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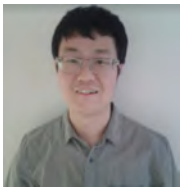

NATO Small Arms Ammunition Standardization

David (Yi Le) Zhou
Master of Strategic Studies, University of Calgary

While some academics have described NATO ammunition standardization and usage procedures generally, there is a lack of examination of the successes and limitations of the alliance's efforts at standardizing ammunition. This Policy Brief will examine a case in which NATO ammunition standardization was sub-optimal, recent improvements in the area, and offer suggestions on how to further improve ammunition interchangeability for future NATO calibers via more specific ammunition specifications.

According to NATO, interoperability means that the alliance's forces must have "the ability to operate in synergy in the execution of assigned tasks."[1] The absence of interoperability among NATO forces may threaten mission success and lead to logistical problems with regard to ensuring that "spare parts, ammunition and fuel" are consistently available.[2] In terms of ammunition, NATO sought to achieve interoperability by drafting standardization agreements (STANAGs) in an attempt to enable its forces to interchange ammunition. Ammunition STANAGs set the standards for the ammunition designs of ratifying member states but do not replace national standards and allow states to design their own NATO standard caliber ammunition.

NATO Rifle Ammunition Standardization: A History

Before 1945, many nations fielded their own unique small arms ammunition calibers, at least partly for reasons of national pride, but this created significant issues with ammunition supply during the Second World War. After its creation in 1949, NATO wanted to pre-empt the potential logistical and interoperability issues that would have arisen if its member states had used various proprietary calibers, and ammunition standardization became a priority. After a meeting convened by US, British and French leaders in 1953, NATO agreed to standardize the US-developed 7.62x51mm caliber as its standard rifle and machine gun ammunition, primarily due to perceptions of the crucial role of the US in the alliance. STANAG 2310 set the technical standards for 7.62x51mm ammunition and was ratified in 1957.

Despite the standardization of the 7.62x51mm cartridge by the US and NATO, the US Continental Army Command supported the development of an assault rifle firing small caliber high velocity cartridges because the concept offered a reduction in recoil and ammunition weight. These efforts led to the development of the M16A1 assault rifle, which saw extensive use with American forces during the Vietnam War.

By 1969 the M16A1 had become the standard rifle for US troops stationed in Europe, which meant that US and other NATO forces no longer had a common caliber for rifles. As a result, NATO held new weapons and ammunition trials between 1976 and 1979 to standardize a new rifle caliber. The 5.56mm cartridge using the SS109 projectile had best met NATO's evaluation criteria and STANAG 4172 was ratified in 1981, thus standardizing that style of 5.56mm ammunition for NATO assault rifles and light support weapons.

NATO Qualification and the Limits of Standardization

Small caliber ammunition designs that have successfully completed tests in NATO Nominated Weapons (NNWs) as defined in the STANAGs and Manuals of Proof and

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Inspection (MOPI) or the successor Multi-Caliber Manual of Proof and Inspection (M-C MOPI) are considered NATO Qualified.[3] Certain weapon models that are in service with some NATO states serve as NNWs but they are not always representative of every major weapon model in use by all of the alliance's military forces.

NATO recommends its members to use NNWs or weapons with similar technical characteristics to enable them to function with all NATO Qualified ammunition designs, thereby ensuring sufficient reliability during emergency use.[4] However, for a NATO state that wants to use a fellow member's ammunition for joint logistics, then an interchangeability study must first be conducted to determine whether the ammunition being considered had safety and performance issues in specific weapons.

Accordingly, NATO's ammunition standards do not guarantee that every member's ammunition design will be reliable enough for combat use in all NATO weapon models of the same caliber. The US military's M4 is the carbine variant of the M16 rifle and has a shorter barrel and gas system than its rifle counterpart. The M4 is a reliable weapon when firing US military standard ammunition like the NATO Qualified 5.56mm M855 round but had issues with the UK's former NATO Qualified 5.56mm round, the L2A2. Sal Fanelli of USMC Systems Command explained that: "the British SA80 rifles [had] a higher spring rate and internal parts friction than the M4 and M16 [and] a different port pressure [was] require[d] to operate the [SA80] reliably. The higher port pressures of the L2A2 overdrove the [M4's operating] components, [which] caus[ed] earlier than expected component damage [and] the USMC restricted the use of the British ammunition."[5] Also, the L2A2 caused *failure to cycle* malfunctions in the M4 because the carbine's "operating components were moving too fast for the ejector to have enough time to eject the spent cartridge."[6]

