# THE EVOLUTION OF COUNTER IED

**Cindy Barfoot** *explores the history of bomb disposal and the long journey to the advanced techniques and technology currently used to make explosives safe*

**Counter IED (Improvised Explosive Devices) methods and technologies were first developed on an industrial scale to support bomb disposal operations during the Northern Ireland Troubles back in the seventies.**

Much knowledge was subsequently acquired by UK forces during the course of this 30-plus years operation, contributing significantly to both the development of Remotely Operated Vehicles (ROV) and other technologies used to effectively detect and defeat IED threats. This included the development of the Pigstick and Hotrod disruptors, close-up tools designed to disrupt a wide range of IED threats. These novel products gave the operator the ability to disable explosive devices at a safe distance by firing a high-velocity jet of water into the suspect device, in order to pull apart the components. By taking the power source away from the timing unit and separating from the explosive, the device could be effectively rendered safe.

During this period, Counter IED operator deaths were becoming all too common, as they were made a prime target through the placement of booby-trapped or secondary explosive devices, and the prevalence of car bombs. The water shot disruptor's less appealing side is that operators had to get close to the device (several centimetres) to deploy it. So, further capability was required to alleviate the problem, putting distance between the operator and the suspect device.

## PROTECTION FROM RISK

The immediate Urgent Operational Requirement (UOR) was, therefore, to protect military personnel and others at risk from improvised explosive threats. Both MOD engineers and soldiers worked together, learning on the job to observe and develop countermeasures. This included a short window of time to develop the predecessor of the modern-day ROV, using parts from an electric wheelbarrow.

While this was a very simple solution, it met the immediate needs. Originally the idea was to drag the vehicle-borne improvised explosive device (VBIED) into a safer position for detonation, and this was quickly replaced by mounting the Pigstick and Hotrod onto the ROV. This allowed the operator to carry out render-safe procedures in situ, without having to make a manual approach. The growing use of ROVs, over the course of the campaign, secured them as the mainstay of UK and overseas EOD operations thereafter.

Other significant innovations during the Northern Ireland Troubles included the continued development of protective bomb suits for operators and portable X-Ray systems, alongside new legislation making it more difficult to create homemade bombs through the restriction of the quantity of ammonium nitrate (fertiliser) that could be purchased.

A later significant development in the EOD operator's tool kit were recoilless disruptors. With the disruptor now staying in the position it was deployed, the task of retrieving the fired disruptor, in an environmentally complex situation, was therefore simplified. This was in addition to minimising the forces on the ROV, where the disruptor was mounted, and reducing damage that a flying disruptor might cause in a complex urban environment.

Counter IED understanding and technology developments have continued in other global conflicts, such as the Iraq war, where threat-specific

## DEALING WITH IEDS WITH CHEMICAL, RADIOLOGICAL OR NUCLEAR AGENTS IS A GROWING THREAT

disruptor projectiles were developed to keep operators safe as part of a 'remote user' UOR. Initially, a typical stand-off disruption range might have been as little as 5cm, so projectiles were developed to enable a safe distance disruption at 20-30m away from the threat device. Such increased range options have given operators greater flexibility in how they tackle each unique situation. This means that patterns of operation are less predictable to the adversary, thereby reducing the vulnerability of troops in the process.

The combination of the ROV and the IED disruptor has been key in supporting operations across the world, and proved to be vital equipment to the bomb disposal expert. While the ROVs used in Northern Ireland and Iraq were highly capable machines, they were large and required a vehicle-based team to transport them.

Subsequent ROV developments have seen them become smaller and more nimble, to support operations where the terrain is varied, and particularly where it is non-urban. ROVs are also becoming smaller and more robust to meet the growing demand for a reduced payload to minimise the soldier burden.

As ROVs became increasingly capable and sophisticated, so their use has became more widespread and adopted in IED philosophy. This is due to the advances at both ends of the capability scale. At one end, the development of ever more capable ROVs, which support multifunction platforms and payloads; and at the other end the miniaturisation of ROV platforms and payloads (such as cameras and disruptors). Developments are now moving towards UAVs with the capability to carry payloads such as recoilless disruptors.

## SEARCH AND DESTROY

In parallel, IED search equipment has also become highly advanced. This includes systems such as advanced ground wire detection, which is able to pinpoint a variety of command firing cables, right down to very fine gauge wires that are buried into vulnerable locations for the activation of IEDs. While it has taken many years to develop this level of sensitivity, the result is improved safety and freedom to manoeuvre for personnel and vehicles, as clear routes can be defined with greater certainty.

