mm NATO pressures and ammo that's loaded to 9mm Luger pressures? First off, you have to establish that there is a difference, because there are people out there who will fight and argue that NATO spec ammo is exactly the same as commercial 9mm Luger. It's not, trust me. Aside from the obvious difference in bullet weight (9mm NATO is 124 grain, most commercial plinking 9mm ammo is 115 grain) rounds that are loaded to NATO spec are loaded to a higher pressure than rounds loaded to industry standard.

The ammo industry uses something called [SAAMI Standards](#) to establish the pressures that ammo should be loaded to. The SAAMI pressure for 9mm Luger ammo is around 35,000 PSI, and [C.I.P](#) (think European SAAMI) rates 9mm Luger ammo at 34,080 PSI. According to documentation, the 9mm NATO rounds are pressured at 36,500 PSI (again according to CIP). That means that when compared to standard 9mm ammo, the 9mm NATO ammo is running a higher pressure, analogous to a 9mm +P load, which SAAMI rates around 36,000 PSI.

So what does this mean for you? Well, a lot of people recommend treating 9mm NATO rounds the same way you'd treat a 9mm Luger +P, which is to say understand that it's loaded to a higher pressure than your garden variety 9mm Luger ammo. For the casual shooter, this means a couple of things: don't put 9mm NATO ammo in older guns. Only use it in modern, robust guns in good condition. Remember that 9mm NATO is the standard service cartridge for something like half the planet, which means that it's in use in wide variety of pistols, including the following:

- Beretta M9
- CZ-75
- [Browning Hi-Power](#)



- [Glock 17 and 19](#)
- All manner of Sigs
- HK

The short answer is that an occasional diet of 9mm NATO isn't going to hurt your gun, provided it's a well made modern gun. I certainly would not put 9mm NATO ammo into a Hi-Point, because I don't want to eat the slide and I don't trust a blowback operated gun with a zinc slide to stay together. But if you're running a [Springfield Armory 1911](#) in 9mm, or a well made pistol from a well made manufacturer you should be fine.

However, what you should be aware of is that a steady diet of 9mm NATO ammo, or 9mm +P ammo is going to increase the wear and tear on your heater. If you're just going to the range every now and then, it's not going to affect you very much. However, if you're shooting 500-1000 rounds a month, you will end up seeing internal wear quicker than you would with standard pressure ammunition. But if you find a good deal on a bunch of 9mm NATO ammo, and you're worried about running it in your [Glock 17](#), you should be fine.*

*User assumes all risks when using overpressure or +P ammo, and accepts that using firearms is inherently dangerous

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30 Round Mini-14 Magazines →

17 comments for "9mm NATO vs. 9mm Luger"



the pistolero
April 3, 2009 at 10:01

there are people out there who will fight and argue that NATO spec ammo is exactly the same as commercial 9mm Luger.

Do these people not have access to Algore's Internets? From what I've read about NATO-spec 9mm it also runs ~1263 fps, about 100 fps faster than commercial 124-grain 9mm. I am guessing that's out of the Beretta, but perhaps you know better than I do.



Caleb
April 3, 2009 at 10:03

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Well, I'm guessing that some people don't like to read or

something. Muzzle velocity is tricky, because higher pressure (which is what defines NATO ammo) doesn't *always* equal higher muzzle velocity, although it usually does.

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- [Carry Gun, the Morph 3X](#)
- [ATF approves all pending NFA requests, apologizes](#)



Wally

April 3, 2009 at 10:37

"Only use it in modern, robust guns in good condition"

I've often wondered how far back "modern" goes.



Caleb

April 3, 2009 at 11:42

I wouldn't use 9mm NATO ammo in anything older than 80s vintage guns, and then only from "big name" manufacturers. The exception to this are Walther P1s, which were designed with the 9mm NATO ammo in mind.

ARCHIVES

Jay G.

April 3, 2009 at 11:56

How common is 9mm NATO outside of Mil-surp?

IIRC, all the 9mm I come across in the gun shops is 9mm Luger (might mention it's also known as 9mm Parabellum just for those that don't like to read...)

So my Sig P226 and SW99 should be fine with 9mm NATO, but grandpa's WWII bring-back Luger wouldn't be...



Caleb

April 3, 2009 at 11:59

You can find 9mm NATO stuff in gun shops from time to time, usually from production overruns and that sort of thing. And yeah, I wouldn't shoot overpressure anything in that Luger.



chris

April 3, 2009 at 12:58

FYI from Hi-Point's web site

All Hi-Point handguns feature:

Polymer frame

Durable, attractive easy-grip finish

Last round lock open

Quick on-off thumb safety

Operations safety sheet

+P rated

Free extra rear peep sight

Free trigger lock

Lifetime warranty

100% American-made, parts and assembly



Caleb

April 3, 2009 at 12:59

Just because they say that they're +P rated doesn't mean it's a safe or smart idea to use +P ammo in them. Aside from the fact that's it's a wretched ball of fuck, that is.



Farmer Frank

April 3, 2009 at 13:57

A couple of things; although there is a difference in the bullet weight and muzzle velocity, I doubt if the terminal ballistics on living creatures would be all that much different between the two because they are both FMJ bullets.

If however you install a barrel with an abnormally slow rate of twist, the results are dramatically different at close ranges as I discovered to my delight when I ran a professional trap line.

As for the Luger, if the headspace is correct those guns were designed for higher pressure, higher velocity ammo and often won't function correctly with our standard run-of-the-mill 9mm Luger ammo. It's been a big bug-a-boo with the Luger since I was a kid and that was decades ago.

All The Best,
Frank W. James



Caleb

April 3, 2009 at 14:00

Yeah, from a terminal ballistics standpoint I agree – both rounds are going to make a small permanent wound cavity and penetrate like the dickens.

When I think about it, it makes sense that Luger would prefer high velocity ammo, because it was designed by Zee Germans; who according to wikipedia loaded the 9mm to “NATO” pressures back during WWII.

I’m honestly not much of an expert in WWII firearms, I just stick with the rule of thumb that I don’t run +P ammo in anything over 40 years old. While some may be safe, I’d rather avoid the risk entirely.



chris

April 3, 2009 at 19:01

i have strong suspicions that you couldnt hurt a ruger with any 9mm rounds including NATO loads...



hypnagogue

April 3, 2009 at 20:33

What source are you using for your SAAMI specs? Everything I've seen has 9mm +P listed at 38,500 PSI (+10%).



Caleb

April 3, 2009 at 20:56

handloads.com for the SAAMI specs.



Trebor

April 4, 2009 at 02:04

I actually would avoid shooting 9mm NATO or 9mm +P *specically* in the P-1.

There is a known problem with frame cracks with the P-1 design. The Germans later modified the pistol design for increased durability. The later guns have a hex bolt in the frame, but even those guns have been known to crack. (The hex bolt itself isn't the important mod, but it's presence indicates the other mods are present).

So, I'd stick with standard SAAMI spec ammo for the P-1 and avoid both NATO spec and +P.



Trebor

April 4, 2009 at 02:06

That should be "specificially". Darn clumsy fingers (or possibly general inability to spell).



Carteach0

April 4, 2009 at 07:02

Interesting stuff Caleb. I had read 'someplace' (must be a great place, since everyone gets all their data from there) that 9mm Nato mimics the older German hotly loaded 9×19 made for SMG's.

I suppose I am loading my 9×19 practice ammo for my carry gun to '9mm Nato' levels instead of '9mm +p' levels (g).



TJP

April 4, 2009 at 12:29

SAAMI maximum averages are based on a general agreement between SAAMI members with respect to what they feel is safe. There is a buffer zone of safety, since pressure will vary between individual cartridges. Garden variety commercial ammo probably doesn't approach the maximum average. If you have read the history of the 5.56 NATO, you'll note that the DOD has a slightly different set of priorities. Remember, too, that military brass is thicker.

CIP maximum averages may be different than SAAMI's in either direction. Since the advent of more accurate pressure testing, 357 S&W Mag loads in this country have been dialed back to a more sane 35K psi. However, the Vihta Vuori data has 357 loads that I would not want to put in a J-Frame Smith. (A 158 grain JHP going 1,569 fps? Holy smokes!)

While I prefer tough military brass in my Enfields, I would shy away from 9mm NATO. The 9×19 is a) a pain in the neck to load as it is, b) I'm lazy, and c) reducing all my loads to account for lesser internal case volume seems like extra "work" to me.

And for those of you worried about the velocity difference: don't worry about it. A hand loader can get 1,200+ (4" tube) with standard pressure, because he is not required to stick to propellants that are approved by some military standards board.

Comments are closed.

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 Magazine Basic created by c.bavota.

7.62×51mm NATO

From Wikipedia, the free encyclopedia

The **7.62×51mm NATO** (official NATO nomenclature 7.62 NATO) is a rifle cartridge developed in the 1950s as a standard for small arms among NATO countries. It should not be confused with the similarly named Russian 7.62×54mmR cartridge; a slightly more powerful^[*citation needed*] round.

It was introduced in U.S. service in the M14 rifle and M60 machine gun in the late 1950s. The M14 was superseded in U.S. service as the infantry adopted the 5.56×45mm NATO M16. However, the M14 and many other firearms that use the 7.62×51 round remain in service, especially in the case of sniper rifles, machine guns, and as the service weapon chosen by special operations forces. The cartridge is used both by infantry and on mounted and crew-served weapons mounted to vehicles, aircraft and ships.

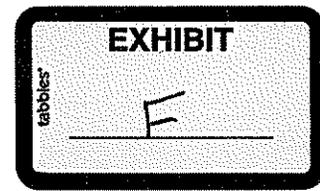
Although not identical, the 7.62×51mm NATO and the commercial .308 Winchester cartridges are similar enough that they can be loaded into rifles chambered for the other round, but .308 cartridges are typically loaded to higher pressures than 7.62x51mm cartridges for use in long-distance hunting of big-game animals. Even though the Sporting Arms and Ammunition Manufacturers' Institute (SAAMI) does not consider it unsafe to fire the commercial round in weapons chambered for the NATO round, there is significant discussion^{[3][4][5]} about compatible chamber and muzzle pressures between the two cartridges based on powder loads and wall thicknesses on the military vs. commercial rounds. While the debate goes both ways, the ATF recommends checking the stamping on the barrel; if you're unsure, consult the maker of the firearm.^{[6][7]}

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- 1 Overview
- 2 Development
- 3 Military cartridge types
- 4 Department Of Defense Identification Codes (DODIC)
- 5 See also
- 6 References
- 7 External links

Overview

The cartridge itself offers similar ballistic performance in most firearms to the .30-06 Springfield that it replaced in U.S. service. Though shorter, standard loadings fire similar bullet weights with



7.62×51mm NATO

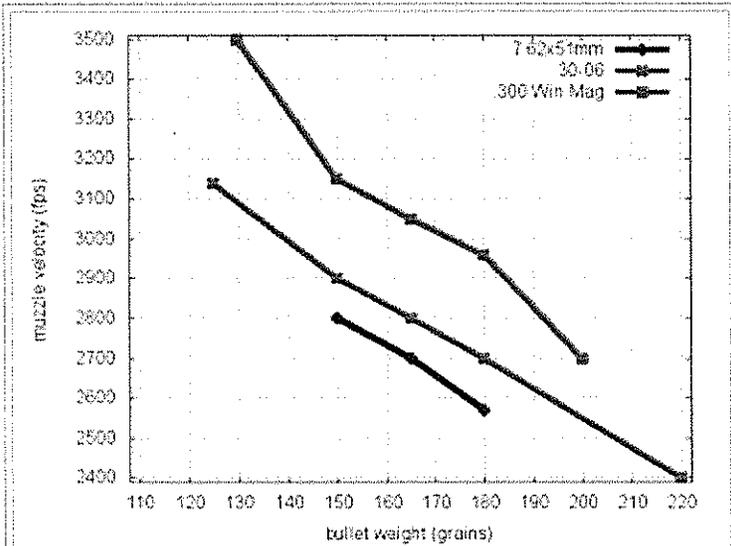


7.62×51mm NATO rounds compared to AA (LR6) cell.

Type	Rifle
Place of origin	 United States
Service history	
In service	1954–present
Used by	United States, NATO, others.
Wars	Vietnam War, Falklands Conflict, The Troubles, Gulf War, War in Afghanistan, Iraq War, Libyan civil war, among other conflicts
Specifications	
Parent case	.308 Winchester (derived from the .300 Savage)
Case type	Rimless, Bottleneck
Bullet diameter	0.308 in (7.82 mm)
Neck diameter	0.345 in (8.8 mm)
Shoulder diameter	0.454 in (11.5 mm)
Base diameter	0.470 in (11.9 mm)
Rim diameter	0.473 in (12.0 mm)
Rim thickness	0.050 in (1.3 mm)
Case length	2.015 in (51.2 mm)
Overall length	2.750 in (69.9 mm)

only a slight reduction in velocity. Modern propellants allowed for similar performance from a case with less capacity. The smaller case requires less brass and yields a shorter cartridge. This shorter cartridge allows a slight reduction in the size and weight of firearms that chamber it, and somewhat better cycling in automatic and semi-automatic rifles.

Development



Velocity comparison between the 7.62×51mm NATO, .30-06 Springfield, and .300 Winchester Magnum for common bullet weights.

firepower than their bolt action-armed opponents. The Garand performed so well that the U.S. saw little need to replace it during World War II and the .30-06 served well beyond the Korean War and into the mid-1960s.

