FRONTLINE PERSPECTIVE

ISLAMIC STATE'S MULTI-ROLE IEDs

Projected grenades used as air-borne improvised explosive devices (ABIEDs)

April 2017

OVERVIEW

This *Frontline Perspective* charts the development by Islamic State (IS) forces of a particular type of improvised explosive device (IED). The device can be thrown, launched from an improvised rifle attachment, or in its most recent phases of development, dropped from a commercial, off-the-shelf unmanned aerial vehicle (UAV) or 'drone.'

Conflict Armament Research (CAR) has identified numerous, identical IEDs of this type, recovered from IS forces across the Mosul theatre of operations. The wide distribution of this multi-role IED reinforces CAR's previous assertions that IS forces centrally manage the design and production of improvised weapons. The findings presented in this *Frontline Perspective* also reconfirm the group's propensity to field-test and rapidly refine its weapon systems—including exploiting emerging technologies, such as UAVs, as delivery systems.

The construction of improvised weapons by IS forces arguably responds to two factors: 1) technical innovation to provide its fighters with weapon systems that are otherwise unavailable; and 2) a self-reliant ideology, which promotes the development of 'own-brand' weapons. CAR's previous investigations into IED construction by the group—and notably its successes in developing improvised equivalents of conventional weapons, such as rockets and mortars—support these observations.[1]

Street of Qaraqosh, where CAR documented multi-role IEDs in November 2016.

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KEY FINDINGS

IS forces have developed a small, projected IED. Over time, the group has employed the device in multiple roles. In these roles, the device is:

1. Used as a hand thrown projectile (effectively a point-detonating grenade), possibly due to the difficulty of manufacturing time-delay grenade fuses in bulk;
2. Used as a projected grenade, launched from a tube affixed to the muzzle of an assault rifle, which employs the pressure generated by firing a blank 7.62 x 39 mm cartridge to expel the projectile;
3. Modified to be dropped vertically from unmanned aerial vehicles (UAVs), initially in an anti-personnel role; and
4. Augmented with the addition of factory manufactured high-explosive dual-purpose (HEDP) grenades to attack both personnel and armoured vehicles from a UAV platform.

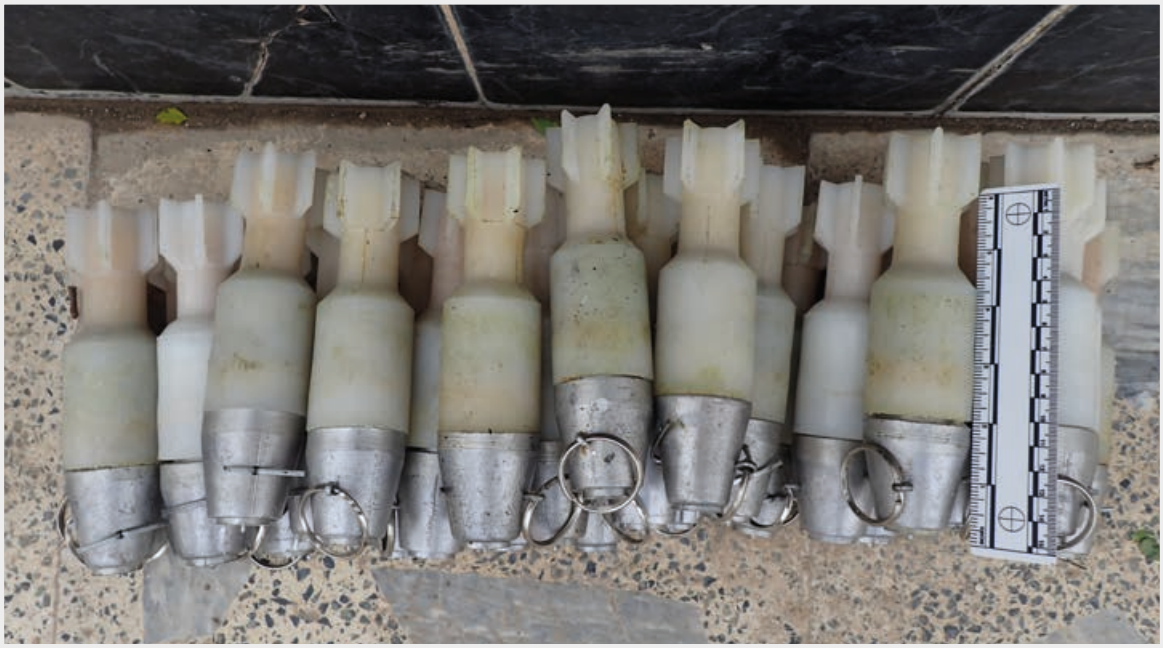

Figure 1
Multi-role IEDs.
Documented by a CAR field investigation team in Bashiqa, Iraq, November 2016.

