

## **SMALL ARMS AND AMMUNITION – WHERE ARE WE HEADING?**

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*Adapted from a presentation given to the DCMS Close Combat Symposium 2017*

This article considers several questions:

1. Who is acquiring what in small arms?
2. What do we want our small arms to achieve?
3. What are the options available now and in development?
4. What does the future look like?

The focus will be on portable small arms for the dismounted infantry section or squad: mainly rifles and light machine guns, but not explosive munitions.

The greatest technical improvements likely to be seen in small arms involve advanced sights and fire control systems, and of course the training implications of any changes are also a vital issue, but here I'm concentrating on the guns and ammunition.

### **Where we are now**

Following the conflicts in Iraq and Afghanistan, armies have been taking stock and either beginning to make re-equipment choices, or engaging in longer-term planning for the next generation of weapons.

The two major western European armies which are re-equipping now are France and Germany. France has selected the Heckler & Koch HK 416 5.56 carbine as their new infantry rifle to replace the FAMAS. They will also be also choosing a new 7.62 semi-auto DMR (Designated Marksman Rifle = Sharpshooter) to replace the current bolt-action FRF2, and are looking for a replacement for the 5.56 Minimi. Initially, it seems that the army wanted to replace the Minimi with another 5.56 Light Machine Gun and buy some 7.62 LMGs as well, but it now seems possible that all 5.56 Minimis could be replaced by 7.62 LMGs – although it's early days yet, with first deliveries planned for around 2022.

Germany is also replacing its small arms. A tender for up to 120,000 new assault rifles to replace the HK G36 was issued in April but interestingly this leaves the choice of calibre to the bidders; the Bundeswehr appears to be uncertain what it wants, although the maximum weight of 3.6 kilos points towards a 5.56 solution. They have chosen the new self-loading 7.62 G28 DMR. For MGs they already have the 5.56 MG4 LMG, with the 7.62 MG5 modular GPMG available, but many users reportedly feel that the MG4 has too little effective range to be worth bothering with.

Some interesting choices have been made by the New Zealand Army. Their infantry sections were previously equipped with rifles and LMGs in 5.56 calibre. They first added a 7.62 DMW (Designated Marksman's Weapon) from LMT which is essentially the same as the British L129 Sharpshooter except for having a longer barrel and selective fire; apparently, two-shot bursts work really well. They then decided to replace the 5.56 Minimi with the 7.62 version. Taken together, these provide a considerable increase in the section's long-range effectiveness. Their third choice – for a new rifle to replace the A U G – is a light and handy short-barrelled 5.56 carbine also from LMT, matching the DMW in design, controls and handling.

Other armies have also shown a lot more interest in the old 7.62 round. The army of Turkey – the second largest in NATO – is replacing a mix of 5.56 and 7.62 weapons with a new rifle, the MPT-76. Initially this was going to be in 5.56, but the decision was changed to 7.62 NATO. A similar process seems to be going on in India; after many attempts to adopt a new 5.56 rifle, they are now looking for one in 7.62 NATO, although they are still planning to buy short-barrelled 5.56 carbines for CQB.

The US forces are mainly looking ahead to the next generation of weapons from 2025 onwards, but in the meantime are making some interesting changes.

The US Army is standardising on the M4A1 carbine, which has a heavier barrel than the M4 in order to deliver a higher sustained rate of fire. This is supplemented by the M110 7.62 Semi-Automatic Sniper System, with the new M110A1 compact SASS – effectively the HK G28 – selected for service. The USMC has replaced most of their M249 Minimi LMGs in their squads with the M27 Infantry Automatic Rifle, an HK 416 variant with a heavy barrel for an even greater capacity for sustaining a high rate of fire. As the M27 is also very accurate, it can perform as a DMR as well as an IAR, within the range limitations of its 5.56 ammunition.

The British Army is also looking ahead to 2025+, with only minor changes to existing equipment in the meantime. I won't comment on these, other than to note that, like the current US Army, there appears to be a strong reliance on 5.56 mm weapons at section level, with only one 7.62 Sharpshooter per section.

I understand that these decisions have been based on assessments of the effective range of the 5.56 weapons. I have to say that I am wary of such analyses because I have observed a repeating pattern over the years: assessments of the effective range of 5.56 weapons go up in peacetime and down in combat.

