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Civilian deaths & injuries: 109,696
Armed actor deaths & injuries: 23,621
Civilian casualties: 81%

Total reported deaths & injuries in populated areas: 99,060
91% civilian deaths & injuries in populated areas

Total reported deaths & injuries in non-populated areas: 25,257
41% civilian deaths & injuries in non-populated areas

Data: AOAV, based on English-language media reports
The global burden of Improvised Explosive Devices

Iain Overton and Jennifer Dathan

There is no day that goes past without the impact of an improvised explosive device (IED) making headlines around the world. Of all explosive weapons used, the IED is the most widespread, the most harmful and the most pernicious. Based on the belief that to overcome a problem, we must first understand it, this monitor is a small step in seeking to address the terrible realities of today.

It is a monitor that is, also, a response to a call to action.

In July 2016, the United Nations Secretary-General released a report called “Countering the threat posed by improvised explosive devices”. Within its pages lay a recommendation: ‘Further research on various dimensions of IED issues, including prevention, preparedness, response and recovery’ was called for, so as to ‘help inform a better understanding of the multifaceted approach required to address the issue of IEDs’ (Recommendation 22). In addition, in late 2016, the Afghanistan government proposed, for the second year, a resolution: “Countering the Threat Posed by Improvised Explosive Devices.” It was adopted by the General Assembly on December 5th 2016. Its text encouraged greater research and awareness- raising on improvised explosive devices (IEDs).

Accordingly, based on data from AOAV’s own Explosive Violence Monitor, and further in-depth research by experts in this field, AOAV presents this monitor on IED harm, developments, tactics, and users.

For more information, please go to AOAV’s website: www.aoav.org.uk or contact its Executive Director, Iain Overton, at ioverton@aoav.org.uk.

Iain Overton
Executive Director
Action on Armed Violence

It would not be an over-statement to say that we live in the age of the Improvised Explosive Device (IED). Since AOAV’s Explosive Violence Monitor began in 2010, AOAV has recorded the appalling suffering caused across the globe by both manufactured and improvised weapons. In the last seven years, the harm caused by IEDs has out-weighed the civilian harm caused by all other explosive weapon types combined.

This monitor, focusing just on the impact of IEDs, with research articles and data associated with it, is a response to that.

In 2016, for instance, Action on Armed Violence (AOAV), recorded 19,246 deaths and injuries as a result of IEDs being used around the world.1 And of those harmed by IEDs, three quarters, or 74%, were reported to be civilians -14,301.2 This counted for 45% of all civilian casualties from explosive weapon types.3 Indeed, that year IEDs resulted in at least one casualty in 48 different countries and territories. This was the highest number of places impacted by IEDs as recorded by AOAV over the last seven years: including 17 countries and territories that were not impacted in 2015.4

It is a violence that is not receding. In the first half of 2017, AOAV has seen a further 7,784 deaths and injuries from IEDs. 82% of the casualties were civilians. It mirrors the figures seen over the last six years. Between 2011 and 2016, AOAV has recorded 124,317 deaths and injuries from IEDs, of which 81% (100,696) were civilians.

Last year, AOAV recorded an average of 39 civilian deaths and injuries from IEDs per day. 14 security personnel/armed actors were also harmed, on average.

This data only focuses on the immediate impact of IEDs. But it should be remembered that the harm of such weapons echoes far beyond the initial blast. Displacement of populations, destruction of homes, hidden psychological suffering, economic deprivation: these are just some of the reverberating effects of IEDs, consequences that are often poorly understood or addressed.

States and other relevant actors must work on measures which address the high level of humanitarian harm caused by these weapons. The harm recorded and reflected in this report illustrates the stark urgency needed to address IEDs.
Almost seven years of core data on Improvised Explosive Devices (IEDs):

**Key findings – 2016**

- AOAV recorded 19,246 deaths and injuries by IEDs in 903 incidents in 2016. Of these, **14,301 were civilians – 74%**.

- These account for **45% of all civilian casualties** from explosive violence.

- When IEDs were used in populated areas last year, **88% of those killed and injured were civilians**. This compares to 29% in other areas.

- Civilian deaths and injuries in populated areas, represented **91% of all reported civilian deaths and injuries from IEDs**.

- **Iraq, Syria, Afghanistan, Turkey and Pakistan** saw the highest number of civilian deaths and injuries from IEDs in 2016.

- The top six worst impacted countries had all seen a rise in civilian casualties from IED incidents, compared to 2015.

- **Turkey** saw a **103% rise** in civilian deaths and injuries in 2016 from IEDs, compared to 2015. **Somalia** saw an increase of **132%** on the same.

- **Six countries and territories** saw over **500 civilian deaths and injuries** from IEDs in 2016.

- Incidents were recorded in **48 countries and territories** around the world – five more countries than in 2015.
2017 (January – June)

• When IEDs have been used in populated areas in the first 6 months of 2017, 91% of the casualties were civilian.

• So far this year, the worst impacted countries from IEDs have been Iraq, Afghanistan, Syria, Pakistan and Somalia.

• Afghanistan has been the worst impacted country by suicide bombings.

• In the first half of 2017, there has been a 61% increase in civilian deaths and injuries from IEDs in Afghanistan compared to the same period last year – or a 105% increase in civilian deaths.

• Pakistan has seen a 22% increase in civilian casualties – or a 41% increase in civilian deaths.

• Somalia has seen an 18% increase in civilian casualties – or a 38% increase in civilian deaths.

Trends and patterns: 2011-2016

• The numbers of civilians killed or injured by suicide attacks have been consistently increasing; with 9,680 harmed in 2016. This was 5% more than recorded in 2015, and 90% more than recorded in 2011.

• In the last six years, the harm caused by IEDs has outweighed the civilian harm caused by all other weapon types combined.

• When IEDs were used in populated areas, 91% of casualties were civilians.
When IEDs are used in populated areas, they massively elevate the threat to civilians. Across the six-years-worth of explosive violence data compiled by AOAV, when IEDs were used in populated areas, 91% of casualties have been civilians. That same proportion was recorded over the first half of 2017: it is a pattern of harm that is notable for its horror and its consistency.

54% of the IED incidents that AOAV recorded in 2016 were in areas reported to be populated (492 incidents). Yet civilian deaths and injuries in populated areas represented 91% of all reported civilian deaths and injuries from IEDs, demonstrating the disproportionate effect of IEDs deployed in populated areas. In short, AOAV recorded an average of 26 civilian casualties per incident of explosive weapon use in populated areas, compared to just three in other areas.

So far in 2017 (January to June), AOAV has recorded a 21% increase in the number of IED incidents in populated areas, compared to the same period in 2016. Fortunately, this hasn't translated into greater casualty figures. However, it could be that many of the injuries from IED incidents in Iraq and Syria are not being reported, due to the numbers of incidents and deaths, the difficulties for journalists to access the blast sites, as well as the fatigue that comes with reporting such numbers in such conflicts.

LOCATIONS
Last year, the most civilians killed and injured from IEDs were from incidents that took place in commercial premises. AOAV recorded 54 such incidents in 2016. These incidents resulted in 1,696 civilian deaths and injuries.

Unsurprisingly, markets followed closely behind as one of the locations seeing the most civilian casualties from IEDs. Last year, AOAV recorded 48 incidents in markets. These incidents resulted in 1,522 civilian deaths and injuries – an average of 32 people harmed per incident. 98% of those killed or injured in market incidents were civilians. Markets have seen the most civilian casualties from IEDs in the last six years.

Places of worship also saw a significant number of civilian casualties from IEDs and were a location in which such attacks were particularly harmful, with an average of 55 civilian casualties per incident.

Whilst most locations saw the majority of attacks in Iraq, places of worship stand out as it is Syria that has seen the most civilian casualties from IED incidents in this type of location.

TARGETING
In recent years, IEDs have also been increasingly targeting armed actors. 2016 saw a 75% increase in armed actor and security personnel casualties from IEDs. But it is worth noting that even when IED incidents targeted armed state actors last year, 37% of the casualties were civilians.

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**After the explosion I was overcome by shock. I fell on my knees, and couldn’t believe what I was seeing. Then fifteen seconds later there was a second blast. We saw flags and pieces of bodies flying into the air… I will never forget the smell of burned human flesh. Even after I left the scene, I couldn’t help feeling it.**

Goksel Ilgin, witness to the 2015 Ankara bombings on the peace rally.
Deaths and injuries from IEDs: 2011-2016
AOAV recorded casualties from IEDs in 85 countries and territories.