During the 1940s and early 1950s several experiments were carried out to improve the Garand. One of the most common complaints was the limited capacity 8-round en-bloc clip and many experimental designs modified the weapon with a detachable box magazine. Springfield Armory's **T20** rifle was a fully automatic version. Though not adopted, experience with a fully automatic Garand laid the groundwork for its replacement.

The test program continued for several years, including both the original .30-06 round and a modified .300 Savage (then known as the **T65**). In the end, the T65 cartridge demonstrated power roughly equal to the original .30-06, firing a 147-grain (9.5 g) bullet at 2,750 feet per second (840 m/s) but was approximately 1/2 inch (13 mm) shorter. The eventual result of this competition was the **T44** rifle.

Rifling twist	1 in 12 in (30 cm)
Primer type	Large Rifle
Maximum pressure	60,191 psi (415.00 MPa)

Ballistic performance

Bullet weight/type	Velocity	Energy
147 gr (10 g) M80 FMJ	2,733 ft/s (833 m/s)	2,437 ft·lbf (3,304 J)
175 gr (11 g) M118 Long Range BTHP	2,580 ft/s (790 m/s)	2,586 ft·lbf (3,506 J)

Test barrel length: 24 inches (61 cm)

Source(s): M80: Slickguns,^[1] M118 Long Range: U.S. Armament^[2]

Work that would

eventually develop the 7.62×51mm NATO started just after World War I when the large, powerful .30-06 cartridge proved difficult to adapt to semi-automatic rifles. A less-powerful cartridge would allow a lighter firing mechanism. At the time the most promising design was the .276 Pedersen. When it was eventually demonstrated that the .30-06 was suitable for semi-automatic rifles, the .276 was dropped.

Thus when war appeared to be looming again only a few decades later, the .30-06 was the only round available and the M1 Garand provided U.S. troops with greater

Designation	Case	Description	Manufacturer	Metric
T-65	T-65 Case [47mm]	Steel jacket lead core 150-grain Flat Base bullet.	Frankfort Arsenal	[7.62x47mm]
T-65E1	FAT1 Case [49mm]	Steel jacket lead core	Frankfort Arsenal	[7.62x49mm]
T-65E2	FAT1E1 [49mm - 30° shoulder]	Steel jacket lead core	Frankfort Arsenal	[7.62x49mm]
T-65E3	FAT1E3 [51mm – 20° shoulder]	Steel jacket lead core	Frankfort Arsenal	[7.62x51mm]
T-65E4	FAT1E3 [51mm – 20° shoulder]	Steel jacket lead core 145-grain Boattail bullet with a #10 ogive point	Frankfort Arsenal	[7.62x51mm]
T-65E5	FAT1E3 [51mm – 20° shoulder]	Steel jacket lead core Boattail bullet	Frankfort Arsenal	[7.62x51mm]



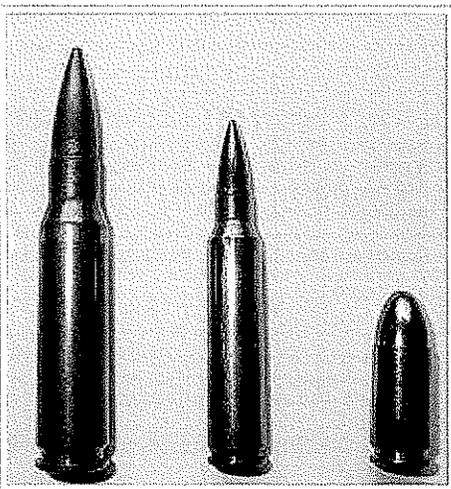
.50 BMG, .300 Winchester Magnum, .308 WIN (7.62 NATO), 7.62x39mm, 5.56 NATO, and .22 LR.

When the United States developed the T65 cartridge, the British military took a different route. They had spent considerable time and effort developing the intermediate-power .280 British (7 mm) cartridge with an eye towards controllable fully automatic fire. The U.S. held to its desire not to reduce the effectiveness of individual aimed shots. The American philosophy was to use automatic fire for emergencies only and continue to use semi-automatic fire the majority of the time. After considerable debate, the Canadian Army announced they would be happy to use the .280 but only if the U.S. did as well. It was clear the U.S. was not going to use the .280. The British did start introducing the .280 along with the "bull-pup" Rifle No. 9, but the process was stopped in the interests of harmonization across NATO. The T65E5 [7.62 x 51mm] was chosen as the NATO standard cartridge in 1954.

Winchester Ammunition (a division of the Olin Corporation) saw the market for a civilian model of the T65 cartridge and released it commercially in 1952 as the .308 Winchester, two years prior to adoption of the cartridge by NATO.

The T44 was adopted as the M14 in 1957. Around the same time Britain and Canada adopted the Belgian FN FAL as the L1 followed by West German army as the G1. The Germans soon transitioned to a modified version of the Spanish CETME rifle by Heckler & Koch that was adopted as the G3. With all three of these firearms, it was clear that the 7.62 mm NATO could not be fired controllably in fully automatic because of recoil. Both the M14s and FAL would later go through several variations intended to either limit fully automatic selection through semi-auto version or selector locks or to improve control with bipods or heavier barrels.

While this was going on, the U.S. *Project SALVO* concluded that a burst of four rounds into a 20-inch (51 cm) circle would cause twice the number of casualties as a fully automatic burst by one of these rifles, regardless of the size of the round. They suggested using a much smaller .22 caliber cartridge with two bullets per cartridge (a *duplex load*), while other researchers investigated the



Comparison of 7.62 mm NATO, 5.56 mm NATO and 9 mm NATO.

promising flechette rounds that were lighter but offered better penetration than even the .30-06. These studies were kept secret to prevent the British from using them as evidence in favour of their smaller rounds.

When the M14 arrived in Vietnam, it was found to have a few disadvantages. The rifle's overall length was not well suited for jungle warfare. Also, the weight of 7.62×51mm cartridges limited the total amount of ammunition that could be carried in comparison with the 7.62×39mm cartridge of the Type 56 and AK-47 assault rifles, which the Vietcong and North Vietnamese Army soldiers were equipped with. In addition, the originally issued wooden stocked versions of the M14 were susceptible to warping from moisture in tropical environments, producing "wandering zeroes" and other accuracy problems, which caused the adoption of fiberglass stocks.

Fighting between the big-round and small-round groups reached a peak in the early 1960s, when test after test showed the .223 Remington cartridge fired from the AR-15 allowed an 8-soldier unit to outgun an 11-soldier unit armed

with M14s. U.S. troops were able to carry more than twice as much 5.56×45mm ammunition as 7.62×51mm for the same weight, which allowed them an advantage against a typical N.V.A. unit armed with Type 56-1s.

Rifle	Cartridge	Cartridge weight	Weight of loaded magazine	10 kg (22#) ammo load
M14	7.62×51mm	393 grains (25.5 g)	20 rds @ 0.68 kg	14 mags / 280 rds
M16	5.56×45mm	183 grains (11.9 g)	20 rds @ 0.3 kg	33 mags / 660 rds
AK-47	7.62×39mm	281 grains (18.2 g)	30 rds @ 1.2 kg* ^[8]	8 mags / 240 rds

(*AK-47 magazines are much heavier than M14 and M16 magazines)

In 1964, the U.S. Army started replacing their M14s with the M16, incurring another series of complaints from the British. Regardless of the M14 having disadvantages in jungle warfare, 7.62×51mm NATO rifles stayed in military service around the world due to several factors. The 7.62×51mm NATO has proved much more effective than 5.56×45mm at long ranges, and has since found popularity as a sniping round. For instance, M14 variants such as the Mk 14 Enhanced Battle Rifle and M25 Sniper Rifle were utilized in the United States military as designated marksman and sniper rifles. Shorter, easier to handle 7.62mm rifles like the Heckler & Koch G3 stayed in service due to their accuracy, range, cartridge effectiveness and reliability.

Specialized loadings were created for 7.62×51mm NATO-chambered sniper rifles. They used heavier and more streamlined bullets that had a higher ballistic coefficient than standard ball rounds, meaning they shed velocity at longer ranges more gradually. Loss of velocity is important for accurate long-range shots because dropping from supersonic to transonic speeds disturbs the flight of the bullet and adversely affects accuracy. The standard M80 ball round weighs 147 gr and has a muzzle velocity 200 ft/s (61 m/s) faster than the M118LR 175 gr sniping round. However, the M80 drops to subsonic velocity around 875 m (957 yd), while the initially slower M118LR is supersonic out to 950 m (1,040 yd) due to its low-drag bullet.^[9]

The 7.62×51mm NATO round nevertheless met the designer's demands for fully automatic reliability with a full-power round. It remained the main machine gun round for almost all NATO forces well into the 1990s, even being used in adapted versions of older .30-06 machine guns such as the Browning M1919A4 from the WWII era. These have been replaced to a considerable extent in the light machine gun role by 5.56×45mm NATO weapons, such as the widespread use of the M249 SAW, but the 7.62 round is still the standard

chambering for most general-purpose machine guns such as the M60E4, the M240 and the German HK21 and MG3, and flexible mountings such as helicopters, jeeps, and tanks.

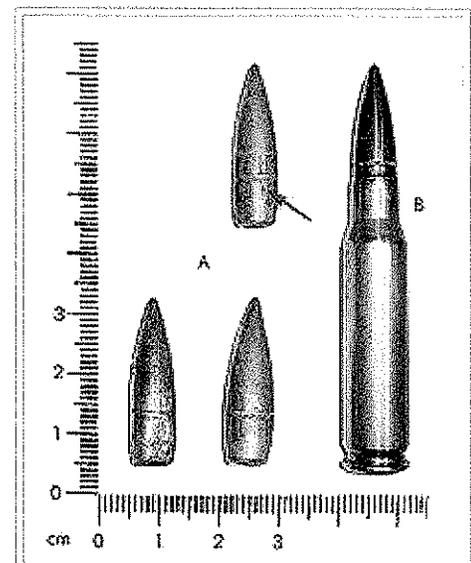
The U.S. Army is developing an improved version of the M80 ball 7.62 mm round, called the **M80A1**. The M80A1 incorporates changes found in the M855A1 5.56 mm round. Like the M855A1, the M80A1 is expected to have better hard-target penetration, more consistent performance against soft targets, and significantly increased distances of these effects over the M80. The bullet is redesigned with a copper jacket and exposed hardened steel penetrator, eliminating 114.5 grains (7.4 g) of lead with production of each M80A1 projectile. Fielding is expected for 2014.^[10]

Military cartridge types

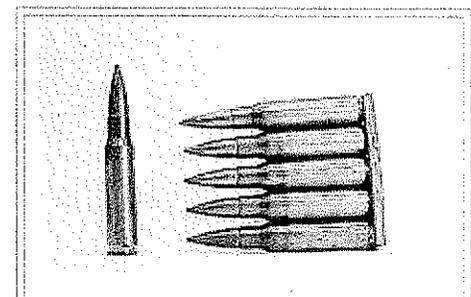
- **Cartridge, Caliber 7.62mm, NATO, Ball, M59 (United States):** 150.5-grain (9.8 g) 7.62×51mm NATO ball cartridge. A further development of the initial T65 cartridge.
- **Cartridge, Caliber 7.62mm, NATO, High Pressure Test, M60 (United States):** 7.62×51mm NATO test cartridge. The cartridge is not for field issue, but is used for proof firing of weapons during manufacture, test, or repair. The cartridge is identified by a stannic-stained (silvered) case.
- **Cartridge, Caliber 7.62mm, NATO, Armor Piercing, M61 (United States):** 150.5-grain (9.8 g) 7.62×51mm NATO armor-piercing round, black cartridge tip.
- **Cartridge, Caliber 7.62mm, NATO, Tracer, M62 (United States):** 142-grain (9.2 g) tracer cartridge, orange cartridge tip.
- **Cartridge, Caliber 7.62mm, NATO, Dummy, M63 (United States):** The cartridge is used for practice in loading 7.62mm weapons for simulated firing to detect flinching of personnel during firing and for inspecting and testing the weapon mechanism. The cartridge is identified by six longitudinal corrugations (flutings) on the cartridge case. There is no primer and no vent hole in the primer pocket.
- **Cartridge, Caliber 7.62mm, NATO, Grenade, M64 (United States):** 7.62×51mm NATO grenade launching blank. The cartridge is identified by a rose-petal (rosette-crimp) closure of the cartridge case mouth and sealed with red lacquer. The cartridge provides pressure upon functioning to project rifle grenade to a desired target when using a grenade projectile adapter and dragon missile launch effect trainer (LET).
- **Cartridge, Caliber 7.62mm, NATO, Ball, M80 (United States):** 147-grain (9.5 g) 7.62×51mm NATO ball cartridge. The U.S. Army's Ballistic Research Laboratory measured a ballistic coefficient (G7 BC) of 0.200 and form factor (G7 *i*) of 1.105 for the M80 ball projectile.^[11]
- **Cartridge, Caliber 7.62mm, NATO, Ball, M80A1 (United States):** M80 Lead Free (LF) 7.62×51mm NATO ball cartridge.^[12] 114.5-grain (7.4 g) of lead eliminated per M80A1 projectile. To be issued in 2014.^[10]
- **Cartridge, Caliber 7.62mm, NATO, Blank, M82 (United States):** 7.62×51mm NATO cartridge is used in rifles and machine guns equipped with blank firing attachments to simulate firing in training exercises and for saluting purposes. The cartridge is identified by its double tapered (bottle nose) neck and absence of a bullet.