The M4 is not a NNW and is not tested with non-US NATO Qualified ammunition at the NATO level. While the US M16A4 is a NNW that achieves the required degree of reliability with all NATO Qualified ammunition designs by meeting the sentencing criteria of the 5.56mm MOPI or M-C MOPI for the function and casualty test, the M16A4 achieved a lower *mean rounds between stoppages* with L2A2 compared to M855 ammunition.[7] This showed that while all NNW models functioned properly with all NATO Qualified cartridges, certain NATO Qualified rounds still caused more stoppages in certain NNW models than other NATO Qualified ammunition designs.

The Need for (and shortcomings of) Standardization

Throughout the Cold War, interoperability between NATO forces was important because the alliance's various national corps would need to reinforce one another in the defense of Western Europe. Yet interoperability is more crucial during contemporary missions due to the demands of coalition warfare in which NATO forces often operated with each other "down to the platoon level."[8] During the Global War on Terror (GWOT), there were situations where a NATO military had to use another member's ammunition during emergencies. For example, US and other NATO forces needed to share ammunition when their logistics systems were sometimes unable to sustain "highly mobile combat units."[9] Also, the nature of asymmetric warfare often required US forces to conduct distributed operations[10] "in order to saturate areas with patrols and provide sustained operations" but this "makes resupply more challenging."[11] As a result, interoperability among NATO forces would be improved if all NATO forces operating in the same battlespace could reliably use each other's ammunition during multinational and distributed operations. Since the L2A2 was the British Army's standard 5.56mm round during the beginning of the GWOT, more specific ammunition standards at the NATO level may have reduced the risks associated with using another member's NATO Qualified rounds in weapon models that are not NNWs and ideally allow for US and British forces to have a common ammunition supply.

Centre for International and Defence Policy
Robert Sutherland Hall, Suite 403
(613) 533-2381 | cidp@queensu.ca
www.queensu.ca/cidp
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A further advantage of standardization is that a NATO state which experiences ammunition shortages could procure ammunition from a fellow member once the appropriate course of action, such as an interchangeability study, had been taken. The US government-owned Lake City Army Ammunition Plant could not keep up with the US Army's increased ammunition demands during the GWOT.[12] As a result, the US Army ordered 5.56mm L2A2 ammunition from the UK for training use. However, not all units had a positive experience. In 2006, 2nd Battalion, 325th Airborne Infantry Regiment, 82nd Airborne Division (2-325 AIR) experienced numerous *failure to extract* malfunctions and increased bolt breakage when using L2A2 in their M4s for training. These reliability issues significantly hindered training tasks. Afterwards, 2-325 AIR had to use L2A2 in their M4s sparingly and request M855 rounds for training.[13] As demonstrated by this experience, the US would have benefited from more universal ammunition standards through the reduction of reliability issues caused by the use of a foreign NATO round in a non-NNW weapon model that was seeing fairly widespread use with the US Army.

The Future of NATO's Standardization

Nevertheless, there are more contemporary and ongoing efforts aimed at improving NATO ammunition interchangeability. The NATO subgroup for interchangeability of small arms ammunition has "recently requested Canada to submit the C8 carbine as a NNW."[14] This request was due to the technical differences between the M16 rifle and its carbine variants like the M4 and C8 and the use of those carbines by several NATO militaries. However, there have probably been improvements at the national level, as demonstrated by the British Army's newer 5.56mm NATO Qualified round, the L17A2, not having any apparent issues with the C8 carbines in British service.[15]

The US military is considering adopting a new assault rifle caliber to replace the 5.56mm round for improved terminal performance in the 2020s and this will result in NATO's need to standardize a new ammunition caliber to maintain interoperability with US forces. Improving the degree of ammunition interchangeability through the creation of more universal ammunition standards is not practical for existing NATO standard calibers because any significant revisions to a current ammunition STANAG will require "re-adoption of that STANAG by each country and this process is too complicated to do all over again" for an existing STANAG.[16] Regarding NATO standardization of a future US small arms caliber, it is unlikely that there would be major obstacles to implementing a future ammunition STANAG with more specific technical specifications than those found in STANAG 4172. Hence, an ammunition STANAG for a future assault rifle caliber should include a standard for case capacity along with a maximum gas port pressure specification tested at a carbine-length gas port location.[17] This recommendation still provides enough freedom for nations to design their own ammunition but may reduce potential variables that could cause functional issues in certain weapons and allow weapons to be designed around a better defined range of ammunition specifications. Improved ammunition standards at the NATO level in conjunction with function and casualty testing can benefit newer member states during their transition to a future NATO caliber given that several of those states may be unable to submit their ammunition designs for NATO Qualification due to budget constraints. More specific ammunition standards may also reduce potential reliability issues when using NATO Qualified ammunition in non-NNW models during emergencies. Finally, after the user nation has completed an interchangeability study, improved ammunition interchangeability may increase the number of suitable ammunition designs that would be available at any point for joint logistics and training.