Church courtyard, Qaraqosh, November 2016.

DOCUMENTATION

Beginning in November 2016, and again in February and March 2017, CAR field investigation teams operating in and around Mosul documented growing numbers of a new type of IS-manufactured IED.

The IED's body, tail section, and fins are constructed from either white- or green-coloured plastic. A raised line of excess plastic on the body—known as 'flash,' which results from leakage along the parting line of a mould—indicates that the body is moulded (Figure 2).

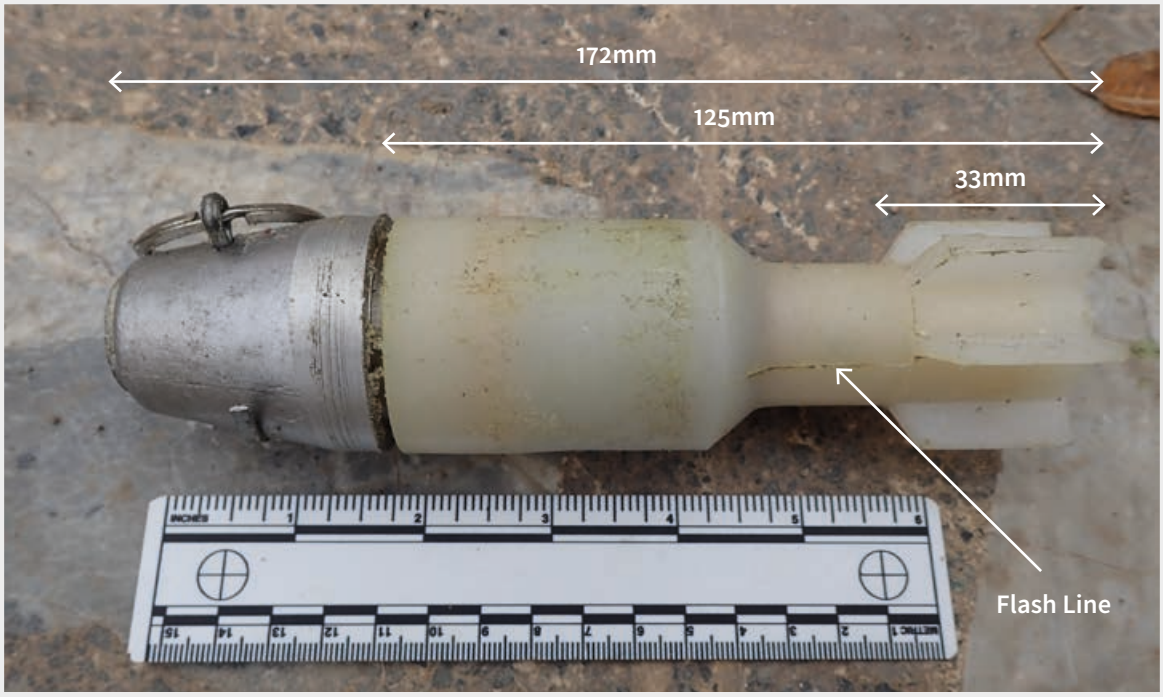

Figure 2
Multi-role IED.
Documented by a CAR field investigation team in Bashiqa, Iraq November 2016.

Figure 3
Dismantled multi-role IED.
Documented by a CAR field investigation team in Al-Arij, Iraq, March 2017.

The IED's total length is 172 mm (125 mm with fuse detached). The plastic body has a maximum external diameter of 44.5 mm and an internal diameter of 36.5 mm. The plastic wall is 8 mm thick at the nose, which is threaded to accommodate the fuse. The tail section is 69 mm in length. Six equally spaced fins occupy the rear 33 mm of the tail section (Figure 2). A cup-shaped internal fragmentation sleeve sits within the plastic body (open at the nose end), the walls of which are approximately 10 mm thick at the aperture (Figure 4).