The 7.62×51mm NATO and 5.56×45mm NATO cartridges compared to an AA battery.

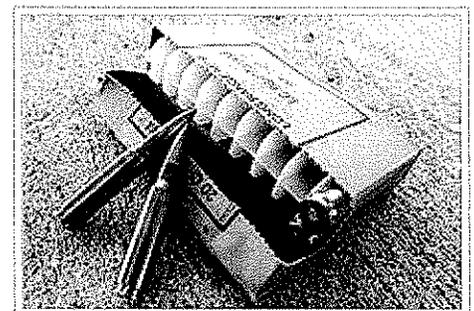


Three recovered 7.62×51mm NATO bullets (next to an unfired cartridge (Tracer ammunition), showing rifling marks



7.62mm, NATO, Orange-tipped tracer ammunition, M62: 142-grain (9.2 g) tracer cartridge.

- **Cartridge, Caliber 7.62mm, NATO, Ball, Silent, XM115** (*United States*): Little is known of this round, but it was an attempt to quiet the round. Never adopted.
- **Cartridge, Caliber 7.62mm, NATO, Match, M118** (*United States*): 173-grain (11.2 g) 7.62×51mm NATO Full Metal Jacket Boat Tail round specifically designed for Match purposes. The round was introduced as the XM118 match in 1963 and was produced at both Frankford Arsenal and Lake City Army Ammunition Plant. It was standardized as M118 match in mid-1965. It used the same bullet as the .30-06 Springfield M72 Match Ball round, match-grade brass cartridges, and used fitted No. 43 primers. Production ceased at Frankford in 1965 but continued at Lake City until the early 1980s. Lake City used dedicated equipment to produce the ammo up until the mid-1970s and during that time the quality of the ammunition was quite good. When they ceased using dedicated machinery the quality of the ammo had a very noticeable decline.^[13]
- **Cartridge, Caliber 7.62mm, NATO, Ball, Special, M118** (*United States*): 173-grain (11.2 g) 7.62×51mm NATO Full Metal Jacket Boat Tail round specifically designed for match purposes. Produced by Lake City Army Ammunition Plant. This is an interim match round which utilized standard M80 ball brass cartridges with the 173-grain (11.2 g) Full-Metal Jacketed Ball Boat Tailed (FMJBT) bullet and staked No. 34 or No. 36 primers. During this period in the early to late 1980s the performance of the round declined. Powder, primer, and brass were the same as standard ball rounds; bullets and powder charges varied in weight due to worn machinery and poor quality control. Since it couldn't be called "Match" due to its erratic trajectory, it was renamed "Special Ball". Snipers used to test shoot batches of ammo, find a batch that shot well (or at least consistently), then zeroed their weapon to that batch and tried to procure as much of that ammo as possible.^[13]
- **Cartridge, Caliber 7.62mm, NATO, Ball, Special, M118LR** (*United States*): 175-grain (11.3 g) 7.62×51mm NATO Match-grade round specifically designed for long-range sniping. It uses a 175-grain (11.3 g) Sierra Match King Hollow Point Boat Tail bullet. Produced at Lake City Army Ammunition Plant. The propellant's noticeable muzzle flash and temperature sensitivity led to the development of the MK 316 MOD 0 for Special Operations use.
- **Cartridge, Caliber 7.62mm, NATO, Frangible, M160** (*United States*): 108.5-grain (7.0 g) 7.62×51mm NATO frangible bullet, upon striking a target, disintegrates, leaving a mark at the point of impact.
- **Cartridge, Caliber 7.62mm, NATO, Dummy, M172** (*United States*): 7.62×51mm NATO cartridge is inert and is used to test the mechanism and metallic link belts of 7.62mm weapons. The cartridge is identified by a black oxide finish over the entire round and has no primer. There is no vent hole in the primer pocket.
- **Cartridge, Caliber 7.62mm, NATO, Ball, Overhead Fire, XM178** (*United States*): 7.62×51mm NATO Overhead Fire Application (OFA) cartridge using a solid, turned, GM bullet. These were developed to supposedly make the OFA cartridges safer since there would be no small pieces of bullet that could separate and fall on the troops. Never adopted.
- **Cartridge, Caliber 7.62mm, NATO, Tracer, Overhead Fire, XM179** (*United States*): 7.62×51mm NATO Overhead Fire Application (OFA) cartridge using a solid, turned, GM bullet. These were developed to supposedly make the OFA cartridges safer since there would be no small pieces of bullet that could separate and fall on the troops. XM179/XM180 difference is the amount of trace mixture. Never adopted.
- **Cartridge, Caliber 7.62mm, NATO, Tracer, Overhead Fire, XM180** (*United States*): 7.62×51mm NATO Overhead Fire Application (OFA) cartridge using a solid, turned, GM bullet. These were developed to supposedly make the OFA cartridges safer since there would be no small pieces of bullet that could separate and fall on the troops. XM179/XM180 difference is the amount of trace mixture. Never adopted.
- **Cartridge, Caliber 7.62mm, NATO, Blank, XM192** (*United States*): 7.62×51mm Short case rose crimped dummy. Never adopted.
- **Cartridge, Caliber 7.62mm, NATO, Duplex, M198** (*United States*): 7.62×51mm NATO duplex round with two 84-grain (5.4 g) bullets. The developmental designation was T314E3.
- **Cartridge, Caliber 7.62mm, NATO, Ball, Low Recoil, XM256** (*United States*): 7.62×51mm NATO Single 82-grain (5.3 g) bullet from M198 round. Another attempt to control the M14 in full auto mode or for small stature troops. Never adopted.
- **Cartridge, Caliber 7.62mm, NATO, Tracer, M276** (*United States*): 7.62×51mm NATO so-called "Dim Traces" with reduced effect primarily for use with night vision devices, green cartridge tip with pink ring.



The 7.62mm M118 long range cartridge.

- **Cartridge, Caliber 7.62mm, NATO, Match, M852** (*United States*): 168-grain (10.9 g) 7.62×51mm NATO Hollow-Point Boat-Tail cartridge, specifically designed for use in National Match competitions. It was dubbed "Mexican Match" because it was based on the International Match loading used at the Pan-Am Games in Mexico. It used standard brass, primer, and propellant, but used a match-grade bullet. It was later approved by U.S. Army JAG in the 1990s for combat use by snipers. It replaced the M118SB as the standard Match round. The bullet was very accurate at around 300 meters (competition match ranges) but suffered at longer ranges.
- **Cartridge, Caliber 7.62mm, NATO, Saboted Light Armor Penetrator, M948** (*United States*): 7.62×51mm NATO Saboted Light Armor Penetrator cartridge.
- **Cartridge, Caliber 7.62mm, NATO, Saboted Light Armor Penetrator Tracer, M959** (*United States*): 7.62×51mm NATO Saboted Light Armor Penetrator cartridge with tracer element.
- **Cartridge, Caliber 7.62mm, NATO, Ball, Training, M973** (*United States*): 7.62×51mm NATO SRTA ball training round. Has air brake to reduce the range the bullet will fly^[14]
- **Cartridge, Caliber 7.62mm, NATO, Tracer, Training, M974** (*United States*): 7.62×51mm NATO SRTA tracer training round. Has air brake to reduce the range the bullet will fly^[14]
- **Cartridge, Caliber 7.62mm, NATO, Armor Piercing, M993** (*United States*): 126.6 grains (8.2 g) 7.62×51mm NATO armor-piercing round, black cartridge tip.
- **Cartridge, Caliber 7.62mm Special Ball, Long Range, MK 316 MOD 0** (*United States*): A 175-grain (11.3 g) round specifically designed for long-range sniping consisting of Sierra MatchKing Hollow Point Boat Tail projectiles, Federal Cartridge Company match cartridge cases and Gold Medal Match primers. The Propellant has been verified as IMR 4064 (per NSN 1305-01-567-6944 and Federal Cartridge Company Contract/Order Number N0016408DJN28 and has a charge weight per the specs of 41.745-grain (2.7 g).^[15]
- **Cartridge, Caliber 7.62mm, NATO, Ball, Barrier, T762TNB1 MK319 MOD 0** (*United States*): 7.62×51mm NATO Enhance Behind barrier performance Enhance Function & casualty and muzzle flash requirements in short barrel carbines, 130 grains (8.4 g).^[15]
- **Cartridge, Grenade, L1A1** (*United Kingdom*): 7.62×51mm grenade-launching cartridge with one subvariant (L1A2).
- **Cartridge, Ball, L2A1** (*United Kingdom*): 7.62×51mm ball cartridge, with three subvariants (A2-A4).
- **Cartridge, Tracer, L5A1** (*United Kingdom*): 7.62×51mm tracer cartridge, designed to last out to 1,000 metres (1,100 yd). Four subvariants exist, with brighter ignition (A2), tracer reduced to 750 metres (820 yd) (A3), with a pistol powder charge (A4), and with improved ballistics (A5).
- **Cartridge, Ball, L42A1** (*United Kingdom*): 7.62×51mm ball cartridge, 155-grain (10.0 g) round
- **Cartridge, Ball, L44A1** (*United Kingdom*): 7.62×51mm ball cartridge, 144-grain (9.3 g) round
- **Cartridge, Caliber 7.62mm, NATO, Ball, F4** (*Australia*): 144-grain (9.3 g) 7.62×51mm NATO ball cartridge. Australian equivalent to U.S. M80 round. In service with the Australian Defence Force.
- **Patrone AB22, 7.62mm × 51, DM41, Weichkern ("Soft-core"),** (*West Germany*): 7.62×51mm NATO ball cartridge; Berdan primed, copper-washed steel jacket. German equivalent to U.S. 7.62×51mm M80 round. Standard service round for the G3 battle rifle.
- **Patrone AB22, 7.62mm × 51, DM111, Weichkern,** (*Germany*): 147-grain (9.5 g) 7.62×51mm NATO ball cartridge, cupronickel-coated steel jacket. German equivalent to U.S. M80 round. In service with the German military. Known for severe fragmentation in human tissue due to its thin jacket, particularly around the cannelure.^[16]
- **Patrone, 7.62mm × 51, DM111A1,** (*Germany*): Further development of the DM111. Retained "green" primer in place of lead acid primer and lead core capped with closure disc. Instead of steel jacket with gilding metal plating, the DM111A1 has a gilding metal jacket. Fragments in soft tissue, sometimes including the closure disc separating from the projectile base.^[17]
- **Patrone AM31, 7.62mm × 51, DM28A2, Manöver ("Maneuver"),** (*Germany*): Blanks, olive colored plastic with a brass base.
- **Patrone AM32, 7.62mm × 51, DM18A1B1, Übung ("Practice"),** (*Germany*): 10-grain (0.6 g) 7.62×51mm NATO plastic training cartridge, plastic case cartridge colored light blue with an extraordinary light 10-grain plastic bullet which is fired with a high initial velocity. Extremely accurate (spot-on up to 300 meters or 330 yards), non-corrosive, steel base with lead free primer. NON-RELOADABLE AMMUNITION.

Department Of Defense Identification Codes (DODIC)

This US Armed Forces and NATO code is used to identify the cartridge, the cartridge type, and the packing method (carton, clips, link belt, or bulk) used.

- **A111 (7.62mm Blank M82 Linked):** 100-round M13 linked belt (M82 Blank).
- **A165: (7.62mm NATO Linked):** 750-round M13 linked belt (4 x M80 Ball : 1 M62 Tracer). Used in 7.62mm miniguns.
- **AA11 (7.62mm Ball M118LR):** Long Range Ball. 20-round carton. Used in precision match, designated marksman, and sniper rifles.