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Endnotes

[1] "Enhancing interoperability: the foundation for effective NATO operations," *NATO Review,* https://www.nato.int/docu/review/2015/Also-in-2015/enhancing-interoperability-the-foundation-for-effective-nato-operations/EN/index.htm.

[2] Florian Ciocan. "Perspectives on interoperability integration within NATO defense planning process," *Journal of Defense Resources Management* 2 (2011).

[3] NATO Military Agency for Standardization, *AOP-6 (V) Vol. I: Catalogue of Ammunition*, March 2007.

[4] NATO Army Armaments Group, *Multi Calibre Manual of Proof and Inspection*, NATO Standardization Agency,2013, 1-5.
An example of a military using a weapon with similar technical characteristics to a NNW would be the Canadian Army's C7A2 rifle, which is a variant of the US M16 rifle.

"There are no significant design differences between the C7A2 and M16 warranting nomination [of the] C7A2 [as a NNW]." See Steven Bradley, Canadian DND delegate to the NATO subgroup for interchangeability of small arms ammunition, email communication to author, December 11, 2017.

[5] Salvatore A. Fanelli, APdM-Engineering USMC IWS SYSCOM, email communication to author, January 8, 2015.

[6] Ibid.

[7] Ibid.

"Mean rounds between stoppages is determined by dividing the total number of rounds fired by the total number of stoppages. 'A stoppage is defined as any unplanned cessation in firing or the inability to commence or cease firing attributable to the gun.'" See Dan Shea, "Torture Test: US Ordnance MAG-58/M240," *Small Arms Defense Journal* (2013):3, accessed May 20, 2015, http://www.sadefensejournal.com/wp/?p=1692.

[8] Ciocan. "Perspectives on interoperability integration within NATO defense planning process."

[9] Jim Schatz, independent small arms consultant, CTTSO contractor and former VP Military Programs at HK USA, email message to author, November 25, 2015.

[10] MAJ William Wando, "Future War Paper Infantry Small Arms of the Future: Practical and Tactical Considerations" (Masters Thesis, Marine Corps University, 2007), 4.

[11] MAJ James Williamson, USMC infantry officer, email message to author, November 18, 2015.

[12] MAJ Mark W. Siekman, "Small Arms Ammunition Production and Acquisition Strategy for the US Army" (Master's Thesis, US Army Command and General Staff College, 2009), 18, 22.

[13] Jason R. Gillis, "Failure Report in Relation to U.K. 5.56mm Ammunition" (Report to NATO, SG-1, 2010).
In terms of increased bolt breakage when using L2A2 ammunition, "B Co, 2-325 AIR and C Co, 2-325 AIR alone experienced no less than six broken M4 bolts in one afternoon of reflexive fire training." See Gillis, "Failure Report in Relation to U.K. 5.56mm Ammunition."

[14] Steven Bradley, Canadian DND delegate to the NATO subgroup for interchangeability of small arms ammunition, email communication to author, December 11, 2017.

[15] Steven Bradley, Canadian DND delegate to the NATO subgroup for interchangeability of small arms ammunition, email communication to author, December 12, 2017.

[16] French Defence Professional. Email communication to author, December 7, 2015.

[17] 5.56mm NATO ammunition STANAG 4172's technical performance specifications for gas port pressure only requires 5.56mm ammunition designs to meet or exceed a minimum level of pressure but there is no maximum port pressure limit. See NATO Military Agency for Standardization, *STANAG 4172 MMS (Edition 2)* (5 May 1993).

The 5.56mm gas port pressure requirement is tested in the 5.56mm test barrel and the port pressure is measured 280mm from the breech. See NATO Army Armaments Group, *Multi Calibre Manual of Proof and Inspection,* Drawing 12-(5.56mm)-3.

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