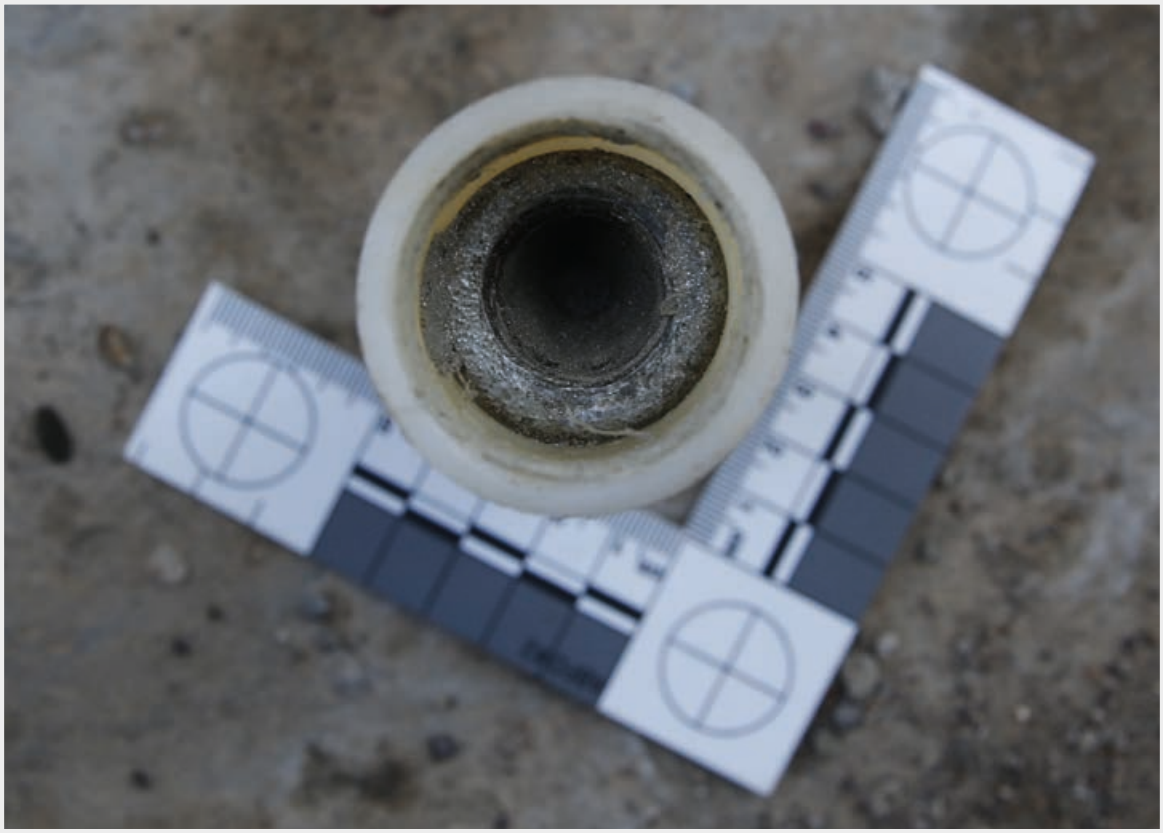

Figure 4
Internal view showing the fragmentation sleeve.
Documented by a CAR field investigation team in Al-Arij, Iraq, March 2017.

The body is filled with a Pentaerythritol tetranitrate (PETN)-based main charge and is fitted with an improvised point-detonating fuse. The fuse is constructed from aluminium and is similar to impact-inertia fuses used in IS-manufactured improvised mortar rounds, which CAR has documented in large numbers in and around Mosul (Figure 3).[2]

CAR initially suspected that the device was designed to function as a point-detonating, hand-thrown grenade. The device has no grazing fuse, which means it would best detonate by striking a surface perpendicularly. In this respect, the device's fins might assist, if thrown in an arc trajectory, to ensure a perpendicular impact. Despite repeated finds of these IEDs, CAR field investigation teams initially found no means of launching the device, other than by hand.

Figure 5
Multi-role IEDs constructed by IS forces.
Documented by a CAR field investigation team in Mosul, Iraq, January 2017.

USE OF THE IED AS A PROJECTED GRENADE

In mid-March 2017, Islamic State video footage recorded the launch of an identical device from an improvised rifle attachment. The launcher is of tubular metal construction and appears to be threaded to fit the muzzle of an AK-pattern assault rifle (Figure 6). The launch mechanism is not apparent in the footage, but the IED is almost certainly expelled from the tube by the gas pressure generated by firing a blank, or improvised blank, cartridge (possibly augmented with additional propellant).

