Explosive formed projectiles/penetrators (EFP) are the latest and most deadly weapon, designed for use against hitherto largely invulnerable Mine Resistant Ambush Protected (MRAP) type vehicles used for patrolling in Iraq and Afghanistan. The core EFP design packs explosive behind a concave metal dish – typically made of copper or similar malleable alloy with a relatively low melting point. In simple IED-type situations, a single explosion creates a solid shot of molten metal capable of hitting vehicles some distance away and penetrating considerable distance through conventional rolled homogeneous armour. The warhead design is such that it can be used in off-road devices – fired directly at the side armour – as well as in under-body mines. The latter is more typical for Iraq and Afghanistan, while the former came to prominence during operations in the Balkans. While gaining prominence as IED devices, EFP warheads already have a strong presence in conventional military weapon systems, allowing for more complex implementations such as top attacks. Different flavours of warheads design also produce different effects, such as a basic slug, long-rod penetrators or multiple fragments to create a high-velocity shrapnel effect.

Some of these more complex, factory-produced designs have entered the current theatre of operations from external sources such as Iran, which is often either the country of origin or a conduit for weapon systems acquired further afield. Barbed comments from the US came to a head in mid-2007 when the Bush administration said that Iran's extraterritorial Qods Force were supplying Shia insurgents and were directly responsible for the deaths of US servicemen. It must be assumed that Iran is not the only supplier or source, as Sunni-insurgents also use this category of weapon.

As an off-road solution, EFPs are not area-effect blast weapons; they must be fired accurately against a target, which is their weakness. The use of homegrown EFPs as IEDs creates, by necessity, simplified designs. Detonation is controlled by cable, radio control, TV or remote control, and these can be disrupted in the same way as any other IED. The designers of such devices typically lack the means to test and refine aerodynamic designs at an instrumented range to ensure they can be fired with an acceptable degree of accuracy. That means the weapon has to be close to its target to stand any chance of hitting it. Typically, the high speed of convoys and individual patrol vehicles often means the only feasible attack will be point at which speed must be reduced, such as corners or crossroads. One way around this is to increase the number of EFPs in a ripple effect, but this takes more time or more personnel to emplace, creates more disruption to the earth and adds to the chance of detection.

EFPs are not exclusively an IED weapon. A number of countries manufacture and field “ambush” EFPs, which are built around a tripod and remotely detonated. Systemised off-road EFPs could also rely on a cueing system, using acoustic sensors to fire up an...
Defeating EFPs

Infra-red sensor that could act with sufficient speed to trigger an attack. These include the Czech PD Mi-PK, the French MIACAH F1 and the Russian TM-B3, which fire directly onto the target. Others are more complex, opting for a top attack solution. The Textron Sensor Fuzed Weapon system consists of ten sub-munitions each firing four EFP projectiles, and was used during the 2003 invasion of Iraq. The US Selectable Lightweight Attack Munition (M2/M3/M4 SLAM) can provide all three options – top attack, mine or off-road attack, depending on its implementation. Later models of the Talley MT2 LAW also use EFPs.

Outside the US, Russian firms have undertaken work to match new EFP warheads with legacy shoulder-launched anti-tank weapons, such as Temp-10 based on the RPG-7 with an enlarged-calibre 50mm EFP warhead. The warhead detonates after it has been launched to create the penetrating effect.

Defending against EFPs

The US MRAP II programme has protection against EFPs as one of its key goals. The MRAP II will provide enhanced levels of protection against direct attacks and under-body blasts compared with current variants, and particularly against EFPs. One of the immediate responses to the EFP threat has been to simply increase the amount of armour carried; MRAP and MRAP-type vehicle have seen their weight go up, with minimal increase to the payload. The MaxxPro Plus, for example, is five tonnes heavier than its predecessor.

One of the issues in developing protection against EFPs is the poor definition of the threat, however. In IED terms, the threat is so diverse that terms of reference expressed in, for example, a NATO STANAG, are largely absent. The US Army’s quick reaction response to EFPs was to task the Army Research Lab (ARL) with developing a solution. The result was the Frag Kit 6, an appliqué solution originally developed for use with HMMWVs. This solution was neither svelte nor elegant, and was used during the 2003 invasion of Iraq. The US Selectable Lightweight Attack Munition (M2/M3/M4 SLAM) can provide all three options – top attack, mine or off-road attack, depending on its implementation. Later models of the Talley MT2 LAW also use EFPs.

Outside the US, Russian firms have undertaken work to match new EFP warheads with legacy shoulder-launched anti-tank weapons, such as Temp-10 based on the RPG-7 with an enlarged-calibre 50mm EFP warhead. The warhead detonates after it has been launched to create the penetrating effect.

Defending against EFPs

The US MRAP II programme has protection against EFPs as one of its key goals. The MRAP II will provide enhanced levels of protection against direct attacks and under-body blasts compared with current variants, and particularly against EFPs. One of the immediate responses to the EFP threat has been to simply increase the amount of armour carried; MRAP and MRAP-type vehicle have seen their weight go up, with minimal increase to the payload. The MaxxPro Plus, for example, is five tonnes heavier than its predecessor.

One of the issues in developing protection against EFPs is the poor definition of the threat, however. In IED terms, the threat is so diverse that terms of reference expressed in, for example, a NATO STANAG, are largely absent. The US Army’s quick reaction response to EFPs was to task the Army Research Lab (ARL) with developing a solution. The result was the Frag Kit 6, an appliqué solution originally developed for use with HMMWVs. This solution was neither svelte nor elegant, and was used during the 2003 invasion of Iraq. The US Selectable Lightweight Attack Munition (M2/M3/M4 SLAM) can provide all three options – top attack, mine or off-road attack, depending on its implementation. Later models of the Talley MT2 LAW also use EFPs.

Outside the US, Russian firms have undertaken work to match new EFP warheads with legacy shoulder-launched anti-tank weapons, such as Temp-10 based on the RPG-7 with an enlarged-calibre 50mm EFP warhead. The warhead detonates after it has been launched to create the penetrating effect.