Counter IED requirements have constantly evolved since the seventies. The adversary in Northern Ireland had a completely different *modus operandi* to those in Afghanistan and Iraq. In these conflicts, coalition forces faced an asymmetric threat where the adversary was a franchise of a terrorist group and not conventionally trained. The military therefore found themselves in a situation where they were fighting against the unknown and unpredictable.

Today, multiple Counter Improvised Explosive Device (CIED) scenarios are now challenging forces around the world. For example, in Syria forces are tackling a more conventional adversary in an urban environment, alongside Iraq where there is a requirement for a mass clear-up operation of unexploded devices. This means that long-range initiation kits are now in demand to help remove IEDs on a larger scale, and which can be detonated at a safe distance. Whereas in Mali, United Nations

**The use of remotely operated vehicles has vastly reduced the risk of injury to personnel**

Picture credit: Chemring

peacekeepers are once again faced with insurgents in a rural, desert environment.

The future threat is the acceleration of global knowledge sharing via the internet, with the Dark Web enabling the real-time distribution of information about the creation of explosive devices in a more covert manner. However, it is also predicted that there will be a return to more conventional warfare as Western allies are also focussing their attention from counter-insurgency, to dealing with a near-peer and hybrid adversary, as experienced by the actions of pro-Russian separatists in eastern Ukraine.

Dealing with conventional IEDs that contain chemical, biological, radiological or nuclear (CBRN) agents is also a growing threat to Western allies. Better known as 'dirty bombs', these are designed to magnify the effect of an IED by diffusing toxic chemicals, biological materials, or radioactive materials that cause multiple injuries and deaths, as well as rapidly create social fear and unrest around the world.

## FINANCIAL DISPARITY

Even 40 years ago in Northern Ireland it quickly became apparent that Counter IED was a war of financial disparity. While operators and their equipment cost millions to train and develop, they could be potentially killed or injured by a bomb costing less than £50. And, that situation remains today as it typically costs less than £10 per IED versus Western allies investing billions to develop Counter IED measures.

Counter-IED capability must deal with a constantly evolving threat, it requires innovative ideas, rapid development and accelerated fielding matched to a dynamic and agile procurement process.

The harsh reality is that the adversary has become smarter. Insurgents know the operational terrain better than any military force as it is their homeland. This makes them very responsive as they observe the Counter IED operation. Threat devices have also become less predictable as the adversary becomes more inventive. For example, if you restrict the sale of fertiliser products they will identify an alternative compound that can be used, or bring in supplies over borders. How to deal effectively with these threats must therefore evolve into a solution quickly.

While the past has proven the need for more fast-paced developments, the modern military procurement process does not support this effectively. It takes too long to meet more immediate needs in the field, with programme costs typically being prohibitively high.

Today's NATO strategy and objectives typically include statements about procurement needs for future conflicts without defining exactly what they are. In contrast, some defence organisations around the world are procuring equipment that is available today in order to bring their country's capabilities up to a NATO standard, to ensure interoperability across multiple nations. It is therefore apparent that there is a need for more unified standards (ie within NATO) to commonly deal with the threat, enable joint working and rapidly meeting urgent requirements as they arise.

**COUNTER-IED CAPABILITY REQUIRES INNOVATIVE IDEAS, FAST DEVELOPMENT AND RAPID FIELDING**

The evolution of modern-day Counter IED has been a gradual fine-tuning adaptation over the last 50 years, since the step-change developments that were introduced in Northern Ireland. This reflects the continual need to remain nimble and react at a fast pace to maintain a continual ability to adapt and counter effectively. Ergonomic considerations must also remain a core goal, with the focus on developing solutions that are easy for the operator to use, in order to lower the training burden and minimise skill fade. The answer to this is to harness the benefits of emerging technology, but to ensure that it sits behind a simple user interface.

With this in mind, it is essential that developers of future counter solutions remember how important it is to learn from the operators on the ground. They must not fall into the trap of developing technology for technology's sake, or developing advanced solutions that would meet the needs of the previous conflict. The mantra to follow is "keep it simple/keep it agile" ●

Picture credit: Chemring

**Developers need to learn from operatives on the ground**

**Cindy Barfoot** is Regional Manager at Chemring Technology Solutions. In a career spanning over 30 years, Cindy has moved through various roles from design engineer to project manager and into technical sales, adding a large amount of experience in Explosive Ordnance Disposal (EOD). She now specialises in Counter Improvised Explosive Device (CIED) technology and equipping armed forces and police EOD teams worldwide.