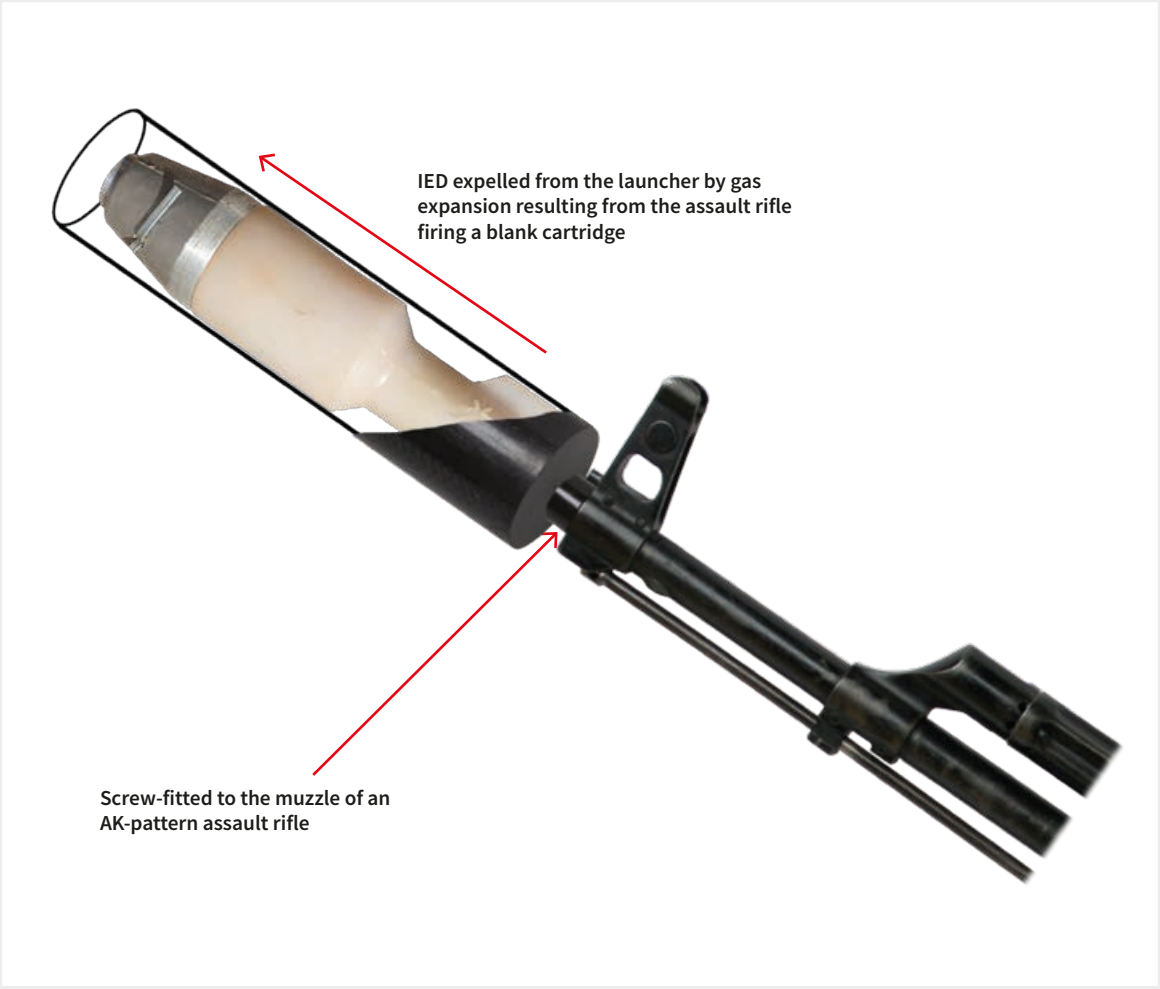

Figure 6
Reconstruction (cut away) of IED launcher configuration.

Eastern Mosul sector, November 2016.

FROM PROJECTED GRENADE TO AIR-BORNE IED (ABIED)

IS forces have further modified the multi-role IED for use as an air-borne IED (ABIED), which is dropped from commercially available UAVs.[3] CAR first documented UAV production and weaponisation in early 2016 in Ramadi, Iraq.[4] Since then, international reports and documents recovered by CAR provide evidence of a sophisticated IS UAV programme which commenced as early as 2015.[5] CAR has documented numerous UAVs employed by IS forces in the Mosul theatre of operations.[6]

Figure 7
DJI Phantom 4 UAV recovered from IS forces.
Documented by a CAR field investigation team in Mosul, Iraq, February 2017.