Why is this? I suspect that it is because what is mainly studied in peacetime is the probability of incapacitation, which is (loosely) a combination of the hit probability and the wounding capability, compared with the weight of ammunition. As with the related concept of "stowed kills", the outcomes tend to favour lighter ammunition. The problem is that this takes no account of other aspects of performance, especially barrier destruction and suppression – in both of which the 7.62 greatly outperforms the 5.56. Emeric Daniau of the DGA has been researching suppression by small arms fire, analysing published studies to devise a formula which fits with the reported results. One conclusion from this is that the suppressive effect of any given weight of 7.62 ammunition is substantially higher than that of the same weight of 5.56 ammunition at any range, despite the 7.62 weighing twice as much per round.

To sum up: there appears to be a general recognition among armies which are re-equipping that 5.56 weapons are for short to medium ranges at best, with 7.62 rifles and MGs needed to cope with longer engagements. In particular, belt-fed 5.56 LMGs seem to be increasingly regarded as not worthwhile. Finally, barrier destruction and suppression should be included in evaluations of effectiveness.

### Where do we want to get to?

This is the key question – what do we expect the next generation of small arms to be able to achieve? We must assume that future small-arms combat could take place in environments ranging from extensive, densely-built up urban areas to open country, plus anything in between. So our small arms must be effective across the range of such environments. This prompts a number of questions:

1. How do we want the effective range of our standard small arms to compare with opposition weapons such as the PKM? Will we be satisfied with less; or want to match them; or want overmatch – a significant advantage?
2. What are we going to do about body armour? To what degree will we require our small-arms ammunition to be able to penetrate current high-grade armour?
3. What are the respective roles of standard rifles or carbines, heavy-barrel automatic rifles, DMRs, and belt-fed LMGs?
4. What kind of support weapons held at platoon or company level will we need to back up the standard section weapons?
5. Can section rifles and LMGs sharing one general-purpose round of ammunition cover all theatres or do we need more specialised options, eg PDWs?
6. What options are being actively pursued today which might emerge in time for adoption in the next generation of weapons from 2025 onwards?

### The ammunition

There have been interesting developments in the USA which provide some pointers to the future. Various studies into infantry rifle cartridges over the past decade have come up with similar answers:

1. The ARDEC calibre study which reported in 2010 concluded that cartridges in the 6.35 to 6.8 mm range offered a superior balance of characteristics to larger or smaller calibres.
2. The USAMU study which followed concluded that 6.5 mm was the optimum, with 6.8 mm a reserve choice, resulting in the 264 and 277 USA.

3. Textron have identified 6.5 mm as the optimum calibre for their Cased Telescoped Small Arms System and will be providing an LMG in this calibre for testing this year.
4. USSOCOM have been testing rifles and LMGs in .260 Remington and 6.5 mm Creedmoor, commercial cartridges which basically use the 7.62 NATO case necked down to 6.5 mm. Current planning shows 6.5 mm ammunition development in 2018, fielding of an LMG to fire it in 2019 and a rifle in 2020.

The results of the Army's SAAC (Small Arms Ammunition Configuration) study had not been released at the time of writing, but it is understood to also favour a calibre of around 6.5 mm. The prime contenders are shown here:

**OPTIONS: AMMUNITION**

US studies favour 6.5 mm – but which?

5.56 mm NATO = 1,700 J	
264 USA = 2,800 J	
.260 Remington = 3,000 J	
6.5 mm Creedmoor = 3,000 J	
6.5 mm CTSAS = 3,000 J	
7.62 mm NATO = 3,300 J	

The 264 USA shown has a hybrid case from steel-reinforced polymer, saving around 5 g over a brass case (c.22% saving overall). The CTSAS round shown is about 8 g lighter than a conventional brass-cased equivalent (c.33% saving, with a further reduction in machine guns from using polymer belt links).

What is noticeable is that these 6.5 mm rounds are all quite powerful for the calibre – not far behind the 7.62 NATO with muzzle energies of about 2,800 to 3,000 Joules. These figures are estimates, due to lack of information about military loadings of the civilian cartridges and the fact that barrel lengths used for quoted figures vary significantly. Scandinavians may feel some déjà vu, as the .260 Remington is pretty much the same as the old 6.5 x 55 Swedish Mauser which served as a military round for decades before being replaced in service – by the 7.62 NATO! These 6.5 mm rounds are estimated to have a similar long-range suppressive effect to the 7.62.

The high power of these rounds seems to be a result of two drivers:

1. The desire to achieve "overmatch" over enemy forces – which means outranging the 7.62 PKM machine gun. Both the NATO and PKM 7.62 mm rounds become subsonic after about 800 m, the 6.5s up to 1200 m (depending on the bullet design).
2. Concerns about the growing availability of military-grade body armour. In the USA a Level IV ceramic plate, proof against steel-cored 7.62mm AP, costs \$115.