See also

- 7.62 mm caliber
- .276 Pedersen
- Caliber conversion sleeve
- NATO EPVAT testing
- STANAG (Standardization Agreements of NATO)
- List of rifle cartridges

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2. ^ *Long range sniper ammunition* (<http://usarmorment.com/m118lr-762-175-gr-long-range-sniper-ammunition-20-rnd-box-p-1.html>), U.S. Armor.
3. ^ <http://forums.gunboards.com/showthread.php?945-FAQ-Difference-between-308-amp-7-62-X51-%28NATO%29>
4. ^ <http://www.snipershide.com/forum/ubbthreads.php?ubb=showflat&Number=769781>
5. ^ <http://www.sksboards.com/smf/index.php?topic=79015.0>
6. ^ http://www.saami.org/specifications_and_information/publications/download/SAAMI_ITEM_211-Unsafe_Arms_and_Ammunition_Combinations.pdf
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9. ^ Cartridges for Long-Range Sniping Rifles by Anthony G Williams (<http://www.quarry.nildram.co.uk/Long%20Range%20Sniping.htm>)
10. ^ ^{a b} Picatinny ammo goes from regular to unleaded (http://www.army.mil/article/106710/Picatinny_ammo_goes_from_regular_to_unleaded/) - Army.mil, 1 July 2013
11. ^ The Case for a General-Purpose Rifle and Machine Gun Cartridge (GPC) by Anthony G Williams (<http://www.quarry.nildram.co.uk/The%20Next%20Generation.htm>)
12. ^ <http://www.dtic.mil/ndia/2010armament/ThursdayLandmarkBJeffreyWoods.pdf>
13. ^ ^{a b} **SniperCentral.com** *History of the M118 Ammunition* (<http://www.snipercentral.com/m118.phtml>)
14. ^ ^{a b} <http://www.globalsecurity.org/military/systems/munitions/images/srta.jpg> 7.62MM M973 SRTA and M973 SRTA-T
15. ^ ^{a b} U.S. Navy Small Arms Ammunition Advancements - 7.62MM Special Ball, Long Range, NAVSEA Warfare Centers Crane (<http://www.dtic.mil/ndia/2009infantrysmallarms/tuesdaysessioniii8524.pdf>).
16. ^ Martin L. Fackler (1989). "Wounding patterns of military rifle bullets". *International Defense Review* (1/1989): 59–64.
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External links

- Various photos of 7.62×51 NATO ammunition (<http://www.conjay.com/Ammunition%20for%20Armor%20Testing%20NATO%207.62mm%20x%2051.htm>)

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5.56×45mm NATO

From Wikipedia, the free encyclopedia

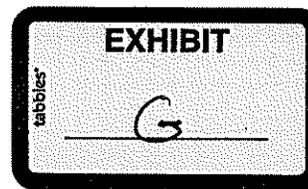
The **5.56×45mm NATO** (official NATO nomenclature 5.56 NATO) is an intermediate cartridge developed in the United States and originally chambered in the M16 rifle. Under STANAG 4172, it is a standard cartridge for NATO forces as well as many non-NATO countries.^[3] It is derived from, but not identical to, the .223 Remington cartridge. If the bullet impacts at high enough velocity and yaws^[4] in tissue, fragmentation creates a rapid transfer of energy which can result in dramatic wounding effects.^{[5][6][7]}

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History

In the 1950s, the 7.62×51mm NATO rifle cartridge (sold commercially as the .308 Winchester rifle cartridge)^[8] was selected to replace the .30-06 Springfield as the standard NATO rifle cartridge. At the time of selection, there had been criticism that the 7.62×51mm NATO was too powerful for light weight modern service rifles, causing excessive



5.56×45mm NATO



5.56×45mm NATO with measurement, left to right: bullet, empty case, complete round with bullet in case

Type	Rifle
Place of origin	 United States
Service history	
In service	Since 1980
Used by	NATO
Wars	Since Invasion of Grenada
Production history	
Designer	Remington Arms
Specifications	
Parent case	.223 Remington
Case type	Rimless, bottleneck
Bullet diameter	5.70 mm (0.224 in)
Neck diameter	6.43 mm (0.253 in)
Shoulder diameter	9.00 mm (0.354 in)
Base diameter	9.58 mm (0.377 in)
Rim diameter	9.60 mm (0.378 in)
Rim thickness	1.14 mm (0.045 in)
Case length	44.70 mm (1.760 in)
Overall length	57.40 mm (2.260 in)
Case capacity	1.85 cm ³ (28.5 gr H ₂ O)
Rifling twist	178 mm or 229 mm (1 in 7 in or 9 in, originally 1 in 14 in)
Primer type	Small rifle



The 7.62×51mm NATO and 5.56×45mm NATO cartridges compared to an AA battery.

recoil, and that the ammunition did not allow for sufficient rate of fire in modern combat.^[citation needed]

The British had extensive evidence with their own experiments into an intermediate cartridge since 1945 and were on the point of introducing a .280 inch (7 mm) cartridge when the selection of the 7.62×51mm NATO was made. The FN company had also been involved.^[9] The concerns about recoil and effectiveness were effectively overruled by the US within NATO, and the other NATO nations accepted that standardization was

more important at the time than selection of the ideal cartridge.^[citation needed] However, whilst the 7.62×51mm NATO round became NATO standard the US was already engaged in research of their own, which ultimately led to the 5.56×45mm NATO cartridge.^[citation needed]

During the late 1950s, ArmaLite and other U.S. firearm designers started their individual Small Caliber/High Velocity (SCHV) assault rifle experiments using the commercial .222 Remington cartridge. When it became clear that there was not enough powder capacity to meet U.S. Continental Army Command's (CONARC) velocity and penetration requirements, ArmaLite contacted Remington to create a similar cartridge with a longer case body and shorter neck. This became the .222 Remington Special. At the same time, Springfield Armory's Earle Harvey had Remington create an even longer cartridge case then known as the .224 Springfield. Springfield was forced to drop out of the CONARC competition, and thus the .224 Springfield was later released as a commercial sporting cartridge known as the .222 Remington Magnum. To prevent confusion with all of the competing .222 cartridge designations, the .222 Remington Special was renamed the .223 Remington. With the U.S. military adoption of the ArmaLite M16 rifle in 1963, the .223 Remington was standardized as the 5.56×45mm NATO. As a commercial sporting cartridge the .223 Remington was only introduced in 1964.

The 5.56×45mm cartridge, along the M16 rifle, were initially adopted by U.S. infantry forces as interim solutions to address the weight and control issues experienced with the 7.62×51mm round and M14 rifle. In the late 1950s, the Special Purpose Individual Weapon program sought to create flechette rounds to allow troops to fire sabot-type projectiles to give a short flight time and flat trajectory with a muzzle velocity of 1,200 metres per second (3,900 ft/s) to 1,500 metres per second (4,900 ft/s). At those speeds, factors like range, wind drift, and target movement would no longer affect performance. Several manufacturers produced varying weapons designs, including traditional wooden, bullpup, "space age," and even multi-barrel designs with drum magazines. All used similar ammunition firing a 1.8 mm diameter dart with a plastic "puller" sabot filling the case mouth. While the flechette ammo had excellent armor penetration, there were doubts about their terminal effectiveness against unprotected targets. Conventional cased ammunition was more accurate and the sabots were expensive to produce. The SPIW never created a weapons system that was combat effective, so the M16 was retained, and the 5.56 mm round was kept as the standard U.S. infantry rifle cartridge.^[9]

In a series of mock-combat situations testing in the early 1960s with the M16, M14 and AK-47, the Army found that the M16's small size and light weight allowed it to be brought to bear much more quickly.^[citation needed] Their final conclusion was that an 8-man team equipped with the M16 would have the same fire-power as a current 11-man team armed with the M14.^[citation needed] U.S. troops were able to carry more than twice as much 5.56×45mm NATO ammunition as 7.62×51mm NATO for the same weight, which would allow them a better advantage against a typical NVA unit armed with AK-47s.

Maximum pressure (EPVAT)	430.00 MPa (62,366 psi)
Maximum pressure (SCATP 5.56)	380.00 MPa (55,114 psi)

Ballistic performance

Bullet weight/type	Velocity	Energy
4 g (62 gr) SS109 FMJBT	940 m/s (3,100 ft/s)	1,767 J (1,303 ft·lbf)
4.1 g (63 gr) DM11 FMJBT	936 m/s (3,070 ft/s)	1,796 J (1,325 ft·lbf)
4.1 g (63 gr) GP 90 FMJBT	905 m/s (2,970 ft/s)	1,679 J (1,238 ft·lbf)

Test barrel length: 508 mm (20.0 in)

Source(s): NATO EPVAT testing, QuickLOAD, SAAMI, C.I.P.^{[1][2]}

According to the official NATO proofing guidelines the 5.56×45mm NATO case can handle up to 430 MPa (62,000 psi) piezo service pressure. In NATO regulated organizations every rifle cartridge combo has to be proofed at 125% of this maximum pressure to certify for service issue. This is equal to the C.I.P. maximum pressure guideline for the .223 Remington cartridge, that is the 5.56×45mm NATO parent cartridge.

Performance

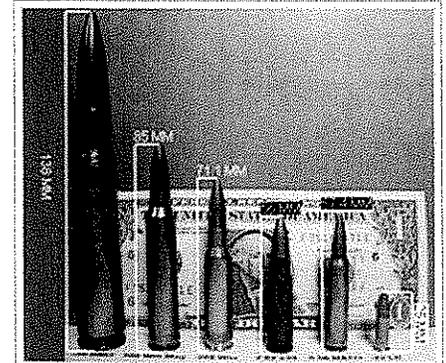
The 5.56×45mm NATO SS109/M855 cartridge (NATO: SS109; U.S.: M855) with standard 62 gr. lead core bullets will penetrate approximately 38 to 51 cm (15 to 20 in) into soft tissue in ideal circumstances. As with all spitzer shaped projectiles it is prone to yaw in soft tissue. However, at impact velocities above roughly 762 m/s (2,500 ft/s), it may yaw and then fragment at the canelure (the crimping groove around the cylinder of the bullet).^[19] These fragments can disperse through flesh and bone, inflicting additional internal injuries.^[20]

Fragmentation, if or when it occurs, imparts much greater damage to human tissue than bullet dimensions and velocities would suggest. This fragmentation effect is highly dependent on velocity, and therefore barrel length: short-barreled carbines generate less muzzle velocity and therefore lose wounding effectiveness at much shorter ranges than longer-barreled rifles.^[21] Proponents of the hydrostatic shock theory contend that the rapid transfer of energy also results in wounding effects beyond the tissue directly crushed and torn by the bullet and fragments.^{[5][6]} These remote wounding effects are known as hydrostatic shock.^[7]

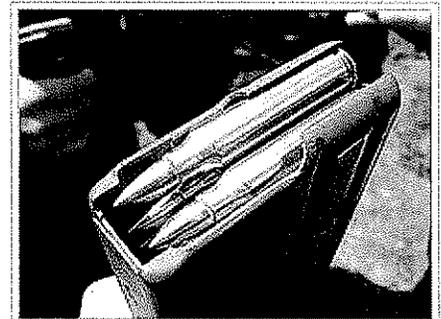
SS109/M855 NATO ball can penetrate up to 3 mm (0.12 in) of steel at 600 meters.^[22] According to Nammo, a Norwegian ammunition producer, the 5.56×45mm NATO M995 armour piercing cartridge can penetrate up to 12 mm (0.47 in) of RHA steel at 100 meters.^[23]

The US Army's Ballistic Research Laboratory measured a ballistic coefficient (G7 BC) of 0.151 and form factor (G7 *i*) of 1.172 for the SS109/M855 ball projectile.^[24]

The Swedish military has measured the bullet velocities of SS109/M855 military cartridges at 4 m (13.1 ft) from the muzzle fired from differing barrel lengths.^[25]



5.56mm NATO shown alongside other cartridges



5.56×45mm NATO cartridges in a STANAG magazine.

Barrel length	SS109/M855 V ₄ bullet velocity	V ₄ velocity loss
210 mm (8.3 in)	723 m/s (2,372 ft/s)	41 m/s (135 ft/s)
240 mm (9.4 in)	764 m/s (2,507 ft/s)	32 m/s (105 ft/s)
270 mm (10.6 in)	796 m/s (2,612 ft/s)	29 m/s (95 ft/s)
300 mm (11.8 in)	825 m/s (2,707 ft/s)	18 m/s (59 ft/s)
330 mm (13.0 in)	843 m/s (2,766 ft/s)	23 m/s (75 ft/s)
360 mm (14.2 in)	866 m/s (2,841 ft/s)	12 m/s (39 ft/s)
390 mm (15.4 in)	878 m/s (2,881 ft/s)	14 m/s (46 ft/s)
420 mm (16.5 in)	892 m/s (2,927 ft/s)	14 m/s (46 ft/s)
450 mm (17.7 in)	906 m/s (2,972 ft/s)	9 m/s (30 ft/s)
480 mm (18.9 in)	915 m/s (3,002 ft/s)	7 m/s (23 ft/s)
508 mm (20.0 in)	922 m/s (3,025 ft/s)	-

Criticism

There has been much criticism of the allegedly poor performance of the bullet on target, especially the first-shot kill rate when the muzzle velocity of the firearms used and the downrange bullet deceleration do not achieve the minimally required terminal velocity of over 750 m/s (2,500 ft/s) at the target to cause fragmentation. Many complaints were reported during the Gulf War, Somalia, and in the conflicts in Iraq and Afghanistan. This can be attributed to the change in barrel length, as this cartridge was designed to achieve maximum performance in a 20-inch (51 cm) barrel. The 14.5-inch (37 cm) barrel of the U.S. military's M4 carbine generates considerably less muzzle velocity than the longer 20-inch (51 cm) barrel found on the M16 rifle, and terminal performance can be a particular problem with the M4.

The 5.56×45mm NATO standard SS109/M855 cartridge was designed for maximum performance when fired from a 508 mm (20.0 in) long barrel, as was the original 5.56 mm M193 cartridge. Greater length barrels actually result in no improvement or a decrease in muzzle velocities due to the propellant burning characteristics induced pressure versus barrel friction relationship. Shorter barrels produce a greater flash and noise signature, and the addition of a suppressor to a short barreled AR family rifle can make it unreliable, as the reduced time for the propellant to burn in the barrel and higher muzzle pressure levels at the suppressor entrance can cause faster cycling and feeding issues. Unless the gas port can be regulated or adjusted for higher pressures, suppressors for short barreled 5.56×45mm NATO firearms must be larger and heavier than models for standard length rifles to function reliably. SS109/M855 cartridges fired from barrels under about 254 mm (10.0 in) in length do not have enough muzzle velocity energy to cause bullet fragmentation that occurs only at terminal velocities of over 750 m/s (2,500 ft/s) on impact, reducing the wounding capacity.^[26]

Combat operations the past few months have again highlighted terminal performance deficiencies with 5.56×45mm 62 gr. M855 FMJ. These problems have primarily been manifested as inadequate incapacitation of enemy forces despite them being hit multiple times by M855 bullets. These failures appear to be associated with the bullets exiting the body of the enemy soldier without yawing and fragmenting.