The device is suspended below a commercially available UAV and released when a custom switching circuit connected to the UAV actuates a servomotor. To prevent the IED from swinging during flight, which would alter its descent path on release, IS forces affix an empty silicon sealant tube to the UAV, housing the IED. A metal wire loop is fitted to the base of the IED, through which a rod connected to a servomotor taped to the UAV passes. When the UAV is directly above the intended target, the operator lowers the altitude of the UAV and transmits a radio signal to a custom switching circuit on the UAV. The custom switching circuit actuates the servomotor, which retracts the rod and releases the IED.

Figure 8
Detail of release mechanism on DJI Phantom 4 UAV. Clockwise from top left: 1) Underside of the UAV; 2) sealant tube; 3) IED release rod; and 4) servomotor and release rod.
Documented by a CAR field investigation team in Mosul, Iraq, February 2017.

FURTHER ENHANCEMENTS TO THE IED

IS forces have further modified the IED by adding a 40 mm high-explosive dual-purpose (HEDP) spin-stabilised grenade. The grenade is taped into the plastic body of the IED, in place of the usual improvised fuse. This modification increases the size of the device's main charge and, because the factory manufactured HEDP grenade features a grazing fuse, arguably increases its potential to detonate on a range of impact angles.

Figure 9
Modified IED recovered from Islamic State forces.
Documented by a CAR field investigation team in Al-Arij, Iraq, March 2017.

In February and March 2017, CAR field investigation teams operating in the Mosul theatre of operation documented such devices fitted with US-manufactured M430A1 40 mm HEDP grenades (Figure 9). The grenades had been removed from their cartridge cases and inserted into noses of the ABIEDs. M430A1 grenades have anti-armour (shaped charge) and anti-personnel (fragmentation) effects, which makes them a potentially versatile UAV-delivered weapon.

However, in normal service, a M430A1 grenade features a M549A1 point-initiated, base-detonated (PIBD) fuse. This type of fuse is designed to arm as a result of the rapid acceleration and spin (around 3,750 rpm) imparted by firing. Neither of these arming systems would function if the grenade were simply gravity dropped from a UAV.

Figure 10
Detail of M549A1 fuse showing evidence of tampering with the nose cap.
Documented by a CAR field investigation team in Al-Arij, Iraq, March 2017.

In response, CAR's analysis of the M430A1 grenades suggests that IS forces have manually armed fuses prior to deploying the devices on UAVs—presumably by manipulating the set back detents and centrifugal locking pins. Evidence for this tampering includes wrench marks on the gold-coloured nose caps, which were partially unscrewed when documented (Figure 10).

CAR was not in a position to disassemble the devices, and it is unclear whether the IEDs that have been modified to carry M430A1 grenades also include an additional, improvised main charge.

CONCLUSION

The battle for Mosul clearly illustrates IS forces' continued capacity to exploit commercial supply lines, which allows the group to innovate in the construction and deployment of new weapon systems, such as UAVs. The group has, moreover, used the battle for Mosul to field-test different types of ordnance, which is an important step in any weapon research and development programme.

The repurposing of IEDs to meet rapidly evolving tactical requirements in the battle for Mosul provides clear evidence of this trend. Within the

space of months, the group has refined a hand-thrown device into an improvised projected grenade and has subsequently modified commercial UAV technology to air deliver the IED. In its latest iteration, IS forces have enhanced the device, to improve its performance and provide anti-armour capacity, by adding factory produced 40 mm HEDP grenades.

Evidence of research and development by IS forces, compiled by CAR since 2014, suggests that such adaptations are likely to continue at pace and will result in further innovations in the near future—potentially for use in theatres other than Iraq.

ENDNOTES

1 Conflict Armament Research (2016b, p. 14).

2 Conflict Armament Research (2016b).

3 Commercial, off-the-shelf (COTS) rotary wing UAVs are the most prevalent weaponised UAV platforms currently in service with IS forces. This is for both tactical and logistical reasons. Tactically, rotary wing platforms—of the multiple rotor, helicopter type—ease the acquisition of ground targets, because the operator does not have to account for inertia when releasing ordnance. A DJI Phantom 4 can carry a payload of up to 300-400 g. Logistically, COTS UAVs are easily adaptable and more reliable than improvised platforms.

4 Conflict Armament Research (2016a)

5 Rassler, al-`Ubaydi, and Mironova (2017).

6 IS forces use UAVs in a variety of roles, including: target surveillance, such as directing suicide vehicle-borne improvised explosive device (SVBIED or 'suicide car bomb') attacks; gathering video footage for propaganda purposes; and dropping explosive ordnance onto Iraqi and Coalition forces in behind-the-line, harassing attacks.

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