Countries and territories with between 1,001 and 3,000 IED incidents
- Afghanistan 1246, Iraq 2473

Countries and territories with between 101 and 1,000 IED incidents
- Egypt 193, India 264, Nigeria 262, Pakistan 917, Philippines 126, Somalia 180, Syria 356, Thailand 244, Turkey 146, Yemen 148

Countries with between 6 and 100 IED incidents
- Algeria 12, Bahrain 30, Bangladesh 16, Burma 18, Cameroon 19, Canada 6, Chad 8, China 25, Colombia 31, France 7, Gaza 9, Indonesia 13, Israel 36, Kazakhstan 6, Kenya 46, Lebanon 45, Libya 66, Mali 26, Mexico 9, Nepal 11, Russia 58, Saudi Arabia 11, UK 6, Ukraine 16, USA 38, West Bank 7

Countries with between 2 and 5 IED incidents
- Australia 5, Belgium 2, Bosnia and Herzegovina 2, Bulgaria 2, Chile 5, Germany 4, Greece 2, Guatemala 2, Iran 5, Italy 4, Japan 2, Laos 2, Malaysia 3, Malta 3, Mauritania 2, Niger 3, Paraguay 2, Republic of Ireland 3, Serbia 2, South Africa 4, Sweden 3, Tanzania 4, Tunisia 3

Countries and territories with 1 IED incident
- Armenia 1, Azerbaijan 1, Belarus 1, Bhutan 1, Croatia 1, Cyprus 1, Czech Republic 1, DRC 1, Ethiopia 1, Georgia 1, Jordan 1, Hungary 1, Kosovo 1, Kuwait 1, Kyrgyzstan 1, Macedonia 1, Moldova 1, Morocco 1, Netherlands 1, Norway 1, Switzerland 1, Taiwan 1, Venezuela 1, Vietnam 1
IRAQ
In the last six years, AOAV recorded 47,817 civilian casualties from IED incidents in Iraq – 87% were civilians. In 2017, Iraq continues to maintain this unenviable position as the country most impacted by IEDs.

After a steady decrease in the number of deaths and injuries from IED attacks since the peak in 2013, 2016 saw a 19% increase in the number of civilian casualties compared to the previous year.

Despite the increase last year, given the worsening security situation, it is likely that this figure does not reflect the true levels of harm, due to a decline in English-language casualty reporting from inside Iraq. This is particularly true of recording civilian injuries. Iraq, in fact, saw a 39% increase in civilian deaths in 2016. However, with so much death from such violence, the injuries did not appear to make the news.

Furthermore, Iraq saw a 50% rise in civilian deaths and injuries from suicide attacks in 2016 compared to the previous year. Over half of all suicide attacks took place in just one city – Baghdad. It appeared that an increase of such attacks was ISIS’s response to their loss of ground in other areas.

Figure 1 Total (2011-2016): 50,533 (43,988 civilians); 2,701 incidents

Top six countries for civilian IED casualties in 2016

<table>
<thead>
<tr>
<th>Country</th>
<th>Civilian Casualties</th>
<th>Armed Actor Casualties</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRAQ</td>
<td>4,851 civilians</td>
<td>852 armed actors</td>
</tr>
<tr>
<td>AFGHANISTAN</td>
<td>1,856 civilians</td>
<td>411 armed actors</td>
</tr>
<tr>
<td>PAKISTAN</td>
<td>1,150 civilians</td>
<td>395 armed actors</td>
</tr>
<tr>
<td>SYRIA</td>
<td>1,863 civilians</td>
<td>312 armed actors</td>
</tr>
<tr>
<td>TURKEY</td>
<td>1,718 civilians</td>
<td>757 armed actors</td>
</tr>
<tr>
<td>SOMALIA</td>
<td>629 civilians</td>
<td>251 armed actors</td>
</tr>
</tbody>
</table>
AFGHANISTAN

While Afghanistan has consistently been amongst the countries worst impacted by IEDs year on year, no year has reached the levels of civilian harm from IEDs that AOAV recorded in 2011, the first full year of monitoring. However, 2017 looks like it could be the year to change this trend.

In the first half of 2017, AOAV recorded at least 1,436 civilian deaths and injuries from IEDs. This would be a 61% increase of the levels recorded in the same period last year – or a 105% increase in civilian deaths. Between January and June 2017, 87% of civilian casualties from IEDs have been caused by suicide attacks.

The Taliban have been the main perpetrators of IED harm in Afghanistan. However, 2016 saw the emergence of ISIS-affiliated attacks in the country, which continue this year.

SYRIA

Syria is in its seventh year of civil war. The intensity of the explosive violence in conflict scenarios like Syria means that AOAV is likely to be capturing just a fraction of the real harm unfolding there.

Despite this, AOAV still recorded a 50% increase in deaths and injuries from IED attacks in Syria in 2016, compared to 2015. When compared to 2011, when AOAV began the monitor, the rise is over 720%. It is clear that IEDs are a fundamental problem in Syria - a problem that looks set to continue.

The first six months of 2017 saw 1,230 deaths and injuries from IEDs in Syria. Of these, 88% were civilians. 68% of civilian casualties were caused by suicide attacks.

Over the last six years, Syria has seen at least 10,834 casualties from IEDs, including 8,890 civilians (82%).

**Figure 2 Total (2011-2016):**
12,064 (9,972 civilians); 403 incidents

**Figure 3 Total (2011-2016):**
16,256 (12,333 civilians); 1382 incidents
TURKEY

2016 saw Turkey recorded in the worst five impacted countries by IEDs. Since 2015, Turkey has experienced significant rises in the levels of IED violence.

In 2016, it saw a 103% rise in civilian casualties from IED violence, compared to 2015 – or a 1,671% increase since 2011. IEDs account for 94% of civilian casualties from all explosive weapon types in Turkey.

757 armed actors and security personnel were also killed and injured by IEDs in Turkey in 2016.

IED incidents in 2017, however, have drastically decreased, with just six incidents and 41 casualties recorded.

PAKISTAN

After decreasing levels of IED harm since 2013, last year Pakistan experienced a 29% rise in IED casualties. Pakistan saw 1,545 deaths and injuries from IED attacks – of which 74% were civilians. This rise looks set to continue in 2017.

In the first half of 2017, Pakistan has seen 942 casualties from IED attacks, including 840 civilians (89%). This is 22% higher than the civilian casualties recorded in the first half of last year, or a 41% increase in civilian deaths. Of the civilian harm this year, 76% was caused in just four IED incidents. Three of which, accounting for 66%, occurred in Parachinar, in Kurram Agency.

98% of all civilian casualties from IEDs in 2017 have occurred in populated areas.

Over the last six years, Pakistan has seen at least 15,020 deaths and injuries from IEDs – 80% of these were civilians. IEDs have caused 76% of all civilian harm from explosive weapons.

Figure 4 Total (2011-2016):
4,233 (3,067 civilians); 153 incidents

Figure 5 Total (2011-2016):
16,776 (13,609 civilians); 985 incidents
SOMALIA

Somalia saw civilian deaths and injuries from IEDs increase by 132% in 2016, compared to the levels recorded in the previous year – 271 civilian deaths and injuries were recorded in 2015 and 629 were recorded in 2016. This was the highest level of harm reported from IEDs in Somalia that AOAV has documented in the last six years.

Al Shabaab was the most prolific user of IEDs there: of the explosive violence claimed by al Shabaab in Somalia, 74% of their attacks used IEDs. The group primarily operate in the south and central regions of Somalia. Last year, almost 70% of Somalia’s IED attacks took place in the Somali capital, Mogadishu. 68% of the total civilian deaths and injuries from IEDs in Somalia were from suicide bombers in 2016.

The rise in IED violence is anticipated to continue this year. In the first half of 2017, Somalia has already seen 395 civilian casualties from IEDs. Compared to the same period last year, this is an 18% increase.

Perpetrators

IEDs are almost exclusively used by non-state actors. In 2016, AOAV recorded IED usage by 34 non-state entities. In the one incident that a state actor was recorded as using an IED last year, the Dallas police force in Texas used a ‘robot-bomb’. It was comprised of a Remotec, Model F-5 and C4 explosive with a detonator cord, to kill a 25-year-old veteran sniper, who had killed five police officers.7

Whilst most IED incidents go unclaimed, of the 350 incidents for which responsibility was assigned last year, 50% were attributed to ISIS groups.8

The largest numbers of civilian deaths and injuries were caused by ISIS (45%), the Taliban (6%) and Jamaatul Ahrar (5%).

