Steve Kennon looks at the challenge and techniques of chemical and biological IED disposal

CONTAMINATED DEVICES

EOD is a tricky beast at the best of times. Whether in a homeland security or war-fighting role, the increasing technological sophistication of devices and knowledge sharing between terrorist groups mean the EOD operator's challenge has never been greater. It is a constant battle between those who would deploy the bombs and those who would prevent them. Although the current situation in Afghanistan has firmly focused minds on the threat from conventional explosive IEDs, there is increasing concern over the risk posed by chemical and biological (CB) devices.

Although still a rarity, the evolution from high explosive to a CB device is one which extremists are either exploring or have already developed and deployed. In reality, these weapons do not present the risk feared by many doomsayers but public perception, fuelled by the media and cult TV shows, is that they have a menace eclipsed only by the nuclear threat. Any terrorist incident must have far-reaching psychological effects on its target audience. The possibility, and consequent fear, of violence must be equal, if not greater, than the act itself. In a world where terrorist acts utilising high explosives are an almost-everyday occurrence, CB devices offer an effective method of spreading fear and grabbing media headlines out of all proportion to the casualties they cause. The media response to the Tokyo underground and US anthrax attacks are witness to this fact, considering the actual numbers of casualties was relatively small.

Differing groups may have specific aims which make CB weapons attractive, but in general the main factors are: CB weapons, used effectively, are capable of causing larger number of casualties than explosives – the challenge is using them effectively; they offer a more accessible and cost-effective WMD than nuclear options; as mentioned above, their psychological effects are far greater than conventional IEDs; and they imbue terrorist groups with a status which may assist a them in negotiations regarding their political/religious goals.

In essence, CB weapons offer a cost-effective way of producing high levels of fear and casualties – what terrorist wouldn't want them! The problem, thankfully, is that the CB option is not an easy one. Few groups have the organisation and ability to acquire the materials, never mind deploy them in a weaponised form. Al-Qaeda has been studying them for many years but has yet to carry out a successful significant attack. Even where groups have succeeded the effects have been limited – with the Aum Shinrikyon attack in 1995, the sarin was not deployed as an aerosol due to technical issues, despite the group having the time and resources for research and testing.

Despite the irregularity and crudeness of previous attempts, most experts would agree that it is not a matter of "if" but "when" an attack happens. Judging by the number of CBRN conferences and seminars, it is clear there is great interest in the subject. But is the focus of these events correct? Based on most event programmes, the spotlight seems to be firmly on identification, protection, decontamination and mass casualty handling after an agent has been released. One could be forgiven for thinking nothing can be done prior to the "bang". From a CBEOD perspective, however, an explosion is simply the end result of a long process with many stages, all of which offer opportunities for intervention. Figure 1 illustrates stages before and after a CBIED has initiated or been found. At every step, EOD or other security services should have the capability to neutralise the threat.

In reality this means specialist equipment and training. The desired end result for EOD technicians is the same as for any IED: the safe disposal of the device; minimising loss of life; minimising damage to property; and the collection of forensic evidence. Unlike a "standard" IED, however, the character of a CB incident has some distinguishing features which pose additional challenges: it must be identified as a CB threat; normal disposal methods may not be appropriate due to the risk of rupturing the container; there may be delays in response due to longer evacuation times as cordon distances are increased and containment and decontaminations systems are established; the team will have to work in protective clothing (assuming they have it in the van) as well as bomb suits, which encumber the operator and leads to increased exhaustion rate; there will be heightened levels of attention from the media and senior officials; and there will be heightened anxiety levels within the team and other emergency services.

That is, of course, if the team consider a CB threat in the first place. The fate of two EOD operators and a Welsh beach, last September, offer a note of caution in this regard, when a mustard shell was blown in place, covering the operators and the nearby flora and fauna with agent. Thankfully both operators and beach were fine after treatment. The situation, however, illustrates the need for a correct threat assessment and demonstrates the consequences ▶

