

Hard target: US military outlines enhanced ammunition plans

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Key Points

- Militaries continue to seek overmatch versus adversaries' ammunition performance
- Weight concerns remain a priority and have driven the development of lighter cartridges

The annual National Defense Industries Association (NDIA) Armament Systems Forum provided an insight into the thinking of the US Armed Forces concerning future small-arms ammunition for the infantry squad.

Several major developments have taken place in the United States over the past few years, including the army's enhanced performance rounds (EPRs) in both NATO 5.56 mm and 7.62 mm calibres: the M855A1 and M80A1 respectively.

These rounds are loaded with lead-free three-piece bullets consisting of a hardened steel tip backed by a copper core, the two connected by a semi-jacket that leaves the tip exposed. It is claimed that they can offer much better penetration than the 5.56 mm M855/SS109 and 7.62 mm M80 NATO rounds they are replacing.

The US Marine Corps (USMC) has gone its own way with bullet developments, introducing the 5.56 mm MK318 to a different design, but US Congress in 2015 instructed the army and marines to consider adopting the same standard 5.56 mm ball round, which seems likely to be the EPR.

Saving weight remains a priority, particularly for a dismounted infantry.

This has prompted the development of lighter cartridge cases, which replace the usual brass with polymer except for the base, which remains brass or steel as it has to be strong enough to withstand the violent extraction forces of automatic firing. This can reduce the case weight by over 40%, but since the bullet and propellant weigh the same, the overall saving in ammunition weight is around 20%.

Polymer cases bring further benefits; one being that the insulating properties of the material slows the transfer of heat between the propellant and the gun chamber. Another is that the thickness of the material can easily be adjusted to ensure that the propellant exactly fills the case, removing the air space (ullage), which is a source of inconsistent burning and inaccuracy. The first such metal-reinforced polymer cartridge (the .50 calibre MK323) has undergone extensive USMC testing, and others seem likely to follow.

This may only be an interim step, however, as significantly greater weight savings have been demonstrated by the US Army's Lightweight Small Arms Technologies (LSAT) programme, now renamed Cased Telescoped Systems (CT).



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EPR loadings: 7.62 mm M80A1 at the front, with 5.56 mm M855A1 behind. (Orbital ATK)



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7.62 mm NATO brass case next to .264 USA brass and steel-reinforced polymer cases. (Anthony G Williams)



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5.56 mm LSAT and 7.62 mm CT with 5.56 mm and 7.62 mm NATO. (Textron Systems)

in the substantially lighter LMG, and the weight savings for the gun with 800 rounds of ammunition is well over 40%. Ten LMGs were made and over 120,000 rounds were fired.

LSAT started as a project to develop lightweight guns and ammunition capable of matching the performance of the service M249 5.56 mm light machine gun (LMG). After initial experiments with caseless ammunition, which ran into the technical problems that have always bedevilled these, the LSAT team focused on polymer-cased telescoped ammunition, in which the bullet is located entirely within the cylindrical case. Ultimately, cartridge weight savings amounted to 33%, and increased to 39% for belted machine gun (MG) ammunition using lightweight polymer links. Add

Despite its success in proving the concept, the 5.56 mm system seems unlikely to enter service. As the forum was told, feedback from users could be summed up as, "it weighs less, but doesn't do any more". Accordingly, a new contract was awarded to the CT team led by Textron Systems, which included three subtasks: to identify the characteristics of the optimum CT round for squad firearms (carbines, rifles, and MGs) and design a CT system to deliver these, to design a carbine around that ammunition, and to make a MG for the 7.62 mm CT ammunition that was already being developed to match the 7.62 mm NATO performance.

The CT team analysed the performance requirements bearing in mind the army's stated wish to achieve "overmatch" at the squad level against likely enemies, which indicated a need to exceed the long-range performance of the ubiquitous and formidable Russian PKM MG, which uses 7.62 mm ammunition as powerful as the 7.62 mm NATO.

However, the CT ammunition could not be too powerful, or it would weigh too much and generate excessive recoil. Accordingly, it was decided that the new cartridge would be based around an aerodynamic bullet shape designed originally for long-range target shooting. The weight and recoil were controlled by choosing the 6.5 mm calibre.

To facilitate comparison between the 6.5 mm and 7.62 mm CT, the cylindrical cases were made the same size so that the carbine and MG can fire either round with little more than a barrel change. Test-firing of the MG mechanism has already begun; a complete weapon is expected to appear by mid-2017, with the carbine to follow afterwards.

The choice of calibre remains to be decided, but the forum was told that the 6.5 mm round has "so much more capability" that there seemed to be "no point in using 7.62 mm". The energy retained by the 6.5 mm bullet at 1,200 m is calculated to be 400 Joules, compared with 320 Joules for the 7.62 mm NATO. The end result is expected to be a MG and ammunition that weigh approximately the same as the service M249 and its brass-cased 5.56 mm, but in 6.5 mm it will provide a superior long-range performance to the NATO 7.62 mm and the PKM. Compared with the current service 7.62 mm M240L MG plus ammunition system (the US Army's lightweight version of the FN MAG/GPMG), there is a weight saving of around 45%.