This failure to yaw and fragment can be caused by reduced impact velocities as when fired from short barrel weapons or when the range increases.

Although all SS109/M855 types must be 62 gr. FMJ bullets constructed with a steel penetrator in the nose, the composition, thickness, and relative weights of the jackets, penetrators, and cores are quite variable, as are the types and position of the cannelures. Because of the significant differences in construction between bullets within the SS109/M855 category, terminal performance is quite variable – with differences noted in yaw, fragmentation, and penetration depths. Luke Haag's papers in the AFTE Journal (33(1):11–28, Winter 2001) also describes this problem.

—^[27]

If 5.56 mm bullets fail to upset (yaw, fragment, or deform) within tissue, the results are relatively insignificant wounds. This is true for all 5.56x45mm bullets, including both military FMJ and OTM (open tip match) and civilian JHP/JSP designs used in law enforcement. As expected, with decreased wounding effects, rapid incapacitation is unlikely: enemy soldiers may continue to pose a threat to friendly forces and violent suspects can remain a danger to law enforcement personnel and the public.

This failure of 5.56x45mm NATO bullets to yaw and fragment can be caused by reduced impact velocities as when fired from short-barreled weapons or when the range to the target increases. Failure to yaw and fragment can also occur when the bullets pass through only minimal tissue, such as a limb or the chest of a thin, small statured individual, as the bullet may exit the body before it has a chance to yaw and fragment. Two other yaw issues: Angle-of-Attack (AOA) variations between different projectiles, even within the same lot of ammo, as well as Fleet Yaw variations between different rifles, were elucidated in 2006 by the Joint Service Wound Ballistic Integrated Product Team (JSWB-IPT), which included experts from the military law enforcement user community, trauma surgeons, aero ballisticians, weapon and munitions engineers, and other scientific specialists. These yaw issues were most noticeable at close ranges and were more prevalent with certain calibers and bullet styles — the most susceptible being 5.56x45mm NATO FMJ ammunition like SS109/M855 and M193.

—Dr. Martin Fackler^[28]

Despite complaints that the 5.56x45mm NATO round lacks stopping power, others contend that animal studies of the wounding effects of the 5.56x45mm NATO round versus the 7.62x39mm have found that the 5.56x45mm NATO round is more damaging, due to the post-impact behavior of the 5.56 mm projectile resulting in greater cavitation of soft tissues.^[29] The US Army contended in 2003 that the lack of close range lethality of the 5.56x45mm NATO was more a matter of perception than fact. With controlled pairs and good shot placement to the head and chest, the target was usually defeated without issue. The majority of failures were the result of hitting the target in non-vital areas such as extremities. However, a minority of failures occurred in spite of multiple hits to the chest.^[30]

Some have contended that shot placement is the most important parameter in determining the lethality of a bullet. Shots to the central nervous system and major blood vessels are the primary forms of incapacitation. Difficulty with the 5.56x45mm NATO at range can be attributed to training, as only a few nations taught shooting beyond 200–300 meters to regular soldiers. At a marksmanship training workshop held in Spain in March 2010, some participants went from using 150 rounds over 28 hours to engage targets out to 200 meters, to using 1,000 rounds over two weeks engaging targets out to 400 meters. Sweden and Canada had requirements to shoot 3-5 rounds, respectively, in the prone or kneeling position at 100 meters with a max dispersion of 150 mm (5.9 in). Due to their inability to adjust rifle fire for dispersion, target movement, unknown ranges, and wind drift, Swedish ISAF units relied on .50 BMG heavy machine guns for long-range. The effect of barrel length is also questioned. A barrel length reduction of 59 percent results in a reduced muzzle velocity for 5.56x45mm NATO ball of only 21 percent. The length differences between a 508 mm (20.0 in) M16 barrel and 368 mm (14.5 in) M4 barrel results in a trajectory difference of 16 mm (0.63 in) at 250 m. A bullet fired from an M16 has a greater terminal velocity than one from an M4 only up to 50 meters longer distance. Time of flight difference from the two barrel lengths is 2 cm (0.79 in) per meter per second at 300 meters. Underperformance can be attributed to errors in range estimation, target lead, wind, firing position, and stress under fire, which are factors that can be resolved through training.^{[25][31]}

Improvements

Advances have been made in 5.56 mm ammunition. The U.S. Military had adopted for limited issue a 77-grain (5.0 g) "Match" bullet, type classified as the Mk 262. The heavy, lightly constructed bullet fragments more violently at short range and also has a longer fragmentation range.^[32] Originally designed for use in the Mk 12 SPR, the ammunition has found favor with special forces^[33] units who were seeking a more effective cartridge to fire from their M4A1 carbines. Commercially available loadings using these heavier (and longer) bullets can be prohibitively expensive and cost much more than military surplus ammunition. Additionally, these heavy-for-caliber loadings sacrifice some penetrative ability compared to the M855 round (which has a steel penetrator tip). Performance of 5.56x45 mm military ammunition can generally be categorized as almost entirely dependent upon velocity in order to wound effectively. Heavy OTM bullets enhance soft tissue wounding ability at the expense of hard-target/barrier penetration.

U.S. Special Forces had sought to create a round that had increased power out of carbine M4 barrels and compact SCAR-L barrels, while increasing hard target performance. Developmental efforts led to the creation of the Mk318. The bullet uses an open-tip design to inflict damage on soft tissue, and has a brass rear to penetrate hard targets. The tip and lead core fragments consistently even out of short barrels, while the rear moves through once the front impacts.^[34] It has more consistent performance because it is not yaw-dependent like the M855; the nose fragments upon impact and solid rear penetrator continues to move relatively straight. This makes the Mk318 effective against personnel with or without body armor. The round also increases accuracy, from 3-5 minute of angle with the M855 from an M4A1 barrel to 1.71 MOA at 300 yards and 1.67 MOA at 600 yards from a 14 in (360 mm) SCAR-L barrel.^[35]

For general issue, the U.S. Army adopted the M855A1 round in 2010 to replace the M855. The primary reason was pressure to use non-lead bullets. The lead slug is replaced by a copper alloy slug in a reverse-drawn jacket, with a hardened steel penetrator extending beyond the jacket, reducing lead contamination to the environment. The M855A1 offers several improvements other than being lead-free. It is slightly more accurate, has better consistency of effect in regards to wounding ability, and has an increased penetrating capability. The round can better penetrate steel, brick, concrete, and masonry walls, as well as body armor and sheet metal. It penetrates $\frac{3}{8}$ in (9.5 mm) of mild steel at 350 meters, which the M855 can only do at 160 meters. The propellant burns faster, which decreases the muzzle flash and gives a higher muzzle velocity, an important feature when fired from a short barreled M4 carbine. Though the M855A1 is more expensive to produce, its increased performance compensates. One possible danger is that it generates more pressure in the chamber when fired, slightly increasing the risk of catastrophic failure of the weapon, though this has yet to occur.^{[36][37]}

The U.S. Marines adopted the Mk318 in early 2010 due to delays with the M855A1. This was a temporary measure until the M855A1 was available for them, which occurred in mid-2010 when the Army began to receive the rounds. Both the Mk318 and M855A1 weigh the same and have similar performance, and both have better performance than the M855 against all targets. SOCOM spent less money developing the Mk318 and is marginally better than the M855A1 in some situations, but costs more per round. The Army spent more developing the M855A1 which performs as well or nearly as well as the Mk318, but is cheaper per round and has the advantage of being lead-free. While SOCOM constantly looks for better equipment, the Army and Marines have far more troops to supply and buys more ammunition.^[38]

Alternatives

If the 5.56 mm bullet is moving too slowly to reliably fragment on impact, the wound size and potential to incapacitate a person is greatly reduced. There have been numerous attempts to create an intermediate cartridge that addresses the complaints of 5.56 NATO's lack of stopping power along with lack of controllability seen in rifles firing 7.62 NATO in full auto. Some alternative cartridges like the 6.8mm Remington SPC (6.8×43mm) focused on superior short-range performance by sacrificing long-distance performance due to relatively short engagement distances typically observed in urban warfare. Others, like the 6.5mm Grendel (6.5×39mm), are attempts at engineering an all purpose cartridge that could replace both the 5.56 and 7.62 NATO rounds. The 300 AAC Blackout (7.62×35mm) round was designed to have the power of the 7.62×39mm for use in an M4 platform using standard M4 magazines, and to easily interchange between subsonic ammunition for suppressed firing and supersonic rounds. All these cartridges have certain advantages over the 5.56×45mm NATO, but they have their own individual tradeoffs to include lower muzzle velocity, less range, decreased magazine capacity, and different internal parts. None of these cartridges have gained any significant traction beyond sport shooting communities.

By late 2004, the 6.8mm Remington SPC was in limited use with U.S. Special Operators.^[39] However, it was not adopted for widespread use due to resistance from officials on changing calibers and the development of the 6.5mm Grendel, which had better accuracy past 500 meters.^[40] In 2007, both the U.S. SOCOM and the U.S. Marine Corps decided not to field weapons chambered in 6.8 mm due to logistical and cost issues.^[41]

General Purpose Cartridge

The conflict in Afghanistan has caused a fundamental shift in the consideration of small-arms cartridge use. Previously, the normal maximum range for small-arms engagements was around 300 meters. In Afghanistan, Taliban fighters with PKM machine guns and Dragunov SVD sniper rifles launched half their attacks between 300 and 900 meters. Over a quarter of engagements took place between 500 and 900 meters. British soldiers were initially only armed with 5.56 mm L85A2 rifles, L86A2 light support weapons, and L110A1 Para light machine guns. The L85/86 had an effective range of 300 meters and the L110A1 had an effective range of 200–300 meters. Over half of small-arms engagements took place beyond the effective range of standard British infantry weapons, and 70 percent were beyond the effective range of a short barreled M4 Carbine. 5.56 mm rounds also have poor suppressive effects against concealed positions at those ranges. The suppressive effect of a small-arms bullet is directly proportional to the loudness of the sonic bang it generates, which in turn that is directly proportional to its size. 5.56 mm rounds have half the suppressive radius of 7.62 mm rounds, which can be further decreased by wind drift at long-range. Complaints are compounded by laboratory tests that reveal that 85 percent of SS109/M855 bullets do not yaw until at least 120 mm (4.7 in) of penetration, which would be most of the way through the body.^{[24][42]}

Weapons like the 7.62 mm Mk 14 Enhanced Battle Rifle and Mk 48 machine gun became increasingly utilized by U.S. troops, as their need for effective fire beyond 500 meters was considered worth the weight increase. British troops turned to carrying the 7.62 mm L7A2 GPMG and L129A1 marksman rifle. The 7.62 NATO cartridge is larger, heavier, and produces three to four times as much recoil as the 5.56. This makes it difficult to fire in rapid semi-automatic mode and almost uncontrollable on automatic. Users of the SCAR-H battle rifle claim that only the first round of an automatic burst would hit the target. Retaining both the 5.56 for close-range fighting and the 7.62 for long-range has its disadvantages, as only half the squad would be well-equipped for each situation. This also hurts logistics and the ability to interchange ammunition, as a squad would be armed with magazine-fed 5.56 and 7.62 rifles, and belt-fed 5.56 and 7.62 machine guns.^{[24][42]}

There are several ways to address 5.56 mm deficiencies. One is to improve the load of the bullet. The U.S. has developed the Mk 262, Mk318, and M855A1 to give better performance from short barreled carbines, improve barrier penetration, and give more reliable terminal effectiveness. However, they have similar exterior ballistics to the M855 and do not meet the need for long-range coverage, as the rounds are limited by the small size and power of the cartridge. Furthermore, the open-tip designs

and fragmentation ability of the rounds may not be accepted by other NATO countries due to their interpretation of Declaration III of the Hague Convention. Another way would be to return entirely to the 7.62×51mm NATO cartridge. The principle 7.62 round is the M80, which delivers terminal effectiveness through its size and power. It does not yaw rapidly on impact and although it has a longer range, it has poor long-range performance due to its relatively light bullet, which sheds velocity quickly. A low-recoil loading could be adopted for rifles, like the 138 gr (8.9 g) bullet used in the Japanese Howa Type 64, while keeping full-power M80 rounds for machine guns and marksman rifles. The disadvantages with this are interchangeability in combat would be difficult because the rifles' gas systems would need to be adjusted to use the different ammo types, the ammunition load for riflemen would be doubled, and the weight of machine gun ammo would be the same. The open-tipped Mk319 loading has good terminal effectiveness and barrier penetration, but greater weight and recoil still limits the usefulness of 7.62 mm rounds. Another option would be to keep the 7.62 for long-range use, and replace the 5.56 for short to medium-range use. The 6.8×43mm SPC has better terminal effectiveness and barrier penetration with little increased weight or recoil. The 6.8 mm round was kept short and relatively light to keep its overall length the same as the 5.56, so longer-range performance is limited.^{[24][42]}