ISIS

Throughout AOAV’s recording, ISIS has remained one of the most prolific and lethal users of IEDs. Of the casualties caused by the incidents claimed by the group in Syria and Iraq, 86% have been civilians.

Two-thirds of their claimed attacks in Syria and Iraq took place in populated areas.

It is likely that ISIS are responsible for far more attacks and subsequent casualties than are claimed. Last year, ISIS was the only group to perpetrate IED attacks in Iraq, but many went unclaimed. AOAV recorded 207 IED incidents in Iraq last year; responsible for 5,703 casualties, of which 85% were civilians.

Suicide bombings have featured particularly heavily in ISIS attacks. Of the IED incidents in Iraq last year, 38% were caused by suicide attacks; accounting for 69% of all IED casualties in country.

Whilst ISIS’s origins are in Iraq and Syria, their affiliates span the globe. ISIS affiliated individuals have also carried out IED attacks across Europe.
TALIBAN
The Taliban are the biggest user of IEDs in Afghanistan. In the last six years, they have claimed responsibility for 268 IED attacks, causing 5,015 casualties – of which 71% were civilians.

However, as with ISIS, it is certain that they are behind many of the unclaimed incidents in Afghanistan. In this period (2011-2016) 965 IED incidents went unclaimed. These were responsible for 8,128 casualties – 75% were civilians.

In incidents claimed by the Taliban, suicide attacks account for 57% and are responsible for 76% of the total casualties from Taliban IEDs. Last year, the Taliban were responsible for at least 1,213 casualties from IEDs – 56% of all casualties from IEDs in Afghanistan. Of those killed or injured in Taliban IED incidents, 77% were civilians.

PAKISTANI TALIBAN
Whilst independent of the Taliban in Afghanistan, the Pakistani Taliban do enjoy strong links with their ‘brothers in arms’. The command structure of the Pakistani Taliban/ Tehrik-i-Taliban includes the affiliated Haqqani network, Lashkar-e-Jhangvi, Lashkar-e-Taiba and Sipah-e-Sahaba Pakistan, as well as other offshoots such as Jamaat-ul-Ahrar.

The TTP is by far the biggest user of IEDs in Pakistan, causing at least 3,500 deaths between 2011-2016. It is believed the real figure is far bigger than this, though, due to the likelihood that the group were involved in a number of the 753 IED attacks committed in Pakistan by unidentified perpetrators over the past six years.

Suicide bombings were responsible for 57% of the civilian casualties claimed by the Pakistani Taliban’s IED attacks. These suicide bombers overwhelming come from the chronically underdeveloped FATA areas.9

BOKO HARAM
Of total civilian casualties from explosive violence in Nigeria over the last six years, 97% have been caused by IEDs – responsible for at least 7,501 civilian casualties. Boko Haram are, on the whole, the only group to have carried out IED attacks in Nigeria in the last six years. Therefore, they are highly likely to be behind most, if not all, IED incidents perpetrated in this time frame in Nigeria.

Last year, there was a significant reduction in IED harm in the West African nation, which continues throughout 2017, as counter-insurgency efforts have seen Boko Haram pushed to the brink of defeat. Despite this, the group still maintain the ability and knowledge to carry out sporadic IED attacks. These remain highly lethal. In the first half of 2017, 175 people were killed or injured in IED incidents in Nigeria. Of these 45% were civilians. All civilian casualties were caused by suicide attacks.

Boko Haram are known for using women and children to carry out suicide attacks. Of the 15 suicide attacks involving 25 suicide bombers that took place in Nigeria in the first half of 2017, 15 of the suicide bombers were women or children.

Delivery method and detonation mechanism
AOAV’s recording distinguishes between car bombs,10 roadside bombs11 and more general non-specific IEDs.12 Over the last six years, the majority of incidents (50%) have been recorded as non-specific IEDs. This could mean the IED device type has not been further identified but it also includes suicide belts. Therefore, suicide attacks are examined separately below. This section will examine the two other main IED types identified within the data: roadside bombs and car bombs.

Car bomb attacks have been recorded in 40 different countries around the globe. In the last six years, as is to be expected given their greater payload capacity, car bombs have proven to be one the most harmful kind of IED for civilians, causing an average of 30 casualties per incident. 84% of casualties from car bombs were civilians. Even when military targets were aimed for in the attack, due to the size of the explosion, civilians were often amongst the casualties.

Despite car bombs only accounting for 24% of IEDs, they accounted for 42% of the civilian casualties.
Roadside bombs, on the other hand, have a small payload in comparison – causing an average of six casualties per incident. They are also less targeted and less-likely to be used in populated areas. Unlike, other IED types, the roadside bomb causes a greater percentage of armed actor and security personnel casualties. 84% of casualties from car bombs were civilians, compared to 55% from roadside bombs. In total, roadside bombs accounted for 6% of civilian casualties from IEDs, but 22% of armed actor casualties.

Roadside bombs were recorded in 29 countries and territories around the globe.

DETONATION MECHANISM

Suicide bombings

Suicide bombings, including car bombs operated by suicide bombers, are a form of command-operated IEDs. AOAV has recorded a consistent increase in casualties from suicide bombings. In 2016, AOAV recorded 12,673 casualties from suicide attacks – an 18% increase from the previous year or a 96% increase compared to 2011, the first year of recording.14

On average, 38 civilians were killed and injured by each suicide bombing last year – 2 more than in 2015, when the average was 36. This was accompanied by a doubling of the numbers of armed actors killed and injured from suicide bombings, reflecting the overall increase of such casualties from IED incidents more generally.

Suicide bombings represented only 28% of all IED incidents recorded, but they accounted for 66% of all deaths and injuries from IED attacks.

The countries worst affected by suicide bombings last year were Iraq, Syria, Afghanistan, Turkey and Pakistan. 30% of all incidents recorded were in Iraq. 70% of all recorded suicide incidents took place in populated areas. In these attacks around 90% of those killed and injured were civilians. Suicide attacks in populated areas caused an average of 51 civilian deaths and injuries per incident. This means suicide bombings are the most injurious of all IED types and, indeed, all explosive weapon types. Despite this, they often remain excluded by disarmament debates.

Figure 7 Deaths and injuries from suicide attacks (2011-2016)
However, so far this year, there seems to be a surprising decrease in the levels of suicide attacks. This is likely due to the extreme loss of ground ISIS have now witnessed across Syria and Iraq – whilst initially this saw the response of more suicide attacks, it is likely that, due to further significant losses, they now lack access to as many facilities and networks to carry out attacks on the levels seen in previous years. This has seen Iraq and Syria drop from the unenvied top-spots for worst impacted in 2017, with Afghanistan taking the place at the top.

**Victim-activated IEDs**

Victim-activated devices are most commonly detonated when a person or animal stands on them, or when they are driven over. IEDs detonated in this fashion are considered as de facto antipersonnel mines under the Mine Ban Treaty and are therefore prohibited under international humanitarian law. Their random trigger mechanism means that they cannot distinguish between armed actors and civilians, and as such are inherently indiscriminate.

16% of IED incidents, where the activation method was identified, in the last six years, have been victim-activated IEDs. However, they account for just 3% of civilian casualties from these incidents.

At least 48% of these incidents were identified as roadside bombs.

Victim-activated IEDs resulted in the lowest average civilian deaths and injuries per incident, with an average of 5 deaths or injuries per incident.

This reality is important for policy makers – as it is clear that seeking to address the complex problem of IED proliferation purely through the mechanisms of the Mine Ban Treaty would fail to acknowledge the multi-faceted nature of general IED production, use and consequence.
Command-operated IEDs

Command operated IEDs (or CIEDs) are detonated generally by radio signals or command wire. AOAV divides these IEDs between those detonated by remote-control or command, and those that involved the suicide of the perpetrator.

CIEDs should technically provide the greatest level of control for a user. However, this is not necessarily an assurance of higher protection standards for civilians from incidental harm.

This activation type accounted for 23% of IED incidents between 2011-2016, where the activation mechanism was identified. They accounted for 10% of civilian casualties recorded from such incidents in this period – as well as 14% of armed actors and security personnel.

CIEDs resulted in an average of 13 casualties per incident – of which 9 were civilians.