At the moment, the only NATO infantry rifle ammunition which can penetrate Level IV armour seems to be the Swedish developed, tungsten-cored 7.62 M993 and 5.56 M995, but these are rarely issued because of their high cost.

There was a further stage of development of 7.62 AP a few decades ago, the Winchester SLAP (Saboted Light Armour Penetrator) type-qualified as the M948, but the only service use of this type of discarding-sabot tungsten ammunition seems to have been in the Swedish PSG-90 sniper rifle. However, the technology is available if required, and can of course be applied to other calibres, although the smaller the calibre, the more technical problems there are likely to be with sabotated bullets.

## The guns

What type of guns would this ammunition be fired in? There are indications that different classes of individual small arms may be merging. The USMC's M27, a heavy-barrel automatic rifle which has largely replaced belt-fed LMGs at squad level, has already been mentioned. The Corps is experimenting with an "Uber squad", in which all of the troops are equipped with M27s, fitted with suppressors, 1 to 8 power scopes, and 60-round polymer drum magazines: *"Anyone can be the Automatic Rifleman, the Grenadier, the Designated Marksman, or the Rifleman based on the situation"*. And of course, with suitable training.

Looking ahead, the US Army's Project Manager Soldier Weapons recently proposed the development of a Next Generation Squad Automatic Rifle to replace the M249 in "select units". While the detailed specification has not yet been finalised, it would be magazine rather than belt fed. A couple of notional illustrations of alternative configurations were shown, interestingly including a bullpup, for which the US Army has not previously shown much enthusiasm.

Possible reasons for the bullpup may be that the powerful 6.5 mm ammunition needs a reasonably long barrel to get the best from it. The ammunition will also need all the help it can get in dealing with ever-evolving body armour, so it makes sense to use the longest feasible barrel to extract the highest velocity and penetration from the ammunition: barrel length is directly related to penetration range. A weapon such as those shown in these notional illustrations, using lightweight long-range ammunition and capable of both high accuracy and a high volume of fire, may well become the infantry's standard small arm in the future.

## OPTIONS: WEAPONS

USMC M27: *"Anyone can be the Automatic Rifleman, the Grenadier, the Designated Marksman, or the Rifleman based on the situation".*

US Army Next Generation Squad Automatic Rifle:



If the USA (and subsequently NATO) were to adopt one of these powerful 6.5 rounds for its standard rifle, would that create a demand for something smaller as a handy CQB carbine and PDW?

## OPTIONS: PDWs

.300 BLACKOUT with 5.56 mm



AAC "Honey Badger"



Lightweight 5.56 carbines like the M4 can fulfil this role, but the ammunition is not best suited to very short barrels. One increasingly popular option for special forces (recently selected by SOCOM for a PDW) is the .300 Blackout, which is designed to be used in rebarrelled 5.56 weapons. It is also much better suited to subsonic, heavy-bullet loads for use with a suppressor.

## OPTIONS: SUPPORT WEAPONS

.338 Norma Magnum with .338 Lapua Magnum

GD LWMMG



Next, the question of support rifles and machine guns. Once again, it is SOCOM which is leading the way in studying new developments. They are looking at modular sniper rifles available in the army sniper calibre of .300 Winchester Magnum, plus both .300 and .338 Norma Magnums – obscure rounds developed for very long-range target shooting. The .338 Norma was selected a few years ago for General Dynamics' Lightweight Medium Machine Gun; if this succeeds, it may well replace the established .338 Lapua Magnum in sniper rifles. The .338 MMG delivers a long-range anti-personnel performance which could partly replace the use of the .50 Browning while weighing no more than the GPMG, and is currently scheduled to enter service with special forces in 2022.

### Conclusions

1. In many western armies we are now seeing a mix of 5.56 and 7.62 weapons at section level in order to cover the normal spectrum of combat ranges, with LMGs increasingly in the larger calibre.

2. There are strong indications that the USA may be moving towards adopting a lightweight, high-velocity 6.5 mm round for the next generation of squad small arms; either a polymer/metal hybrid version of a conventional case, or a polymer-cased/telescoped system.
3. There are suggestions from the USA that future individual small arms may be multi-purpose, with the standard rifle being capable of delivering high volumes of accurate fire to long range.
4. More attention is being paid to the need to defeat military-grade body armour – there is likely to be a classic gun vs armour technology race for the foreseeable future.
5. Support MMGs as well as sniper rifles may also be adopting more powerful, longer-ranged ammunition such as the .338 Norma Magnum.
6. There may still be a need for smaller and less powerful weapons, particularly for the PDW role, but they will have problems in penetrating body armour without very specialised ammunition.

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