A more radical alternative is to create a new cartridge that can replace both rounds. This concept has become known as a *General Purpose Cartridge (GPC)*, which could create one common round for a dismounted infantry section. With the size and performance class of the 6.8 mm for short-range, balancing the right caliber and bullet could theoretically match the long-range performance of the 7.62 with much lower weight and recoil. There have been several attempts to create and adopt a general purpose cartridge. The U.S. had previously sought to adopt a reduced power, general-purpose cartridge with the .276 Pedersen in the early 1930s. It was intended to replace the .30-06 Springfield but was rejected in 1932 because of large stocks of available .30-06 ammunition. The U.S. Army also felt it offered insufficient long-range performance, as their mindset was for long-range semi-automatic fire. The British created a reduced-power round with the .280 British for trials to select NATO's first standard rifle and machine gun cartridge. The bullet had less weight and recoil than the American 7.62×51mm and had more energy at long range, but was defeated by the U.S. insistence of their cartridge to be powerful enough to replace the .30-06 in machine guns. In the 1970s, the U.S. created the 6 mm SAW round for use in a squad automatic weapon. Because of logistics concerns over adopting a third rifle caliber, development was abandoned when a better 5.56 mm round was promised, which arrived as the M855.^{[9][24]}

A comparison of M80 7.62 mm, M855 5.56 mm, 115 gr 6.8 mm SPC, and 123 gr 6.5 Grendel shows very different performances. 7.62 mm starts out very powerful at the muzzle, but drops significantly out to 1,000 meters. 6.8 mm is more powerful than 5.56 mm, but also decreases with range due to its short bullet. 6.5 mm starts with similar power to 6.8 mm, but has slightly greater energy than 7.62 mm at 1,000 meters. The 6.5 Grendel's low-drag, lead-cored bullet is longer and more aerodynamic, giving it a flatter trajectory and less wind drift despite its lower muzzle velocity. 6.8 SPC and 6.5 Grendel were designed to be the same length as the 5.56 to fit in a converted AR-15 rifle, constraining certain bullet designs. A new GPC in a new family of weapons would not be constrained.^[24] While the 6.5 Grendel appears to fill the role of a GPC, it achieves the required performance through a long barrel and heavy lead-cored bullet. Out of a shorter carbine barrel, it would need an even heavier round for the same ballistics. It is constrained by its overall length if a lead-free round were made, as it would need to be longer to be the same weight as the lead-cored round, which would require filling up more case space and losing propellant; even more would be lost using tracer bullets. If a light hybrid polymer/metal case were to be used, it would be thicker and further reduce propellant space. The desire for lead-free cartridges and lighter case designs mean that even though the 6.5 Grendel has better performance than most existing rounds, it does not have the case capacity to match 7.62 mm performance, and so cannot be the GPC.^[43] The case is also very short and wide with little tapering and a sharp shoulder, making it less suitable to be linked in belts for machine guns.^[44]

The United States Army Armament Research, Development and Engineering Center (ARDEC) Small Caliber Munitions Technology Branch released the results of tests carried out to determine the optimum caliber for a military rifle in March 2011. 5.56 mm and 7.62 mm rounds were tested against 6 mm, 6.35 mm, and 6.8 mm rounds, all loaded with lead-free copper and steel bullets. Criteria examined included: penetration; terminal effectiveness; accuracy; initial, retained, and striking energy; wind drift; stowed kills; and recoil. The study found that the 6.35 and 6.8 calibers comprehensively outperformed the others in their overall balance of characteristics. In 2012, a study from the U.S. Army Marksmanship Unit (AMU) concluded that the optimum cartridge for a future infantry carbine should have a length and diameter greater than 5.56×45mm, be 6.5 mm caliber, have a muzzle energy of 2,500 J (1,800 ft-lb), and use low-drag bullets (G7 BC of .250+) to provide better long-range performance over the 7.62 mm with more retained velocity and energy, a flatter trajectory, and less wind drift. A Small Arms Intermediate Caliber Study done by the Canadian Department of Applied Military Science as part of their Small Arms

Modernization and Replacement Project shows similar findings. They compared the ballistics of NATO 5.56 mm and 7.62 mm with commercial 6.5 mm and 6.8 mm rounds. Their conclusion was that 6.5 mm rounds with low-drag bullets had the best long-range performance and resistance to external factors.^{[24][43]}

Two 6.5 mm cartridge designs, one lead-free weighing 7 g (110 gr) and one lead-cored weighing 8 g (120 gr), have both been calculated to outperform M80 7.62 mm and M855 5.56 mm out to 1,000 meters, with all fired from 20 in barrels. At that distance, the 6.5 mm rounds have higher velocities, more energy, and more armor and barrier penetration. 7.62 drops 15 meters and 5.56 drops 17 meters below the line of sight, while both 6.5 rounds drop 12.5 meters. Against a 10 mph cross-wind at that range, 7.62 is blown sideways 4.25 m and 5.56 moves 5.4 m, while the 8 gram and 7 gram 6.5 rounds move 3 m and 3.3 m respectively. Time of flight for 7.62 is 2.1 seconds to travel 1,000 meters, while 5.56 takes 2.2 seconds, and both 6.5 rounds take 1.9 seconds. The 5.56 cartridge has the advantages of being the lightest and having the least recoil, but poor performance at long range makes it incapable of fulfilling the role of a GPC.^[24]

A general purpose cartridge used by U.S. forces would likely be lead-free and have a steel penetrator like the M855A1. European cartridges would need to comply with their interpretations of the Hague and Geneva Conventions, likely having a jacket that fully encloses the nose and sides of the bullet and doesn't expand or readily fragment on impact. Ball rounds would need to penetrate intermediate barriers and maintain its trajectory after passing through. Armor-piercing and tracer rounds also need to be developed. The GPC could be utilized through the Lightweight Small Arms Technologies effort to develop cased telescoped ammunition and caseless ammo, as well as weapons to fire them. Creating a lighter form of ammunition and new weapons would be a missed opportunity if current projectiles were used with their known deficiencies.^[24]

5.56 mm NATO versus .223 Remington

The 5.56 mm NATO and .223 Remington cartridges and chamberings are similar but not identical.^[45] While the cartridges are identical other than powder load, the chamber leade, i.e. the area where the rifling begins, is cut to a sharper angle on some .223 commercial chambers. Because of this, a cartridge loaded to generate 5.56mm pressures in a 5.56mm chamber may develop pressures that exceed SAAMI limits when fired from a short-leade .223 Remington chamber.

Brass Case

The dimensional specifications of 5.56 NATO and .223 commercial brass cases are identical. The cases tend to have similar case capacity when measured, with variations chiefly due to brand, not 5.56 vs .223 designation. The result of this is that there is no such thing as "5.56 brass" or ".223 brass", the differences in the cartridges lie in pressure ratings and in chamber leade length, not in the shape or thickness of the brass.^{[46][47]}

In July 2012, the Army solicited a request for vendors to supply alternative cartridge cases to reduce the weight of an M855A1 5.56 mm round by at least 10 percent, as well the for 7.62 NATO and .50 BMG rounds. The cartridge cases must maintain all performance requirements when fully assembled, be able to be used by the Lake City Army Ammunition Plant, must be manufactured in quantities totaling approximately 45 million per year. Polymer-cased ammunition is expected as a likely lightweight case technology.^[48] A hybrid polymer/metal version of a conventional cartridge case would be thicker than regular cases and reduce the amount of space for the propellant,^[43] although certain polymers could be thermodynamically more efficient and not lose energy to the case or chamber when fired.^[44]

Pressure

C.I.P. defines the maximum service and proof test pressures of the .223 Remington cartridge equal to the 5.56 mm NATO, at 430 MPa (62,366 psi). This differs from the SAAMI maximum pressure specification for .223 Remington of 380 MPa (55,114 psi), due to CIP test protocols measuring pressure using a drilled case, rather than an intact case with a conformal piston, along with other differences.^[49] NATO uses NATO EPVAT pressure test protocols for their small arms ammunition specifications.

Because of these differences in methodology, the CIP pressure of 430 MPa (62,366 psi) is the same as a SAAMI pressure of 380 MPa (55,114 psi), which is reflected in US Military specifications for 5.56 mm NATO, which call for a mean maximum pressure of 55,000 PSI (when measured using a protocol similar to SAAMI).^[50]

These pressures are generated and measured using a chamber cut to 5.56 NATO specifications, including the longer leade. Firing 5.56mm NATO from a chamber with a shorter .223 Remington leade can generate pressures in excess of SAAMI maximums.

Chamber

The 5.56 mm NATO chambering, known as a NATO or mil-spec chamber, has a longer leade, which is the distance between the mouth of the cartridge and the point at which the rifling engages the bullet. The .223 Remington chambering, known as SAAMI chamber, is allowed to have a shorter leade, and is only required to be proof tested to the lower SAAMI chamber pressure. To address these issues, various proprietary chambers exist, such as the Wylde chamber (Rock River Arms)^[51] or the ArmaLite chamber, which are designed to handle both 5.56×45mm NATO and .223 Remington equally well. The dimensions and leade of the .223 Remington minimum C.I.P. chamber also differ from the 5.56 mm NATO chamber specification.

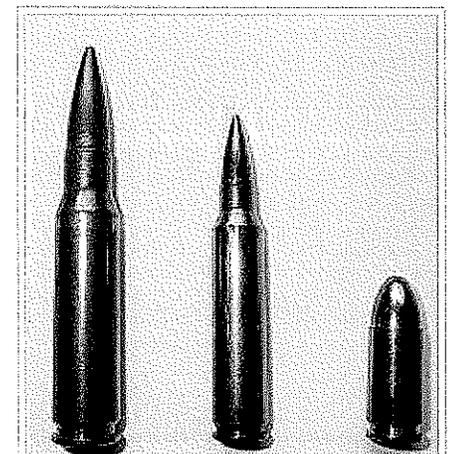
Using commercial .223 Remington cartridges in a 5.56 mm NATO chambered rifle should work reliably, but until recently, it was believed this was less accurate than when fired from a .223 Remington chambered gun due to the longer leade.^[52] Although that may have been true in the early 1960s when the two rounds were developed, recent testing has shown that with today's ammunition, rifles chambered in 5.56mm can also fire .223 ammunition every bit as accurately as rifles chambered in .223 Remington, and the 5.56mm chamber has the additional advantage of being able to safely fire both calibers.^[53] Using 5.56 mm NATO mil-spec cartridges (such as the M855) in a .223 Remington chambered rifle can lead to excessive wear and stress on the rifle and even be unsafe, and SAAMI recommends against the practice.^{[54][55]} Some commercial rifles marked as ".223 Remington" are in fact suited for 5.56 mm NATO, such as many commercial AR-15 variants and the Ruger Mini-14 (marked ".223 cal"), but the manufacturer should always be consulted to verify that this is acceptable before attempting it, and signs of excessive pressure (such as flattening or gas staining of the primers) should be looked for in the initial testing with 5.56 mm NATO ammunition.^[56]

It should also be noted that the upper receiver (to which the barrel with its chamber are attached) and the lower receiver are entirely separate parts in AR-15 style rifles. If the lower receiver has either .223 or 5.56 stamped on it, it does not guarantee the upper assembly is rated for the same caliber, because the upper and the lower receiver in the same rifle can, and frequently do, come from different manufacturers – particularly with rifles sold to civilians or second-hand rifles.

In more practical terms, as of 2010 most AR-15 parts suppliers engineer their complete upper assemblies (not to be confused with stripped uppers where the barrel is not included) to support both calibers in order to satisfy market demand and prevent any potential problems.

5.56 mm NATO versus 7.62 mm NATO

Cartridge	Model	Cartridge size	Cartridge weight	Bullet weight	Velocity	Energy
5.56mm NATO	M855 ^[57]	5.56×45mm	12.31 g (190 gr)	4.02 g (62 gr)	991 m/s (3,251 ft/s) ^[57]	1,974 J ^[58]
7.62mm NATO	M80 ^[59]	7.62×51mm	25.40 g (392 gr)	9.33 g (144 gr)	838 m/s (2,749 ft/s) ^[59]	3,275 J



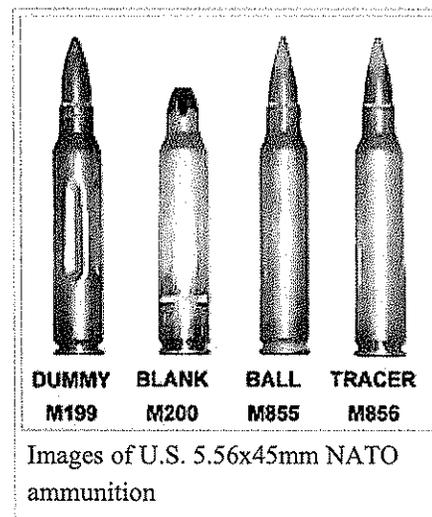
Comparison of 7.62mm NATO, 5.56mm NATO and 9mm Parabellum.

Military cartridge types

- **Cartridge, Ball, F1 (Australia):** 5.56×45mm FN SS109 equivalent produced by Thales Australia, formerly Australian Defence Industries (ADI).
- **Cartridge, Ball, F1A1 (Australia):** 5.56×45mm with optimized projectile having a modified boat tail length and meplat diameter, redesigned case thickness, new primer cup design, and AR2210V01 propellant. [green tip]^{[60][61]}
- **Cartridge, Blank, F3 (Australia):** 5.56×45mm Blank cartridge produced by Thales Australia, formerly Australian Defence Industries (ADI).