Even where they are used to target armed actors, civilians were often killed or injured, either because of their large inherent blast effects, deliberate attempts to target civilians, or the deployment of these weapons in populated areas.

Of command-operated IEDs, 10% were identified as car bombs, accounting for a significant number of command-IED civilian casualties – 34%.

Whilst those identified as roadside bombs accounted for a greater percentage of incidents (45%) they more accounted for less civilian casualties (14%). However, it appears that though roadside command-operated IEDs caused more civilian casualties than armed actors or security personnel, they accounted for 56% of all command-IED casualties of the latter category.

Conclusions

AOAV has now recorded 135,255 deaths and injuries as a result of IEDs between October 2010 – June 2017, outweighing the harm from all other explosive weapon types. Over 81% of all of these were civilians (109,745 deaths and injuries). Year on year, civilians have consistently borne the burden of IED harm.

IEDs have constantly caused the most civilian casualties – more than any other explosive weapon type. Despite this the international community remains very divided and often inactive in regard to addressing the causes and prevention of such harm.

Suicide bombings are the most lethal explosive weapon type, despite the slight decrease in their use this year, they remain a great concern and the cause of the majority of civilian casualties from IEDs. There is a desperate need for greater understanding of why these weapons are used, the harm they cause and how best to prevent their use.

In addition, States and non-governmental organisations have been encouraged to build upon existing awareness and risk education campaigns regarding the urgent threat of improvised explosive devices as part of the UN resolution ‘Countering the threat posed by improvised explosive devices’ (A/RES/71/72) passed in December 2016.

The resolution also urged States in a position to do so to contribute funding to the diverse areas of work needed to effectively address the issue of improvised explosive devices, including research, clearance, ammunition stockpile management, preventing violent extremism, awareness raising, capacity-building, information management and victim assistance, through existing trust funds and arrangements. These recommendations need to be acted upon.

The heads, legs and arms of the dead people were scattered on the floor of the mosque.

Mohammed al-Ansi, a witness to the March 2015 bombings on two mosques in Sana’a.
Recommendations

- Recognising the large and consistent number of civilian casualties caused by IEDs, all parties should work on measures which address the high level of humanitarian harm at the hands of these weapons. This includes measures to address the security of stockpiled ammunition and munitions, coordinated efforts towards the control of source materials, and more systematic data collection.

- Efforts should be made to encourage civil society, religious and cultural leaders to publicly condemn the use of IEDs in populated areas.

- The issue of suicide bombings, while contentious, is relatively absent from the wider disarmament debate. This needs to be addressed and urgently. How to stop the use of suicide bombers, and addressing the reverberating harm such weapons bring, needs to be a matter of urgent discussion by States, international organisations and civil society.

- States should work towards the full realisation of the rights of victims, including those killed and injured, their families, and affected communities. They should strive to ensure the timely and adequate provision of needed services for the recovery, rehabilitation, and inclusion of victims of IEDs, without discrimination.

- States, international organisations, and non-governmental organisations should gather and make available data on the impacts of IEDs. With a need to share prioritised, States must imaginatively reassess what they do and do not share, and be better prepared to engage in information sharing.

- The full recommendations in the December 2016 UNGA resolution on ‘Countering the threat posed by improvised explosive devices’ (A/RES/71/72) have to be put into action, and soon. The global threat of IEDs needs to be addressed far more by States, international organisations and civil society, and in a way that does not impinge on human rights or humanitarian principles.

- More research is needed to better understand the reverberating effects of IEDs, including their impact on the displaced and refugees, on vital infrastructure and services, and economic livelihoods.

- Whilst this is the first dedicated to IEDs, AOAV has demonstrated over six years the importance of systematic and continuous monitoring of IEDs and its impacts in populated areas. This monitoring must continue in order to assess whether recommendations are put into effect.
The Islamic State's suicide industry

Charlie Winter and Joe Whittaker

Introduction
The Islamic State (henceforth IS) has fundamentally changed what we, in the West, understand as suicide tactics. Drawing on primary data compiled and processed by the first author between 2015 and 2016, this paper analyses and discusses the nature of this transformation, offering a nuanced definition for what the group considers to be a “suicide operation,” an analysis of its strategic usage of the tactic, and a statistical dissection of the demographic origins of IS’s suicide attackers.

The data demonstrates that IS is currently using suicide attacks in a manner that is more akin to the kamikaze pilots of Imperial Japan than that of other jihadist groups; that most of its attacks are committed by local actors against hardened military targets; and that it is militarising suicide at an unprecedentedly high rate. These findings contrast with the conventional wisdom on suicide attacks and suggest that IS’s use of the tactic presents a uniquely complex challenge to all those engaged in the war against the group today.

Defining suicide tactics
Too often, discussions of suicide tactics suffer from a lack of nuance. Indeed, as Martha Crenshaw notes, “the tactic is usually treated as though it were a single unified method of violence.”17 However, it is important to recognise that there is no single type of suicide attack, particularly in the context of IS, which takes a far more granular approach to militarising suicide than what the “traditional” definition describes.

Similar to the position held by other salafi-jihadist groups, IS holds that suicide attacks are dependent upon the intent of the perpetrator, rather than the means by which they die. As such, whether an IS attacker dies by their own hand or that of another, in both instances they may be regarded as a suicide attacker.

With this as a definitional foundation, one must then distinguish between ‘amaliyyat istishhadiyya and ‘amaliyyat inghimasiyya, both of which should be considered suicide attacks. The first term refers
to ‘conventional’ operations—i.e., those that incorporate an individual bomber bearing an improvised explosive device (IEDs). The latter is slightly different. Deriving from the Arabic word *ghamasa*, to submerge or plunge, the term has a long history in the context of salafi-jihadism. In the specific operational context of IS, *inghimasiyya* refers to operations involving fighters that willingly put themselves in harm’s way, maximising the risk of their deaths in order to cause as much damage as possible to the enemy. This, for example, could take the form of a unit attacking an enemy with light weapons and later, when overrun, detonating a series of suicide IEDs. Importantly, the perpetrator’s death is not a necessary condition for operational success in the *inghimasi* context.

**The data**

To holistically assess the nature of IS’s suicide operations, data was collected¹⁸ from two official sources; the centrally run Amaq News Agency, and the provincial media offices. Previous research on IS’s use of suicide attacks has utilised the former but not the latter.¹⁹ Between 1st December 2015 and 30th November 2016—the data collection period—IS’s provincial media offices gave individualised reports of 923 fighters who committed suicide attacks. This provincial data forms the bulk of the analysis below.

It should be noted that independent verification of individual attacks is impossible because most of the operations occurred where no journalists are present and, in the areas in which journalists are present, there tended to be a reporting bias towards those that were particularly destructive. However, because of IS’s rigorous four- to eight-step verification process, there is good reason to believe its reports are reliable.

**The rate**

When assessing the strategic logic of IS suicide tactics, the rate at which attacks occur is particularly instructive.

What is clear is that variance in the rate of IS suicide operations is not random. Rather, IS implements suicide attacks in a manner that is both carefully calculated and precisely coordinated. The events of March 2016 offer a window into this phenomenon: after weeks of sustained territorial losses all over Iraq, IS conducted a nationwide, suicide-led counter-offensive involving 87 separate operations. The attacks were not geared towards capturing territory (there has been no real strategic offensive in Iraq since 2015); rather, they were an attempt to destabilise security in general, or derail shaping operations geared towards preparing the ground for large future offensives. IS’s defence of the city of Mosul provides further evidence for the existence of a sophisticated command-and-control structure for suicide operations. In the first few weeks of the campaign to liberate the city, it carried out hundreds of vehicle-borne suicide operations, increasing the average number of attacks in the area more than tenfold.

**The location**

One can discern a similar strategic logic behind IS’s use of suicide tactics when dissecting the data on attack location. Nearly two thirds took place in Iraq, while almost a quarter occurred in Syria (mostly in IS’s Aleppo Province).

The data illustrates a strong correlation between the use of suicide attacks and the intensity of the military threat faced by IS; it is clear that the frequency with which the tactic is used varies according to situational exigency. The data also suggests that a sudden reduction in the use of suicide attacks may be an indicator for the group’s willingness to retreat from a battle, if it deems it a lost cause. This can be seen in the context of Fallujah, when, a few weeks into the campaign to re-take the city in May/June 2016, IS’s leadership seemed to make a strategic decision to curtail the...
use of suicide operations, ceasing to use them entirely after an initially high rate. Conversely, a persistent suicide attack rate offers a way to identify areas of long-term strategic importance to IS. Examples of this can be seen in Aleppo Province in Syria and Dijila Province in Iraq.