Assuming that the development and testing proceeds as planned, NATO armies could be equipped during the 2020s with squad firearms that provide unmatched performance for their weight. The main drawback appears to be that the system uses radically different gun mechanisms as well as ammunition, requiring some adaptation of weapon and ammunition production facilities.

In parallel with these developments, work continues in the United States on more conventional alternatives. These may be divided into two categories: those intended for modified versions of the AR-15 gun family - which includes the M16 rifle and M4 carbine - and those designed for the larger AR-10 series, which includes the US Army's M110

Semi-Automatic Sniper System (SASS) and the British Army's L129A1 Sharpshooter.

The AR-15 family is limited to using ammunition no longer than the 57 mm of the 5.56 mm NATO. Perhaps the most commercially successful alternative in recent years has been the .300 AAC Blackout. This uses the 5.56 mm case with the mouth necked-out to take 7.62 mm bullets. Available ammunition falls into two groups: heavy-bullet subsonic loadings designed for use with suppressed carbines, or supersonic loadings that are closely comparable to the famous 7.62 mm AKM (Kalashnikov) round. This is a short- to medium-range cartridge that could not replace the much more powerful 7.62 mm NATO.

Another new AR-15 compatible round presented to the NDIA Forum is the 6.5 Super Z by Osprey Combat. This uses a wider case than the 5.56 mm to provide more propellant capacity, and, like the 6.5 mm CT, was designed to take low-drag 6.5 mm bullets. These lose velocity and energy much more slowly than the military 5.56 mm and 7.62 mm bullets, enabling the Super Z to exceed the retained energy of the 7.62 mm NATO from 600 m onwards, at the cost of a steeper trajectory and less energy at shorter ranges.

The US Army acknowledges the advantages of the 6.5 mm calibre, but has shown interest in a higher performance than the AR-15 platform can deliver. The AR-10 family is capable of taking ammunition with an overall length of 71 mm. At the extreme, this includes cartridges as big as the 7.62 mm NATO except for their calibre, such as the commercial .260 Remington. With the right bullets, this delivers a greatly superior ballistic performance to the 7.62 mm, but it saves little or no weight and generates almost as much recoil. The US Army's Marksmanship Unit (USAMU) has therefore developed a smaller 6.5 mm round, the .264 USA, which uses a slimmer and shorter cartridge case than the 7.62 mm, however, the round is not much shorter overall. This has been made with both brass and steel-reinforced polymer cases, as has a variant necked-out to 6.8 mm calibre: the .277 USA. These rounds have been used to develop loadings similar in performance to the 6.5 mm CT, and might be regarded as a "fallback option" should the CT system fail to be adopted.

One other significant development in small-arms ammunition is the One-Way Luminescence (OWL) project intended to replace conventional tracer bullets that have a number of undesirable characteristics. One such characteristic is that much of the bullet volume consists of chemicals that burn throughout the flight, affecting the bullet's ballistics, and thus its trajectory normally only matches that of other bullets at one specified distance. Further, by tracer burnout, the much lighter weight means that the bullets are less effective. Additionally, the tracer is visible from the front, and so could indicate to the enemy where one is shooting from (infrared tracers that can only be seen through thermal imagers are now available, but an enemy might acquire these). Finally, the burning chemicals also do not infrequently start fires. As a result, a US Army project is underway to identify a luminescent material that can be attached to the base of a standard bullet and will be visible only from behind. If successful, this could be fitted to all bullets.



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.300 AAC Blackout with 5.56 mm NATO. (Anthony G Williams)



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Bullets compared: 5.56 mm NATO, 6.5 mm low-drag, 7.62 mm NATO (Anthony G Williams)



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.264 USA with brass and steel-reinforced polymer cases. (Anthony G Williams)

COMMENT

The goal to have infantry weapons and ammunition that are longer-ranged and more effective than 5.56 mm systems is being demonstrated by some recent acquisition decisions. The New Zealand Army, which previously relied on 5.56 mm rifles and LMGs in the infantry section, has added a 7.62 mm designated marksman weapon, which is similar to the British Army's L129A1 Sharpshooter but with a longer barrel and selective fire, and replaced the 5.56 mm Minimi LMG with the 7.62 mm version. The 5.56 mm round remains in use only in a carbine. Even more strikingly, the Turkish Army, which currently uses a mix of 5.56 mm and 7.62 mm rifles, has decided that its new MPT-76 infantry rifle will only be in 7.62 mm, despite the weight and recoil penalties.

The United States, like the United Kingdom, does not expect to replace its current small arms before the mid-2020s. This allows time for the new weapons and ammunition currently being developed to be evaluated before a decision is made.