- **Cartridge, Ball, SS109 (Belgium):** 5.56x45mm 61-grain [3.95 g]^[62] Semi-Armor-Piercing cartridge w/. steel penetrator produced by Fabrique Nationale. Adopted in 1979 as the NATO standard.^[63]
- **Cartridge, Ball, C77 (Canada):** 5.56x45mm FN SS109 equivalent used in the C7, C8 and C9 type weapons. Made by General Dynamics Canada.
- **Cartridge, Blank, C79 (Canada):** 5.56x45mm blank cartridge used in the C7, C8 and C9 type weapons. Also made by General Dynamics Canada.
- **Cartridge, Ball, DM11 (Germany):** 5.56x45mm 4.1 g dual core ball cartridge w/steel core, produced by RUAG Ammotec. [green tip]
- **Cartridge, Tracer, DM21 (Germany):** 5.56x45mm tracer compliment to DM11, also produced by RUAG Ammotec. [orange tip]
- **Cartridge, Ball, L2A1 (United Kingdom):** 5.56x45mm M193 equivalent produced by Radway Green.^[64]
- **Cartridge, Ball, L2A2 (United Kingdom):** 5.56x45mm FN SS109 equivalent produced by Radway Green.
- **Cartridge, Tracer, L1A1 (United Kingdom):** 5.56x45mm tracer compliment to L2A1, produced by Radway Green. [red tip]
- **Cartridge, Tracer, L1A2 (United Kingdom):** 5.56x45mm tracer compliment to L2A2, produced by Radway Green. [red tip]

- **Cartridge, Caliber 5.56 mm, Ball, M193 (United States):** 5.56x45mm 55-grain [3.56 g] ball cartridge.
- **Cartridge, Caliber 5.56 mm, Grenade, M195 (United States):** 5.56x45mm grenade launching blank.
- **Cartridge, Caliber 5.56 mm, Tracer, M196 (United States):** 5.56x45mm 54-grain [3.43 g] tracer cartridge. [red or orange tip].
- **Cartridge, Caliber 5.56 mm, Dummy, M199 (United States):** 5.56x45mm dummy cartridge, non firing, indented case.
- **Cartridge, Caliber 5.56 mm, Blank, M200 (United States):** 5.56x45mm violet-tipped blank cartridge.
- **Cartridge, Caliber 5.56 mm, Ball, M202 (United States):** 5.56x45mm 58-grain FN SSX822 cartridge.
- **Cartridge, Caliber 5.56 mm, Ball, XM287 (United States):** 5.56x45mm 68-grain ball cartridge produced by Industries Valcartier, Inc. An Improved version was also produced designated XM779.
- **Cartridge, Caliber 5.56 mm, Tracer, XM288 (United States):** 5.56x45mm 68-grain tracer cartridge produced by Industries Valcartier, Inc. An Improved version was also produced designated XM780.
- **Cartridge, Caliber 5.56 mm, Grenade, M755 (United States):** 5.56x45mm grenade launching blank specifically for the M234 launcher.
- **Cartridge, Caliber 5.56 mm, Ball, XM777 (United States):** 5.56x45mm ball cartridge.
- **Cartridge, Caliber 5.56 mm, Tracer, XM778 (United States):** 5.56x45mm tracer cartridge.
- **Cartridge, Caliber 5.56 mm, Ball, M855 (United States):** 5.56x45mm 62-grain FN SS109-equivalent ball cartridge with a steel penetrator tip over a lead core in a partial copper jacket. [green tip]
- **Cartridge, Caliber 5.56 mm, Ball, M855 Lead Free (United States):** 62-grain bullet with a steel penetrator tip over a tungsten-composite core in a partial copper jacket. Primarily used during training in countries with strict lead disposal laws. [green tip]^[65]
- **Cartridge, Caliber 5.56 mm, Ball, M855A1 (United States):** 62-grain bullet w/ a 19-grain steel penetrator tip over a copper alloy core. [bronze tip]^[66]
- **Cartridge, Caliber 5.56 mm, Tracer, M856 (United States):** 5.56x45mm 63.7-grain FN L110 tracer cartridge. Provides red visible light and lacks a steel penetrator. [orange tip]^[65]
- **Cartridge, Caliber 5.56 mm, Tracer, M856A1 (United States):** 5.56x45mm 56-grain Lead Free Slug (LFS) Tracer with similar ballistic performance to the M855A1 and improved trace to range consistency.^[67]
- **Cartridge, Caliber 5.56 mm, Plastic, Practice, M862 (United States):** Short Range Training Ammo (SRTA) has a smaller charge than standard ball, reducing its aimed range to 250 meters, and fires a plastic bullet. The M2 training bolt must be used in the M16 Rifle / M4 Carbine when using SRTA for the weapon to cycle properly due to its lower power. It is used during training on shooting ranges near built-up or populated areas. [Brass primer, Aluminum case and Blue plastic projectile].



- **Cartridge, Caliber 5.56 mm, Armor Piercing, M995 (United States):** 5.56×45mm 52-grain AP cartridge with a tungsten core. [black tip].
- **Cartridge, Caliber 5.56 mm, Tracer, XM996 (United States):** 5.56×45mm so-called "Dim Tracer" with reduced effect primarily for use with night vision devices. [red tip?]
- **Cartridge, Caliber 5.56 mm, Frangible, MK 255 Mod 0 (United States):** 5.56×45mm 62-grain Reduced Ricochet Limited Penetration (RRLP) round with copper/polymer composite core for training and operational use.^[68]
- **Cartridge, Caliber 5.56 mm, Special Ball, Long Range, Mk 262 Mod 0/1 (United States):** 5.56×45mm 77-grain Open-Tipped Match/Hollow-Point Boat-Tail cartridge. Mod 0 features Sierra Matchking bullet, while Mod 1 features either Nosler or Sierra bullet.
- **Cartridge, Caliber 5.56 mm, MK318 MOD 0 enhanced 5.56 mm ammunition (United States):** 5.56×45mm 62-grain Open-Tipped Match Boat-Tail cartridge.^{[69][70]}
- **Cartridge, 5.56 mm, Ball, MLU-26/P (United States):** Early USAF designation for 5.56×45mm ball cartridge produced by Remington.
- **Cartridge, 5.56 x 45 mm, Ball, M1A3 (South Africa):** 56-grain FMJ Ball round based on the M193 cartridge. It was used with the R4 assault rifle.
- **Cartridge, 5.56 x 45 mm, semi-jacketed frangible, MK 311 Mod 0 Reduced Ricochet Limited Penetration (RRLP) round, intended for training. Headstamp: WCC11, produced by Western Cartridge Company, loaded in 2011.**

SS109/M855

In 1970, NATO decided to standardize a second rifle caliber. Tests were conducted from 1977 to 1980 using U.S. XM177 5.56 mm, Belgian SS109 5.56 mm, British 4.85x49mm, and German 4.7x33mm caseless. No weapon could be agreed upon, as many were prototypes, but the SS109 was found to be the best round and standardized on October 28, 1980. The **SS109** was developed in the 1970s for the FN FNC rifle and the FN Minimi machine gun. To increase the range of the Minimi, the round was created to penetrate 3.5 mm of steel at 600 meters. The SS109 had a steel tip and lead rear and was not required to penetrate body armor. Barrels required at least a 1:9 in rifle twist, but needed a 1:7 in rifle twist to fire tracer ammunition.^{[25][31]} ^[35] The U.S. designated the SS109 cartridge the **M855** and first used it in the M16A2 rifle. The 62-grain round was heavier than the previous 55-grain M193. While the M855 had better armor penetrating ability, it is less likely to fragment after hitting a soft target. This lessens kinetic energy transfer to the target and reduces wounding capability.^[71] The M855 is yaw dependent, meaning it depends on the angle upon which it hits the target. If at a good angle, the round turns as it enters soft tissue, breaking apart and transferring its energy to what it hits. If impacting at a bad angle, it could pass through and fail to transfer its full energy.^[37] The SS109 was made to pierce steel helmets at long range from the Minimi, not improve terminal performance on soft tissue from rifles or carbines.^[28] In Iraq, troops that engaged insurgents at less than 150 yards found that M855 rounds did not provide enough stopping power. In addition to not causing lethal effects with two or more rounds, they did not effectively penetrate vehicle windshields, even with many rounds fired at extremely close range.^[72] In Afghanistan, troops found that M855 rounds also suffered at long ranges. Although 5.56 mm rifles have an effective range of 450–600 meters, the M855 bullet's performance falls off sharply beyond 300 meters. The ranges are even shorter for short-barreled carbines. Half of small-arms attacks were launched from 300-900 meter ranges.^[73] An M855 fired from an M4 Carbine has severely degraded performance beyond 150 meters.^[28]

The maximum effective point target range of an M4 carbine with M855 rounds is 500 meters, with a maximum effective area target range of 600 meters. These mark the greatest distances the rounds can be expected to accurately hit the target, not the ranges that they have terminal effectiveness against them. Because the M855 is yaw dependent it requires instability in flight to deform upon hitting the target. It is the most stable in flight between 150–350 meters, potentially lessening its effectiveness if it strikes an enemy between those distances. In addition to this, tests have shown that 5.56 mm bullets fragment most reliably when traveling faster than 2,500 ft/s (760 m/s). From full-length 20 in rifle and machine gun barrels, rounds are kept above this velocity out to 200 meters. An M855 from an M4 has a muzzle velocity of 2,970 ft/s (910 m/s), but that is reduced to 2,522 ft/s (769 m/s) by 150 meters. Even if it impacts at optimum speeds, 70 percent of 5.56 mm bullets will not begin to yaw until 4.7 in (120 mm) of tissue penetration. 15 percent more begin to yaw after that distance, so up to 85 percent of rounds that hit do not start to fragment until nearly 5 in of penetration. Against small statured or thin combatants, the M855 has little chance of yawing before passing through cleanly and leaving a wound cavity no bigger than the bullet itself. The factors of impact angle and velocity, instability distance, and penetration before yaw reduce the round's predictable effectiveness considerably in combat situations.^[74]

M855A1

On June 24, 2010, the United States Army announced it began shipping its new 5.56 mm cartridge, the **M855A1 Enhanced Performance Round**, to active combat zones. During testing, the M855A1 performed better than M80 7.62×51mm NATO ball ammunition against certain types of targets (particularly hardened steel), blurring the performance differences that previously separated the two cartridges. The US Army Picatinny Arsenal stated that the new M855A1 offers improved hard target capability, more consistent performance at all distances, enhanced dependability, improved accuracy, reduced muzzle flash, and higher velocity compared to the M855 round. Further, the Army stated the new M855A1 ammunition is tailored for use in M4 carbines, but should also give enhanced performance in M16 rifles and M249 light machine guns. The new 62-grain (4 g) projectile or bullet used in the M855A1 round has a copper core with a 19-grain (1.2 g) steel "stacked-cone" penetrating tip. The M855A1 cartridge is sometimes referred to as "green ammo" because it fires a lead free projectile.^{[66][67][75][76][77][78]}

It is not necessarily more lethal than the M855, but performs more consistently every time it hits a soft target and retains its performance at longer distances. The EPR can penetrate a $\frac{3}{8}$ in (9.5 mm) thick steel barrier from an M4 at 350 meters and from an M16 at 400 meters. Ballistics for both rounds are similar and don't require weapons to be re-zeroed, but if they are the EPR can be slightly more accurate. The steel-tip penetrator of the M855A1 is noticeably separated from the jacket of the bullet and can spin, but this is part of the design and does not affect performance. The M855A1 costs only 5 cents more per round than the M855.^[79] The M855A1 bullet has a greater length than the M855. Because steel and copper are less dense than lead, the bullet is lengthened inside the case to achieve the same weight as its predecessor.^[9] The longer bullet and reverse-drawn jacket give it a better ballistic coefficient and make it more stable and accurate in-flight. Its steel tip is exposed from the jacket and bronzed for corrosion resistance. The tip is larger and more serrated than the M855's steel tip. The M855A1's bullet composition, better aerodynamics, and higher proof pressures give it an extended effective range for penetration and terminal performance.^[80]

The M855A1 was put on hold in August 2009 due to the experimental bismuth-tin alloy core exhibiting undependable ballistics at high temperatures. The US Army has since replaced the bismuth-tin alloy core with one of solid copper eliminating the heat issue. The United States Marine Corps purchased 1.8 million rounds in 2010, with plans to adopt the round to replace the interim MK318 SOST rounds used in Afghanistan when the M855A1 project was delayed.^[81]

On a media day at Aberdeen Proving Ground on May 4, 2011, reports were given about the M855A1's performance in the field since it was issued 11 months earlier. One primary advantage given by the round is its consistent performance against soft targets. While the older M855 was yaw-dependant, which means its effectiveness depends on its yaw angle when it hits a target, the M855A1 delivers the same effectiveness in a soft target no matter its yaw angle. The new SMP-842 propellant in the round burns quicker in the shorter M4 carbine barrel, ensuring less muzzle flash and greater muzzle velocity. The M855A1 was able to penetrate $\frac{3}{8}$ inch (9.5 mm) of steel plate at 300 meters. The round even penetrated concrete masonry units, similar to cinder blocks, at 75 meters from an M16 and at 50 meters from an M4, which the M855 could not do at those ranges. Its accuracy is maintained and sometimes increased, as it was able to shoot a 2 inch group at 600 meters. February 2011 was the first time the M855A1 was used more than the M855, and approximately 30 million M855A1 rounds have been fielded from June 2010 to May 2011.^{[82][83]}

The M855A1 was put to the test at the 2012 National Rifle Association's National High-Power Rifle Championship at Camp Perry, Ohio in August 2012. The shooter for the Army was Rob Harbison, a contractor supporting small caliber ammunition capability development at Fort Benning Georgia. This was a special event for the Project Manager for Maneuver Ammunition Systems and the Army's Maneuver Center of Excellence as it was an opportunity to showcase the capabilities of the Enhanced Performance Round. With an M16 loaded with M855A1 ammo, Harbison fired a perfect 200 points in the Coast Guard Trophy Match, which is 20 shots fired from the sitting position at 200 yards, finishing 17th out of 365 competitors. He also scored a perfect 100 on the final string of ten shots during the Air Force Cup Trophy Match, fired at 600 yards from the prone position, which is 10 shots in a row within the 12-inch, 10-point ring at 600 yards with combat ammunition. Harbison was happy with the performance of the EPR, with his scores showing that the Army's newest general purpose round is accurate enough to go toe-to-toe in the competition with the best ammo that can be bought or hand-loaded. Harbison even said, "I don't think I could have scored any higher if I was using match-grade competition ammunition."^[84]



M855A1 Enhanced Performance Round and its environmentally friendly projectile.