Of course, the vast number of potential extenuating factors means that such conclusions should be treated with caution and are probably only useful in hindsight. Despite this, it is reasonable to infer that the group uses suicide attacks in a rational and measured way that serves long-term strategic objectives.

The type
Assessing the data on attack modus operandi offers a further insight into IS's strategic thinking. Eighty-four percent of the 923 operations its provincial media outlets reported on were geared towards achieving military goals, most of which were defensive in nature (an effort to thwart enemy advances and pre-empt counter attacks). Others were part of the group’s war of attrition, and sought psychological, rather than territorial gains. IS’s suicide attacks targeted civilians just sixteen percent of the time, a statistic that is testament to the sheer scale of its use of suicide on the battlefield.

IS suicide tactics manifest in three forms, each of which differ significantly in terms of attack type and target:

- Firstly, there are vehicle-borne IEDs (VBIEDs), which accounted for seventy percent of IS’s suicide attacks in the year in question. There are nine types of VBIED, which range according to size, speed, and power. When IS was still expanding, VBIEDs were primarily used offensively. However, as its territories haemorrhaged across 2016, it primarily used them defensively.

- Secondly, there are inghimas operations. Inghimas attacks take three forms: ‘battlefield,’ in which operatives attack a conventional enemy with light weapons and occasionally suicide belts; ‘psyops,’ in which they attempt to undermine enemy soldiers’ morale by attacking military and police targets away from the battlefield; and, finally, ‘terrorist,’ in which operatives attack civilians (the November 2015 Paris attack was an example of ‘terrorist inghimas’).

- Finally, there are human-borne IEDs (HBIEDs), which accounted for ten percent of IS’s operations in 2015-16. Involving explosive devices concealed on the body of the operative, these attacks tend to be aimed at soft targets. Indeed, seventy-three percent were directed at civilian, rather than military, targets.

The demographics
The final aspect of the data which speaks to IS’s suicide strategy is the origins of the fighters; just twenty per cent were foreign fighters, with seventy-four percent being local (and a further six percent undefined). Although there is a widespread belief that the majority of IS’s suicide attackers are made up of foreigners, the data shows that it is local actors, largely Syrians and Iraqis, that commit the bulk of the attacks.

Intriguingly, of the total number of foreign fighters that committed suicide attacks for IS, the highest proportion came from Tajikistan. Over the twelve months in question, significantly more Tajiks died in VBIED and inghimas operations in Syria and Iraq than any other foreign national. Although it is beyond the scope of this paper to determine why that may be, it is worth noting that Gulmurod Khalimov, a Tajik national, is currently rumoured to be IS’s highest ranking military authority.

Implications
There are three important conclusions to draw from the above observations.

Firstly, the data demonstrated that the use of suicide operations by salafi-jihadists in the 2010s only partially reflects the use of suicide operations by salafi-jihadists in the 2000s. IS has operationalised suicide on an industrial scale, perpetrating operations at a rate higher than all other terrorist groups combined (salafi-jihadist and otherwise) for five years running.

Secondly, it is evident that there is a high degree of centralised planning and strategizing behind each
and every operation. This is not simply a case of suicidal fanatics running around with unmitigated destruction as their sole purpose. The group’s use of militarised suicide now seems to revolve more around defence than anything else—suicide operatives are IS’s way of making up for technological disparity, its equivalent of guided missiles. In this regard, the thinking behind its use of suicide tactics is perhaps more reminiscent of the Imperial Japan than of other salafi-jihadist groups like al-Qaeda.\(^{22}\)

Thirdly, because much of the conventional wisdom around IS’s use of suicide tactics relies on recycled data gathered from observations made a decade ago, policymakers are at risk of mis-calibrating their response. It is no longer true that “civilians are the target of choice,” that “the bombers are mostly foreign, not Iraqi,” and that the tactic is a “largely imported phenomenon.”\(^{23}\) Instead, the lion’s share of the attacks are by locals (74 percent) against military targets (84 percent). What is more, the operational shape of suicide attacks is less unified than ever. The type of attack that most closely reflects our traditional understanding of suicide tactics, HBIEDs, currently occurs least regularly in the context of IS. Simply put, this means that there is no single theory or schema through which militarised suicide as a phenomenon can be understood.

In months and years to come, suicide tactics will continue to be a fundamental part of salafi-jihadist irregular warfare. Regardless of what happens to IS in Mosul or Raqqa, the tactics’ appeal will endure, based on the fact that they have a high margin of casualties per fighter lost, their human operators have a unique ability to seek out targets, they are difficult to defend against, and, as spectacular operations, they can shatter enemy morale.\(^{24}\) Given that insurgent groups are, as a rule, imitative actors, understanding the accumulating appeal of suicide-based violence is critical, and not only because of what it means in the context of the fight against the so-called caliphate.
Drones and the IED threat
Roger Davies MBE QGM

Executive summary
Recent years have seen a marked and rapid technological development in the capacity and availability of drones or ‘Unmanned Aerial Systems (UAS)’. And, as with so many technological advancements, it has not taken long before such drones have been employed by those who seek to spread terror. Today, with limited financial investment and minimal innovation, terror groups can use drones to gather information or – of more concern – to modify them for use as improvised guided weapon systems.

Most notably, over the past two years, drones have been increasingly used by terror groups as the means to deliver improvised explosive devices (IEDs). And the methods used for weaponising such consumer drones have been shown to be simple and effective.

Frustratingly, the technology and systems to mitigate the risk from such attacks are still developing, and are not currently widely available or deployed routinely. The size of the explosive device that can be deployed by a drone is comparatively small compared to most IEDs, however. Nonetheless, the ability to deploy such weapons to a specific, vulnerable location, at speed and with accuracy, is significant. The implications and responses to this threat will be examined below.

Throughout this paper the term “drones” will be used to describe all Unmanned Aerial Systems.

Historical context
The use of drones to strike terror in populations may feel like a new concept. But, as with many terrorist techniques, history teaches us that what we see as “new”, isn’t that new at all.

On August the 22nd, 1849, Austrian forces laying siege to the city of Venice carefully fitted explosive charges to 200 unmanned aerial systems. These balloons were released from an offshore platform, allowing the wind to carry them gracefully over the city. But each balloon was far from graceful, as each carried a bomb; a pear-shaped vessel filled with gunpowder. The designer, the Austrian artillery officer Franz von Uchatius, was able to “programme” the balloon flight by pre-releasing smaller balloons, enabling him to calculate wind speed and direction. The bombs were to drop after 23 minutes, released by an ingenuous burning fuse mechanism.

In World War Two, similar devices were also used by both the British, who sent balloons trailing long bare wires to short circuit German power lines, and the Japanese, who sent high altitude balloons driven by the jet stream all the way across the Pacific to drop incendiaries onto North American forests.

With somewhat more proactive control systems than the use of the wind, Nazi Germany also employed radio-controlled guided bombs. These were called the “Fritz X” by the Allies, and British sailors were shocked to see high-altitude aircraft dropping bombs miles away, but then seeing the bombs track towards them in a manner quite unexpected. Later the Henschel HS-293 remotely controlled glide bomb, with a range of about 9 miles, was used to attack Allied shipping.

On a larger scale, the United States Army Air Forces (USAAF) and the United States Navy (USN) formed “Operation Aphrodite”. This was intended to remotely pilot B17 and PB4Y bombers as precision guided munitions against hardened enemy facilities, such as U-boat pens and V weapon launch sites. Typically, the aircraft were stripped of all unnecessary systems and loaded with a huge amount of explosives. They had a
human pilot and flight engineer who “bailed out” after take-off, with the plane fitted with TV cameras and a radio control system, so it could be steered by an accompanying aircraft.25

Since the end of WW2, at least until recently, the technology required for Unmanned Aerial Systems has generally been exclusive to national governments, with the budget and access to control technology that was required to effectively control these weapons. But, particularly in the last four years, technology has become both available and cheap enough for the general public, including Non-State Actors (NSAs), to purchase and operate their own remote controlled airborne devices. There have been numerous attempts by NSAs to use model aircraft for attacks or reconnaissance. While the blurring of lines between nationally developed UAVs and consumer drones, has been seen in Hezbollah’s use of Iranian supplied drones to overfly Israel in the last decade.

