Winning the firefight: IFV cannons evolve

Samuel Cranny-Evans and _Mark Cazalet_ examine the IFV weapon systems that have shaped modern conflicts, and how future firefights might be won

As the threat of conventional war between two superpowers receded, counter-insurgency wars took their place, starting with the first Chechen War in 1994. Since then, the world's most advanced militaries have been dragged into urban conflicts time and again. The confines of cities have revealed some weaknesses of heavy armoured vehicles and shown that firepower can be difficult to apply. More recently, near-peer threats have resurfaced, with significant medium-weight vehicle fleets sharing broadly similar protection characteristics.

Anti-tank guided missiles (ATGMs) provide infantry fighting vehicles (IFVs) with some capability against main battle tanks (MBTs), providing that the IFV spots the tank first with advanced optics and is able to act quickest. However, during a protracted engagement where an IFV is designed to augment the actions of an infantry formation, or vice versa, the primary defining factor is the ability of the vehicle's cannon to suppress the enemy so that the infantry can advance or win a firefight.

Russia's T-15 HIFV with the Kinzhal remote turret, equipped with a 57 mm automatic cannon. (IHS Markit/Mark Cazalet)

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A wide variety of cannons are used to arm IFVs. The United States employs the 25 mm M242 on the M2 Bradley, Russia the 2A42 on its BMPs and BMDs, while France and the United Kingdom are introducing into service the CT40, which fires cased telescoped ammunition (CTA).

The M2 Bradley has been a stalwart of US armoured operations since the 1980s. It is armed with the 25×137 mm M242 Bushmaster cannon, a dual-feed weapon with a fire rate of 200 rds/min. The

cannon can fire high-explosive fragmentation (HE-Frag) and armour-piercing fin-stabilised discarding sabot (APFSDS) rounds, which were used extensively during US deployments to Iraq for Operation 'Desert Shield' and then Operation 'Iraqi Freedom'.

An anecdote in the US Army's *Armor* magazine noted that the 25 mm gun was used against BMPs during 'Desert Shield', with crews firing "10–15 rounds at each" BMP to destroy them. In 2004, when US troops were engaged in Samara during 'Iraqi Freedom', the guns were used against enemy fighters, according to the US Army Combined Arms Center.

Both operations underscored the lethality of the M242, but also some of its limitations. The first incident was of an engagement with three BMPs, which required a minimum of 23 and a maximum of 45 rounds to achieve success. The M2 Bradley carries 300 rounds of 25 mm ammunition, so in a worst case scenario the vehicle crew consumed 15% of their ammunition to achieve three kills. In a prolonged engagement this could become a considerable issue as the Bradley can be complicated to resupply, and for best results must be reloaded when at 10–20% of its ammunition load.

The 'Iraqi Freedom' anecdote highlights the efficacy of the M242 against infantry; however, the Combined Arms Center noted that the Bradley in some cases was unable to reach targets at long range and so relied instead on artillery or an MBT.

At long ranges, the M242 cannon may struggle to defeat the BMP-3's frontal armour, as the BMP-3 was designed specifically to defeat the Bradley's APFSDS rounds. Moreover, the maximum of 60° elevation for the M242 could make it difficult to engage potential threats posed by unmanned aerial vehicles (UAVs). Accordingly, the US Army's emerging Next Generation Combat Vehicle (NGCV) requirement is to replace the Bradley first, and then consider possible replacements for the Abrams MBT and Stryker wheeled combat vehicle.

Before it is replaced, it is possible that the Bradley will be upgraded. Earlier in 2018, the army was understood to be considering the 30 mm Bushmaster II, which can fire Super Forty 40×180 mm ammunition with changes to the barrel assembly, feed sprockets, forward feeder assembly, and recoil spring set. Similarly, the XM813 cannon that is mounted on the Stryker 'Dragoon' vehicles can also be increased to Super Forty by replacing the barrel. There is a related Stryker lethality improvement programme, which could lead to a common calibre for the Bradley (if upgraded) and the Stryker fleet.

Multiple rounds are available for Bushmaster II; however, it is fed by conventional cassettes, which means the user must select and load the most appropriate rounds before combat and is limited to two ammunition natures when target types might be varied. It is possible that a larger calibre, such as the 35 mm Bushmaster III (also referred to as the 35/50) or the Cased Telescoped 40 mm (CT40) cannon, would be necessary to meet future requirements.

35/50 mm cannons

The 35/50 is used to arm the CV9035 IFV, which is in service with Denmark, the Netherlands, and Estonia. On the CV9035, the weapon is fitted with a muzzle-mounted ammunition programmer, and is capable of firing airburst munitions. The 35 mm calibre is a compromise between larger and smaller calibres, as the muzzle energy of the 35×228 mm cartridge is not far below that of the 40×255 mm Case Telescoped Weapon System (CTWS) cartridge, at 400 and 500 joules, respectively. Additionally, the HE-Frag airburst rounds can address infantry and soft-skinned targets, while the AP round is sufficiently powerful for engaging most IFVs and APCs. If future needs

expand to include greater firepower, the cannon can be converted to fire 50 mm Supershot (50×330 mm) ammunition by changing the barrel and several components of the feed mechanism.

There are, however, downsides to the 35/50 mm technology. A turret accommodating the 35/50 mm cannon must provide sufficient room for the ammunition handling system, which includes two separate cassettes attached one either side of the weapon. The cassettes need space to elevate and depress with the gun. The CV9035's gun, for example, has an upper elevation limit of 37°, but Future IFVs may be required to fight against aerial targets and infantry fighting from elevated positions in complex urban environments. They may also require relatively large calibre weapons.

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