From fielding in June 2010 to September 2012, Alliant Techsystems delivered over 350 million M855A1 Enhanced Performance Rounds.^[85]

Since its introduction, the M855A1 has been criticized for its propellant causing increased fouling of the gun barrel. Post-combat surveys have reported no issues with the EPR in combat. A series of tests found no significant difference in fouling between the old M855 and the M855A1. However, manufacturers have reported "severe degradation" to barrels of their rifles using the M855A1 in tests.^[86] The Army attributes pressure and wear issues with the M855A1 to problems with the primer, which they claim to have addressed with a newly designed primer.^[87] It uses a modified four-pronged primer anvil for more reliable powder ignition.^[80] The round does increase the chamber pressure from 55,000 psi to 62,000 psi.^[43]

From June 2010 to June 2013, issuing of the M855A1 Enhanced Performance Round removed 1,994 metric tons of lead from the waste stream. 2.1 grams (32 gr) of lead are eliminated from each M855A1 projectile.^[88]

Mk 262

The **Mk 262** is a match quality round manufactured by Black Hills Ammunition made originally for the Special Purpose Rifle (SPR). It uses a 77-grain (5.0 g) Sierra MatchKing bullet that is more effective at longer ranges than the standard issue M855 round.

In 1999, SOCOM requested Black Hills Ammunition to develop ammunition for the Mk 12 SPR that SOCOM was designing. For the rifle to be accurate out to 600 yards, Black Hills "militarized" a cartridge that used the Sierra 77 grain OTM projectile; it switched from a .223 Remington to 5.56 mm case, increased pressure loading, crimped and sealed the primer, and added a flash retardant to the powder. The Mk 262 Mod 0 was adopted in 2002. Issues came up in development including reliability problems in different temperatures and when the weapon got dirty, and cycling issues in cold weather due to the slightly shorter barrel of the SPR compared to the full-length M16A2 barrel. The problems were addressed with a slower burning powder with a different pressure for use in the barrel, creating the Mk 262 Mod 1 in 2003. During the product improvement stage, the new propellant was found to be more sensitive to heat in weapon chambers during rapid firings, resulting in increased pressures and failure to extract. This was addressed with another powder blend with higher heat tolerance and improved brass. Also during the stage, Black Hills wanted the bullet to be given a cannelure, which had been previously rejected for fear it would affect accuracy. It was eventually added for effective crimping to ensure that the projectile would not move back into the case and cause a malfunction during auto-load feeding. Although the temperature sensitive powder and new bullet changed specifications, the designation remained as the Mod 1.^[89]

According to US DoD sources, the Mk 262 round is capable of making kills at 700 meters. Ballistics tests found that the round caused "consistent initial yaw in soft tissue" between 3-4 in at ranges from 15 feet to 300 meters. Apparently it is superior to the standard M855 round when fired from an M4 or M16 rifle, increasing accuracy from 3-5 minute of angle to 2 minute of angle. It evidently possesses superior stopping power, and can allow for engagements to be extended to up to 700 meters when fired from an 18 inch barrel. It appears that this round can drastically improve the performance of any AR-15 platform weapon chambered to .223/5.56 mm. Superior accuracy, wounding capacity, stopping power and range power has made this the preferred round of many Special Forces operators, and highly desirable as a replacement for the older, Belgian-designed 5.56×45mm M855 NATO round. In one engagement, a two-man special forces team reported 75 kills with 77 rounds.^{[90][91]} The Mk 262 has a higher ballistic coefficient than the M855 of (G7) .190, meaning it loses less velocity at long-range.^[24] Hard target penetration is slightly decreased.^[92]

Mk318 Mod 0

Following early engagements in Afghanistan and Iraq, U.S. Special Operations Forces reported that M855 ammunition used in M4A1 rifles was ineffective. In 2005, the Pentagon issued a formal request to the ammunition industry for "enhanced" ammunition. The only business that responded was the Federal Cartridge Company, owned by Alliant Techsystems. Working with the Naval Surface Warfare Center Crane Division, the team created performance objectives for the new ammo: increased consistency from shot to shot regardless of temperature changes, accuracy out of an M4A1 better than 2 minute of angle (2 inches at 100 yards, 3.9 inches at 300 yards), increased stopping power after passing through "intermediate barriers" like walls and car windshields, increased performance and decreased muzzle flash out of shorter barrel FN SCAR rifles, and costs close to the M855.¹⁴ The first prototypes were delivered to the government in August 2007. Increased velocity and decreased muzzle

flash were accomplished by the type of powder used. The design of the bullet was called the Open Tip Match Rear Penetrator (OTMRP). The front of it is a hollow point backed up by a lead core, but the lead core only goes about halfway down the length of the bullet, while the rear half is solid brass. When the bullet hits a hard barrier, the front half of the bullet smooshes against the barrier, breaking it so the penetrating half of the bullet can go through and hit the target. With the lead section penetrating the target and the brass section following, it was referred to as a "barrier blind" bullet. Special Forces role in counter-terror operations allow them to follow certain law enforcement guidelines, so they could use hollow point rounds without violating the Hague Convention.^{[34][93]}

Officially designated the **Mk318 Mod 0 "Cartridge, Caliber 5.56mm Ball, Carbine, Barrier"**, and called SOST (Special Operations Science and Technology) ammunition, the 62-grain bullet fragments consistently, even out of a 10.5 in barrel. The lead portion fragments in the first few inches of soft tissue, then the solid copper rear penetrates 18 in of tissue (shown though ballistic gelatin) while tumbling. Out of a 14 in barrel, the Mk318 has a muzzle velocity of 2,925 fps.^{[34][93]}

In February 2010, the U.S. Marine Corps adopted the Mk318 for use by infantry. To be fielded by an entire branch of the military, the round is classified as having an "open-tip" bullet, similar to the M118LR 7.62 NATO round. The SOST bullet uses a "reverse drawn" forming process. The base of the bullet is made first, the lead core is placed on top of it, and then the jacketing is pulled up around the lead core from bottom to tip. Conventional, and cheaper, bullets are made with the method of the jacket drawn from the nose to an exposed lead base. The reverse drawn technique leaves an open tip as a byproduct of the manufacturing process, and is not specifically designed for expansion or to affect terminal ballistics. The Pentagon legally cleared the rounds for Marine use in late January. The Marines fielded the Mk318 gradually and in small numbers. Initial studies showed that insurgents hit by it suffered larger exit wounds, although information was limited. SOST rounds were used alongside M855 rounds in situations where the SOST would be more effective.^{[34][93][94]} In July 2010, the Marines purchased 1.8 million M855A1 Enhanced Performance Rounds in, addition to millions of Mk318 rounds in service, as part of its effort to replace its M855 ammo.^[95]

5.6mm Gw Pat 90

The **5.6mm Gw Pat 90** or **GP 90** (5.6 mm Rifle Cartridge 90), is the standard round used by the Swiss military in its rifle, the SIG SG 550. The cartridge is also known as the **Cart 5.6mm 90 F** to the French and Italian speaking Swiss militiamen. The Swiss refer to the round as the 5.6 mm Gw Pat 90, although it is interchangeable with the 5.56×45mm NATO and .223 Remington round. The Gw Pat 90 is optimized for use in 5.56 mm (.223 in) caliber barrels with a 254 mm (1:10 in) twist rate.

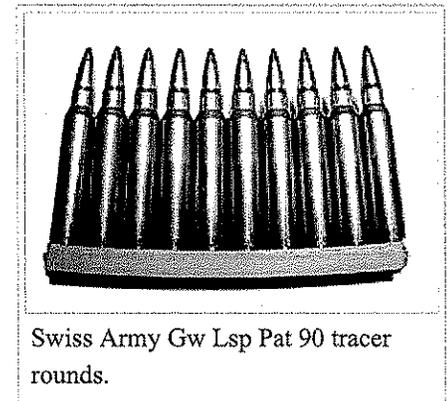
The Gw Pat 90 was designed for the SIG SG 550 when it came into production in 1987, replacing the SIG SG 510. Previous experience of a change in standard rifle had proved that changing the distance of fire for the training ranges was more expensive than the design of a new ammunition; this prompted the design of a cartridge nominally capable at 300 meters. The cartridge was also designed to reduce pollution by controlling lead emissions.^[96] The bullet was originally clad with a nickel alloy jacket, however, this was found to cause excessive barrel wear, so in 1998 the nickel jackets were replaced with tombac jackets. In addition, in 1999 a copper plug was added to the base of the bullet to address environmental concerns.^[96]

The ammunition is currently (2009) produced by RUAG Ammotec, a subsidiary of the RUAG group.^[97] The ammunition is manufactured in three variations: the standard FMJ round, the tracer round, and a blank round.

The FMJ cartridge has a Copper-Zinc alloy case and uses a double base propellant. The bullet is a 4.1 g (63 gr) tombac jacketed FMJ projectile with a G1 ballistic coefficient of 0.331 (ICAO) / 0.337 (Army Metro). The projectile contains approximately 95% Pb, 2% Sb, 3% Cu, and was designed for terminal ballistic instability. The required accuracy for Gw Pat 90 ammunition out of factory test barrels is 63 mm (0.72 MOA) for 10 rounds (100% radius measurement method) out to 300 m. The Gw Pat 90 cartridge dimensions are in accordance with the civilian C.I.P. standards for the .223 Remington C.I.P. chambering.^[98]



Swiss Army 50-round Gw Pat 90 ammunition box.



Swiss Army Gw Lsp Pat 90 tracer rounds.

The Gw Pat 90 is used both in the Swiss military and in sport shooting. The very high level of individual training in the Swiss militia (every single soldier bearing a weapon has to shoot for qualification once a year; see Gun politics in Switzerland) and the overall use of the Gw Pat 90 by the many Swiss citizens who shoot in competitions and for amusement has resulted in significant input on its usage. Over 1 billion cartridges have been produced as of 2005.

Use

Main article: List of 5.56x45mm NATO firearms

See also

- 5.45×39mm
- 5.8×42mm
- 7.62×39mm
- Express (weaponry)
- NATO EPVAT testing
- Table of pistol and rifle cartridges by year
- List of rifle cartridges

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Further reading

- Stan Christ, "5.56mm NATO Alternatives", *Special Weapons Magazine*, Semi-Annual #50 2007, pp. 52–59.

External links

- Various photos of 5.56×45mm ammunition (<http://www.conjay.com/Ammunition%20for%20Armor%20Testing%20NATO%205.56mm%20x%2045.htm>)
- RUAG Ammotec factsheet on German Army DM11 5.56×45mm ammunition (http://www.ruag.com/de/Defence_Security/Amunition/PDF_Munition/5.56mmx45_NATO_DualCore_DM11.pdf)
- RUAG Ammotec factsheet on German Army DM21 5.56×45mm ammunition (http://www.ruag.com/de/Defence_Security/Amunition/PDF_Munition/5.56mmx45_NATO_Tracer_DM21.pdf)
- ADI brochure on 5.56mm F1 ball ammunition conforming to the design parameters of the NATO STANAG 4172 and tested with Kistler 6215 transducers at different temperatures (http://www.thalesgroup.com.au/pdfs/556_Ball_Ammo.pdf)
- The AR15.COM Ammo-Oracle (<http://www.ar15.com/ammo/>)
- FAS: 5.56mm Ammunition (<http://www.fas.org/man/dod-101/sys/land/556.htm>)
- The Gun Zone: 5.56mm FAQ (<http://www.thegunzone.com/556faq.html>)
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- I.M.I Small Arms Ammunition Division (<http://www.imi-israel.com/home/doc.aspx?mCatID=63189>)
- Small Arms (http://www.swissmun.ch/e/defence/small-arm_text.htm)
- www.swissmun.ch (http://www.swissmun.ch/d/press/press050701_e.htm)
- www.swissrifles.com – The New GP 90 (<http://www.swissrifles.com/ammo/index.html#5.6>)
- RUAG Ammotec Defence Forces and Government Agencies Ammunitionpage (http://www.ruag.com/en/Defence_Security/Amunition/Defence_Forces_and_Government_Agencies)
- RUAG Ammotec Sintox SWISS ORDNANCE cartridge fact sheet (http://www.ruag.com/de/Defence_Security/Amunition/PDF_Munition/5.56mmx45_Sintox_SWISS_ORDNANCE.pdf)
- Swiss Ammunition Enterprise (http://www.cybershooters.org/swiss_ammunition_enterprise.htm)

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