This technological development has been matched in parallel by manufacturing companies taking UAVs to markets as “consumer” items. It is no exaggeration to say that millions of drones will be sold in 2017.27 We face a double impact of game changing technology available to anyone in the world at a relatively cheap price. Defence and Security organisations have largely been caught napping by this change.

In terms of impact, so far the harmful impact of this development has been largely felt on the battlefields of Iraq and Syria. As a US military commander in Iraq described in 2016, the step change in the threat has impacted operations:

About five or six months ago, there was a day when the Iraqi effort nearly came to a screeching halt, where literally over 24 hours there were 70 drones in the air, Thomas recounted. At one point there were 12 ‘killer bees,’ if you will, right overhead and underneath our air superiority.

Another indication of the significant change seen in the last few years is the release of videos by terrorist groups showing consumer drone use – occurring as early as May 2014. IntelCenter27 recorded 9 instances of videos showing terrorist use of consumer drones that year, in total. In 2015, 37 such videos were released. As of 21 November 2016, 137 such videos were released that year.

The first video of a consumer drone being used to drop an explosive device occurred in September 2016 and dozens have been released since then. At least 15 different terrorist groups have released videos showing them using consumer drones.

Of greater concern, of course, is the fact that there is nothing intrinsically keeping drones used for nefarious intent only on the battlefield. The IED-carrying drone is now the poor man’s guided weapon, available at a cost of less than $1,000 dollars, with the added benefit of easy availability, re-usability, and with built in propaganda effect.

Why drones?
First, drones allow a terrorist to avoid and circumvent traditional security measures, or even battlefield defences, simply by flying over them.

Second, the operator can remain behind cover, out of sight of targets and enemy, to conduct the attack from a position of safety: they do not even require “line of sight” to a target, thereby lessening the risk in conducting the attack.

Third, recent advancements have enabled operators to drop IEDs from a drone with great accuracy; such attacks are therefore efficient and the accuracy outweighs the relatively small size of the IED.

Fourth, modern consumer drones are relatively quiet and very hard to spot in certain battlefield conditions, enabling the attacker to achieve tactical surprise.

Fifth, the drone operator is able to film the attack from on-board cameras, generating a propaganda of the deed to suit modern social media.
Sixth, the images transmitted to the operator can also prime other attacks, and provide surveillance of the targets.

And, finally, the drones are relatively cheap, and often reusable; compared to the price of, say, an expensive anti-tank missile, a drone that can drop cheap improvised munitions such as grenades at the price of a few hundred dollars.

So powerful are the advantages of this form of weapon that conventional military commanders have claimed that that terrorist use of drones is their most challenging problem on the battlefield. And, of course, drones are not constrained to battlefields: the potential for terrorists to deploy IED carrying drones in areas other than war zones is very real indeed.

**Technological developments**

Several recent developments in technology have enabled modern drones and the opportunities they provide for terrorists. Control technology, for instance, has advanced considerably. Two decades ago, the British Army examined the utility of “remote control helicopters” as reconnaissance vehicles in support of hazardous bomb disposal operations, but the project faltered, owing to the challenges of training pilots: one required the same skills then to fly a remote-controlled helicopter as to fly a full-blown helicopter. Modern technology today, though, has automated much of the “skill” needed to use such a system.

First Person View (FPV) technology adds to the potential ability of a controller to seek out and deploy a payload to a target, avoiding obstacles in real time. Communications infrastructure available to the public (such as 4G) can be used and exploited by drone users to control drones and such communication networks may even have advantages over the use of more-common industrial, scientific, and medical radio (ISM) band control frequencies.

Multi-rotor technology has also advanced, with quad or octo systems providing steady, easily controlled flight. Collision avoidance technology is also now feeding through to commercially available drones, as are navigation systems such as Global Positioning System (GPS) controlled waypoints and “return to launch” capabilities. “Default to hover” technology, which automatically makes the drone hover if hands are taken from the controls, was unheard of just a few years ago.

Battery technology can now provide significant flight duration, increasing both range and possible payload weights.

Modern drone systems also use a range of radio frequency (RF) technology that is now cheap and freely available, along with commonly available systems such as smart phones and tablets as control systems. Internet communication has enabled the easy transfer of third party “add-on” technology to a range of commercial drones. Easily available instructions such as add on aerosol release mechanisms or IED release switches can be downloaded by anybody, anywhere in the world.

Some specialised drones have payload release mechanisms that can be also be weaponised. Switches on drones used for cinematography or crop dusting (spraying) provide just two examples.

The speed of commercially available drones is increasing, making them faster and more difficult to interdict. In addition, swarm control systems are now coming to market allowing users to control multiple drones safely and easily at the same time.

The size of effective drones has decreased making them more difficult to detect by systems such as radar.

The cost of these systems have dropped and are globally available. The cost is now so low that the market for drones is now huge and millions are expected to be sold in coming years.

Furthermore, the legal system in most countries is struggling to “catch up” with technology to impose appropriate controls. Issues such as drones entering commercial flight paths are among the numerous challenges that drones are presenting to governments worldwide.
Implications to the terrorist
The implications of all of the above to the terrorist are significant. Drones can be purchased easily, anywhere, by anyone for a few hundred dollars and it will be very difficult to prevent terrorist access to this technology. Innocuous drones can easily be adapted for terrorist purposes with little engineering skills required.

Drones can be used to insert a hazard at great speed. Given that one of the key aspects of counter-terrorist security measures is the principle of establishing a secure perimeter, within which a search has removed any hazards, drones can circumvent that basic security measure. The accuracy of the drone in terms of piloting means that targets not previously considered vulnerable even to significant terrorist weaponry are now vulnerable. A drone can approach a critical component or a key person, at high speed, and can even enter a building in some circumstances. The piloting skills required are minimal, and the range of the system can place the pilot easily outside secured areas.

Payloads are still relatively small, but given the ability to place a hazard at very close proximity to a target, this is perhaps less of an issue. Swarms can overwhelm a number of counter measures. A drone also offers a terrorist a cheap and effective reconnaissance and propaganda tool.

Examples of terrorist use or similar indicative use of drones
In many ways the issue posed by drones is already extant. Non-State Actors are widely using drones today, in Syria and Iraq, for reconnaissance and propaganda, and for dropping IEDs accurately on to targets. Such operations are allowing terrorists, of all varieties, to rapidly develop tactics and technology to optimise attacks. The genie is out of the bottle. Indeed, the then British Prime Minister David Cameron warned that terrorists have already tried to obtain crop spraying drones for the purpose of spreading radiological material.29

The success of the terror drone is also very evident. Social media has transmitted hundreds of images of drones dropping small grenade-like IEDs as targets in Syria and Iraq. Indeed, even Iraqi security forces, facing Daesh, have adopted this technology for their own ends.
Likely threat evolutions

The threat from drone-delivered IEDs will continue to evolve, and the operating environment in Syria and Iraq will allow users to learn rapidly new lessons and to test new methods of attack. There are, in this way, a number of methods by which this threat will likely continue to provide new challenges.

First, IED payloads are likely to increase in size, as a result of larger drones or more powerful motors. This will make the drones yet more attractive to the user for delivering larger payloads.

Second, the relatively crude methods currently used to counter drones will push developers to harden their vulnerability. Currently many drones are vulnerable to electronic counter-measures (“jamming”) and it is likely that a traditional technology versus technology battle will drive the threat in new directions.

Third, swarms of drones are expected to be increasingly used, overwhelming traditional counter-measures. It is also very likely that the IED carrying drones will appear in areas outside of the current theatres of war in Iraq and Syria. Daesh, for example, have shown a propensity to take its attacks to Europe and attack high profile population dense targets in order to gain the press attention they seek so dearly. The additional value to the propaganda of the deed, by ensuring the drone films their attacks is also significant to the terrorist. It is also possible that the capabilities of a drone-delivered IED will enable terrorists to attack targets which hitherto have been beyond their current capabilities.

Implications to security measures

Security measures are impacted by the evolving capabilities of drones in a number of ways. There is a need to think somewhat differently about security. While many targets – both military and humanitarian – were once vulnerable to terrorist mortars or rockets, the potential accuracy of a drone-delivered hazard to any location demands a rethink. Drones can enter buildings through open doors or windows, manoeuvre, and can be placed within inches of a vulnerable target, controlled from great range.