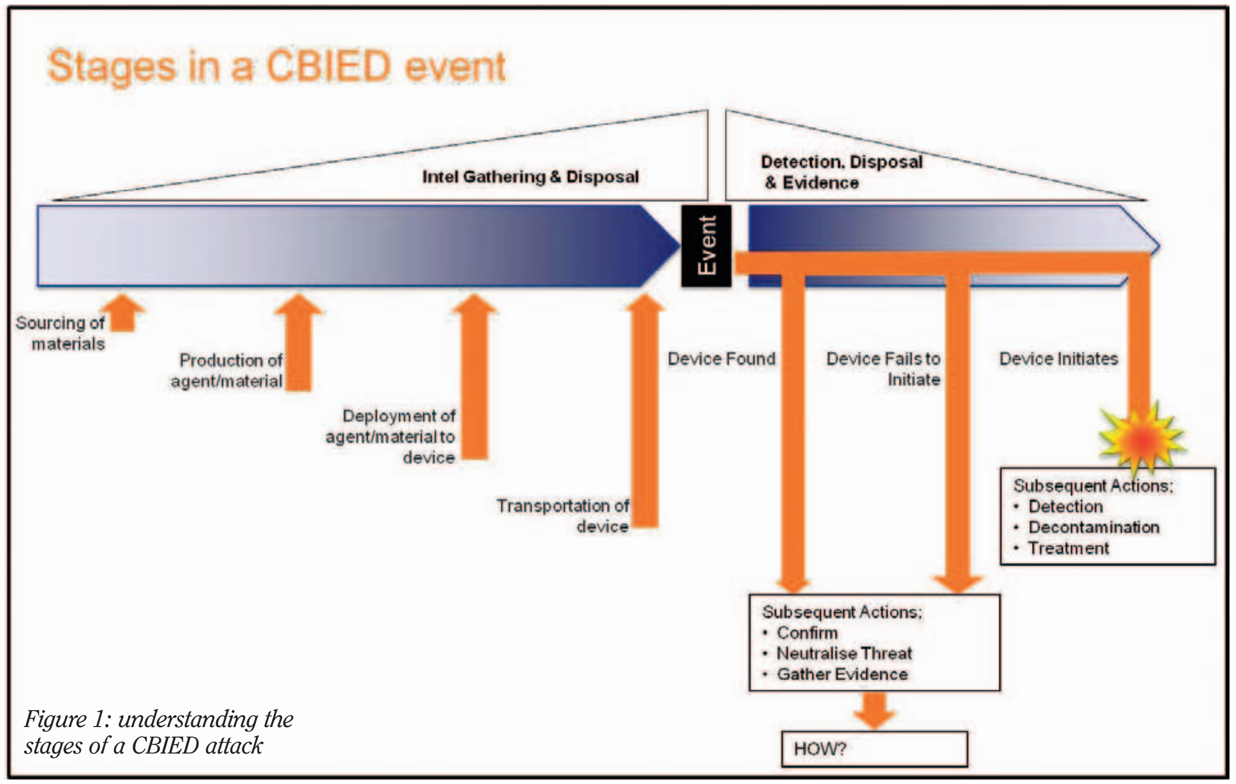

Figure 1: understanding the stages of a CBIED attack

when inappropriate methodology is used.

Assuming a CBIED is suspected, what then? The two issues facing the team are: what is it and how do we get rid of it? Identification at an early stage is fundamental, as it will dictate the level of threat and therefore the response. A quick and dirty X-ray offers a fast, reliable way of establishing the internal structure of the device and gives clues as to the presence of a CB hazard. A liquid or powder fill, assuming it is not an innocent mistake or hoax, points towards a chemical or biological agent (or liquid explosive). The question then is which agent it is. Accurate identification is vital, as it will dictate cordon distance, evacuation, decontamination and containment processes.

The ease with which the fill is identified will depend on whether a sample is available externally or not. An external "puddle" found on the device may or may not be related to the internal contents or a cunning hoax, but at least offers a starting point to help identify the threat. In all likelihood, however, there will be no puddle of goo present, as the agent will be enclosed in some form of sealed container (unless the bomber does not intend reaching the target). This may be anything from a plastic bottle to a metallic container, as long as it keeps the agent in. Unfortunately, as well as keeping the agent in, it also keeps detectors out and makes identification more difficult.

In this situation there are two options: non-invasive or invasive detection. The former includes some of the more common methods. These include: infra red (IR) spectroscopy, which can provide valuable information from IR transparent containers (glass and plastic) but is foiled by anything even slightly opaque; X-Ray, which is excellent at displaying the internal structure of a device but cannot provide any information on the nature of it; and neutron activation analysis, found in devices such as the Portable Isotropic Neutron Spectroscopy (PINS) system, is a common system in use with many specialist EOD teams. While it can identify the elemental composition of the fill, it cannot identify its molecular structure and therefore can give false positives.

These techniques have the advantage of keeping the agent safely within the device and, dependent on the scenario,

Investigating a suspected CB device

may be sufficient for identification. They can suffer from being complex and heavy, and might require shielding due to radiation emissions. In many cases they also require access to the complete circumference of the target.

Invasive techniques can prove thuggish – by simply making a hole in the device, accepting leakage and hoping the containment system and protective clothing is up to the task. Alternatively, the more elegant solution is to utilise specialist equipment which can drill into the target, regardless of material, without allowing the contents to escape. An operator or ROV can then extract a physical sample for analysis. These systems tend to be more portable, faster, need only limited access and are, of course, 100 per cent accurate. Still relatively new, they have been used successfully on a wide range of targets.

Once the threat is identified, by whatever means, the next phase involves disposal of the device. Moving it to a safe place for this process has advantages, but this is rarely an option due to the risk of initiation. Dealing with the device in-situ will be the norm, and there are a number of options in this regard, some more attractive than others.

One traditional IEDD method is "blow in place" (BIP), or disrupt. This is a fast method, but runs a considerable risk of puncturing the container and doing the terrorist's work for them. It may be acceptable in a remote location, but is less acceptable in heavily populated areas or near sensitive targets.

Alternatively, containment covers can be used. There are many systems designed to cope with a blast or puncture by containing the effects of the explosion and contamination. Quick to place, they offer stop-gap protection until disposal actions can be taken. They very often will be filled with foam which can make working within them difficult, however. Where the device does detonate, a contaminated blanket and foam are left and must be dealt with.

Invasive techniques can allow the operator access to the internal structure of the device without allowing the release of the contents. The agent can then be drained and the device decontaminated. This isolates the explosive charge which can be dealt with as for a normal IED. The agent can then be transported to a safe location for disposal. Where this technique has been used for the identification phase there is no need to re-drill, as the same penetration can be used for disposal.

In recent years, forensics and evidence gathering have become less of an afterthought and more of an important part of the EOD role. This is especially true in domestic situations where criminal prosecutions are required. Equally, the war-fighter is finding it a useful way of tracking and stopping insurgent bomb makers. Where this is the case, the maxim "less is more" applies. The more intact a device is after it is made safe, the greater the chances of maximising evidence recovery.

As with any EOD situation, there is a balance between risk and benefit based on knowledge and a thorough assessment. In any incident there is always a danger that an action may initiate the device, but doing nothing is not a luxury EOD teams have. The challenges and pressures surrounding a CB event are so much greater due to the nature of the threat and its longer-term consequences. As such, EOD teams must be equipped and trained appropriately prior to a call out. An IEDD team in a "Noddy" suit, with a chemical agent monitor (CAM) and a "give it a go attitude" is not good enough. i

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