Drones can be relatively stealthy. The drone that landed two years ago on the Japanese Prime minister’s roof carrying a payload of alleged radio-active...
material was discovered only by chance some days later. Other drones have “crashed” on prison roofs delivering contraband and not been discovered for some time.

As well as providing complex threats, drones also provide a simple hazard if control is lost and they fall on those people underneath them – security measures need to bear that in mind – causing a drone (even without a payload) to crash can kill people. And the wide availability of drones will mean even the foolish may have the opportunity to fly what has been described as “an airborne lawn mower” over crowds of people at concerts and other major events. As such, mitigation systems that offer the ability to take control and land drones are preferable over those that simply cause drones to fall from the sky.

Secure perimeters surrounding a cleared area, may not remain so. A drone can deploy a hazard to the area after it is secured.

Technology continues to advance rapidly – the threat posed by drones is and will remain highly dynamic in nature. The ingenuity of third party drone adaptations will reinforce that.

The legality of establishing certain drone counter-measures has yet to be tested. Drones pose other security threats beyond terrorism; protection from cyber threats – such as a drone flying a wi-fi access point into a secure area, or filming sensitive activities or filming sports events for which TV rights belong elsewhere – all pose challenges.

The presence of a drone will not always equate to a threat. Drone use for legitimate purposes is likely to mushroom in coming years; such that there may well be many legitimate drones in the air near a secured facility. Separating threat drones from legitimate drones will be a challenge.

Drone threat response plans need to be flexible and integrated both with other security measures and with any counter-drone solution. Some current or developing counter-drone solutions are not holistic and only answer part of the question.

Security measures will need to be compliant with local regulations and legal structures. Some measures will need appropriate authorisation which will need to be balanced with the potential of a drone threat being detected say at 250m, and then being immediately adjacent to a vulnerable target just seconds later, 24/7. Drones pose challenges to the speed of security responses and immediate decision making; a reality that might run counter to some concerns about fully automated responsive weapon systems. There may be little time for formal, slow time authorisations and so pre-authorisation of certain security measures – and the implications of such – may be an issue for the near future.

The drone threat can be highly dynamic. If a drone – or a swarm of drones – lands in a facility adjacent to vulnerable component “X”, a security plan might be implemented, an evacuated cordon put in place and a command post established. Then the drone, within seconds, relocates to vulnerable point “Y”, or even to an evacuation point elsewhere in the facility. Theoretically, a drone can chase crowds evacuating from a building, thereby causing significant panic. Most hazards detected in a secure facility will remain stationary and most security plans assume that. However, a drone might not; this would demand, accordingly, far more agile security plans. A key requirement of counter-drone systems, then, could be to maintain the mitigation effect until such time as the threat is otherwise immobilised.

Any terror-threat drone captured or shot down will hold significant forensic intelligence value and security plans should recognise that.

It may be difficult to establish the nature of any hazard from payloads. In essence, they should be treated like a Radio Controlled IED until such time as the proper authorities have mounted their response.

Swarms of drones also need to be considered. Technology to control swarms of drones is already available and counter-drone systems need to be capable of responding to a number of drones at the same time.
In some circumstances, a counter-drone system can provide an effective deterrent measure. In this sense, the drone threat and counter-measure situation is unusual. There is no counter-measure that can prevent a shooting completely or a rocket or mortar attack. But the more effective counter-drone systems can mitigate certain drone attacks completely.

**Drone counter-measures**

Just as the market for drones is increasing, so too is the market for drone counter measures. It is not the purpose of this article to recommend one or other of the available or soon-to-be-available counter measures. But the following may be considerations:

1. There will be one or more elements to a counter-drone system, that might include:
   a. Detection
   b. Alarm
   c. Identification
   d. Categorising as a threat
   e. Tracking
   f. Mitigating/Active measures

For counter-drone systems that do not offer all of the above, then consideration needs to be addressed to the others in a coherent plan.

2. Depending on the nature of the secured area or potential target for threat drones, there may or may not be a need for a 24/7 capability, and by implication, operations in the dark.
3. Some systems may be automated, some will require man-in-the-loop.
4. Some measures may require appropriate authorisation. “Jammers” may not be legal in certain jurisdictions.
5. “Jammers” which cause a drone to land or crash wherever it is at that moment in time may complicate matters further and could pose a threat to civilians. In those circumstances, more advanced systems that take control of the threat drone and enable it to be landed in a pre-designated safe zone may have attractions.
6. Some counter-measures can deal with “swarms” of threat drones others cannot.
7. Some require line of sight, others do not.
8. Some cannot operate at night, others cannot.
9. Some require minutes or more to deploy an active counter measure, others can do it at speed. Rapid response to the drone threat brings with it its own legal complexities.
A car bomb, more specifically referred to as a Vehicle Born Improvised Explosive Device (VBIED), is any vehicle that has been altered so as to solely function as a large rolling IED. These are vehicles driven to and detonated near a given target. The VBIED can either be parked and then remotely detonated, or it can be driven by a suicide bomber who ultimately controls the detonation mechanism. The latter is defined as a Suicide Vehicle Born Improvised Explosive Device (SVBIED), or more commonly: a suicide car bomb.

Using SVBIEDs can enable a numerically and technologically inferior force to accurately strike its enemy using large explosive payloads. As such, it has become one of the most popular methods of attack for a variety of terrorist and insurgent groups, mainly due to its powerful role as a force multiplier. While many groups employ (S)VBIEDs, the Islamic State (IS) are perhaps the most infamous for its widespread use of the tactic; they claim to have conducted 815 (S)VBIED attacks in Syria and Iraq in 2016 alone.\footnote{Over six years (2011-2016) Action on Armed Violence (AOAV) has recorded over 21,000 deaths and injuries from suicide car bombs. Of which, 73\% were civilians. There has been a considerable rise in casualties from such attacks over the last six years. Last year, civilian deaths from suicide car bombs rose by 97\% compared to the previous year, or 148\% compared to 2011 — the first year of AOAV’s recording. Of the civilian casualties recorded globally, 40\% occurred in Iraq, whilst a further 21\% occurred in Syria.}

Generally speaking, all (S)VBIEDs can be divided into two broad categories: the covert and the up-armored.

The covert (S)VBIED is an unmodified civilian vehicle fitted with a hidden explosive payload. This type is overwhelmingly used in insurgencies where the actor has a low level of territorial control. Its stealthy nature allows the (S)VBIED driver to blend in with civilian traffic and to get as close as possible to the intended target before detonating. This type allows for both VBIEDs and SVBIEDs to be used, as whoever is using them operates covertly.

On the other hand, an up-armored SVBIED is based on military and civilian vehicles, which are overhauled with metal plates welded to the front and sides of the vehicle. This type is mostly limited for use in conflicts where the actor using (S)VBIEDs has gained control of a sizeable piece of territory, thereby creating fixed front lines. In this situation, the use of covert (S)VBIEDs does not make sense anymore, as they most likely would be disabled before reaching the target.

During the Iraq War’s bloody insurgency, the predecessors of IS favoured the method of covert (S)VBIEDs. While both subtypes were used extensively, they each served a different purpose. The parked VBIED functions as a larger static IED, while the covert SVBIED is more suited for offensive operations. At the same time, they also used up-armored SVBIEDs against well-defended targets, in areas where they had an increased presence and fighting was especially tough.\footnote{Up-armed 4×4 SVBIED, used by IS in the Aleppo area and featured in a video released on February 19th, 2016.}
As IS swept across Syria and Iraq in 2013-14, though, their resources and territorial holdings grew rapidly, provoking a shift in their (S)VBIED use. They switched to almost entirely using up-armored SVBIEDs in areas that they swept through, a change necessitated by the shift away from guerrilla tactics to more semi-conventional combat in these areas. While IS and their predecessors have always had an affinity for (S)VBIED use, it wasn’t until after 2013-14 that the up-armored SVBIED was really institutionalised as one of the mainstays of their offensive and defensive military capabilities.

While up-armored SVBIEDs gradually became the norm, covert SVBIEDs and parked VBIEDs were, and are, still used in areas where IS don’t hold territory, and where clashes are more in line with an insurgency. For example, IS conducted 28 parked VBIED attacks and 3 covert SVBIED attacks in Baghdad during a 100 day period between October 3rd 2016 – January 10th, 2017. This shows that the usage of up-armored SVBIEDs may be related to the amount of territorial control and the intensity of fighting in a given area. Parked VBIEDs and covert SVBIEDs are used in areas where IS do not control territory, while up-armored SVBIEDs are exclusively used on active frontlines.

This is true not only for the conflicts in Syria and Iraq, but can also be applied to other conflicts where a non-state actor using (S)VBIEDs gains territorial control.32 In Syria, for instance, Jabhat al-Nusra (now Hayyat Tahrir al-Sham) underwent the same process with regard to (S)VBIED use, shifting from using covert (S)VBIEDs en masse at the beginning of the war, to mainly employing up-armored SVBIEDs in and around their strongholds once the fighting had entered a semi-conventional stage of combat.

IS’s massive investment into the construction of (S)VBIEDs is, however, unique because it is so unparalleled. IS – at least up until recently – ran a network of (S)VBIED manufacturing workshops divided on a provincial level and tasked with supplying each province (Wilayah) across the territories it controlled. While each province was responsible for manufacturing its own (S)VBIEDs, there were some provinces that have been able to supplement (S)VBIED operations in surrounding provinces.33 Resources play a big part when it comes to (S)VBIED manufacturing, and the cities of Raqqah and Mosul are good examples of its importance.

There are very clear geographical differences when it comes to identifying certain IS (S)VBIED types. As resources are more plentiful in cities, the hardware that came with capturing Raqqah and Mosul allowed IS to increase the (S)VBIED manufacturing quantity and quality there, compared to other provinces.

In order to facilitate and speed up SVBIED construction, IS have also standardised many of the components that are used in the construction process. They often use the same or similar vehicle models that are fitted with identical armour kits, and a lot of time the IEDs that make up the main payload are standardised as well. Recent evidence has surfaced indicating that IS are experimenting with Explosively Formed Penetrators (EFPs) and aimed-charges in the main payloads. This shows that they have a good understanding of how explosive forces work and that they are actively seeking to increase the effectiveness of the (S)VBIEDs they manufacture.

A series of daisy-chained IEDs function as the main payload for most (S)VBIEDs used by IS. Footage from an IS-run SVBIED workshop in the Mosul area, released on May 17th, 2017.

The immense pressure felt by the ongoing ground and aerial campaign against them has also forced them to experiment and innovate in many other aspects. One such innovation came about after the beginning of the Mosul offensive last year.

Once Iraqi forces reached the city proper, IS exclusively began using up-armored SVBIEDs that had the armour
painted in the same colour as the rest of the vehicle (stage 1 camouflaged SVBIEDs). They utilised a wide range of colours, sometimes even bright hues that seem counter-intuitive from a camouflage viewpoint. This was a likely attempt to fool Iraqi forces and coalition aircrafts into thinking the vehicles were not SVBIEDs, thereby potentially giving the SVBIED drivers more time to reach their targets. This evolution was likely to be a result of fighting progressing from the wide-stretched Ninawa plains to the often-narrow streets of Mosul city; with seconds often making the difference between life and death in an urban environment.

Once fighting reached the western bank, IS began painting fake windshields, side windows, grilles, and tires on the already masked armour (stage 2). Emulating the defining exterior features of a regular car gave the camouflaged SVBIED an even more authentic civilian silhouette from a distance.

A further innovation within this SVBIED type came as the battle of Raqqah was drawing closer in early April. There, IS began using camouflaged SVBIEDs with interior armour (stage 3). While these constructions are visually identical to covert (S)VBIEDs, they can also withstand a hit if fired upon. It’s a mixture of stealth and protection: the best features of both covert and up-armored (S)VBIEDs.

The explosion happened in the morning around 8.30am inside Jamilla market. It was a big lorry full of tomatoes and the driver was shouting in the middle of the market that he had very cheap [produce]. So people came close to him and then he blew himself up.

Ali, a witness to the suicide attack in Jamilla, Baghdad in August 2015.
Another innovation that IS has pioneered is the two-man SVBIED. These are up-armored or camouflaged SVBIEDs that have both a driver and a light or heavy machine gunner tasked with suppressing the target. The idea is to increase the chances of the SVBIED being able to reach the intended point of detonation, and it is typically used on targets considered to be especially difficult.

A further innovation within suppression-based SVBIEDs came in late April, when the IS contingent in Mosul city introduced camouflaged SVBIEDs with rocket pods welded to the roofs of the vehicles. These gave the driver the ability to launch five 73mm recoilless rifle rounds toward their enemy before detonating the main payload, essentially providing the same suppression effect as two-man SVBIEDs, while only needing a single operator.

IS has also made great use of heavy construction equipment in conjunction with, or as, SVBIEDs, especially front-end loaders. These vehicles are able to remove concrete blast barriers, berms, roadblocks, as well as other obstacles blocking the road – clearing the path for SVBIEDs to strike areas that were previously too well-defended.

(S)VBIEDs are very adaptable weapons, and can be modified to function in a variety of different settings. There is essentially a different (S)VBIED design for every potential target type and battlefield condition. This makes them all the more difficult to counter, as the groups using (S)VBIEDs more often than not will adapt to the counter-(S)VBIED tactics.

IS are an exceptional case though. They are the only group to have constructed (S)VBIEDs on an industrial scale, and they have used more (S)VBIEDs than any other group in the history of (S)VBIED usage. All the different design variations and (S)VBIED types they pioneered are not necessarily tactics that other groups using (S)VBIEDs are going to employ, but the scale and width of their (S)VBIED program is an important illustration of what is possible when a group dedicates enough resources to the development and refinement of (S)VBIEDs.
End notes

1. This is according to English-language media sources. AOAV’s data is not an attempt to capture every casualty of every incident around the world. No claims are made that this sample of data, taken from English-language media reporting, can represent the total impact of IEDs on civilians. For more on AOAV’s methodology please see: https://aoav.org.uk/explosiveviolence/methodology/

2. Casualties were recorded as ‘armed actors’ only if they were reported as being part of the state military, members of non-state armed groups, or security personnel who AOAV considered likely to be armed. This includes police, security guards, intelligence officers, and paramilitary forces. All casualties not reported as belonging to these armed groups were recorded as civilians.

3. Refers to the use of explosive weapons that caused at least one casualty and took place in a 24-hour period.

4. In alphabetical order these were; Armenia, Belgium, Democratic Republic of the Congo, Georgia, Germany, Guatemala, Hungary, Japan, Jordan, Kyrgyzstan, Laos, Malta, Mexico, Nepal, Paraguay, Taiwan, Venezuela.

5. Refers to areas likely to contain concentrations of civilians. The definition of a populated area used by AOAV is based on Protocol III of the 1980 Convention on Certain Conventional Weapons (CCW) which defines concentrations of civilians as: “any concentrations of civilians, be it permanent or temporary, such as in inhabited parts of cities, or inhabited towns or villages, or as in camps or columns of refugees or evacuees, or group of nomads.” The full definition is available at: “Protocol on Prohibitions or Restrictions on the Use of Incendiary Weapons (Protocol III),” ICRC, Geneva, 10 October 1980, posted by U.S. Department of State, www.state.gov/documents/organization/190579.pdf (accessed 06 Oct. 2017). AOAV’s guidelines for recording an area as populated are included in the Methodology.


9. Car bomb’ is taken as shorthand for vehicle-borne IEDs or VBIEDs, including explosives concealed in or built into vehicles of all kinds. Thus some car bombs may in fact be bike bombs or truck bombs. Incidents where the IED was clearly described as a ‘car bomb,’ or other vehicles like trucks were used. IEDs which were reported as being attached to vehicles, such as a sticky bomb attached to a politician’s car or a remote control IED attached to a bicycle, were recorded as ‘Non-specific IEDs.’

10. IEDs which were either specifically reported as ‘roadside bombs’ or where an IED was reported to be used alongside a road and no further information was provided.

11. The broadest recording category in this grouping. It refers to all IEDs which could not be categorised as either ‘roadside bombs’ or ‘car bombs.’

12. For the majority of IED incidents no detonation mechanism was reported. Often the detonation mechanism is not clear after a bomb has exploded, and even if there is a local capacity to investigate a lack of follow-up or security concerns means this information never makes it to publication.

13. In 2011 AOAV recorded 6,476 deaths and injuries as a result of suicide bombings - 5,107 were civilians.

14. 18 percent of IED attacks with a reported mode of detonation in 2016 were triggered by victim-activation.


Bombers in Iraq: The Strategy and Ideology in Martyrdom
22 The Japanese formally adopted militarised suicide after suffering a series of crippling strategic defeats; much like IS from 2016 onwards.