THE DEVELOPMENT OF THE BRITISH APPROACH TO IMPROVISED EXPLOSIVE DEVICE DISPOSAL IN NORTHERN IRELAND

Supervisors: Prof Richard Holmes
Dr Bryan Watters

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Abstract

When the army deployed to Northern Ireland in 1969 it was unprepared for the intensive bombing campaign that was to follow. Improvised Explosive Device Disposal (IEDD) was conducted in much the same way as it had been since the 19th century – manually, with one or two men pitting themselves against the device, or its creator. The painful experience of the ‘Troubles’ in Northern Ireland - and in particular the Provisional Irish Republican Army (PIRA) bombing campaign - led to the development of the contemporary British approach to IEDD.

The army dealt with over 56000 Explosive Ordnance Disposal (EOD) incidents by 2007, rendering safe over 6300 IEDs. These successes came at a heavy price. 17 Ammunition Technical Officers (ATOs) and three other EOD team members were killed in Northern Ireland. Most of these deaths occurred during the early 1970s. It must be asked why the IEDD was more dangerous then and why did it become apparently safer in later years, despite the terrorists’ growing prowess? This thesis argues that EOD changed in the 1970s as a result of the lessons learned when casualties occurred, and that the most important changes were conceptual. Safety and success for the EOD teams came not from out-braving the bombs, but from out-thinking the bombers. The lessons learnt were distilled and formalised into a set of principles, philosophies and rules that guided the conduct of IEDD operations.

This thesis explains how the EOD experience in Northern Ireland shaped the contemporary British approach to IEDD operations. It begins with an introduction and a historical background. The methodology used is discussed, and the available literature on the subject is reviewed. An overview of the development of IEDs and IED tactics is offered, and the state of IEDD at the start of the Northern Ireland campaign is examined. Each of the incidents resulting in an EOD fatality is discussed and analysed in a case study, and this is followed by a further selection of case studies that scrutinise non fatal incidents that had an influence on the conduct of operations. A chapter is devoted to an analysis of successful attacks on EOD teams and from this a number of theories are offered. The official responses to incidents, in the form of regulatory documents and training publications are then discussed before the roles of equipment and personnel selection are considered.
Acknowledgements

I have had an interest in this subject for as long as I have been involved with it, which dates back to 1992. I first began seriously researching in 2004, when I was posted to Explosive Ordnance Disposal Branch at Headquarters Northern Ireland. My idea then was to produce an internal service paper. I must thank Lieutenant Colonel Mark Wickham MBE QGM for tolerating my frequent absences from whatever I was supposed to be doing while I spent hours in the archive. The first person to see any work on paper was Lieutenant Colonel David Ockleton and it is doubtful that, without his encouragement and advice, this document would have progressed any further. He showed it to Colonel Jim Storr who offered further encouragement and, crucially, passed it to the late Professor Richard Holmes.

I owe the greatest debt to Professor Holmes, for it was he who enabled the transformation from a service paper to a research degree. Along with Colonel Ockleton, Professor Holmes saw what he most generously described as “an unrecognised talent” in me and he was wholeheartedly supportive. I am also grateful to him for applying his wisdom and experience while supervising the development of this work and it is my greatest regret that he did not live to see it completed.

Dr Bryan Watters took over the responsibility of supervising me when Professor Holmes became ill and I have learnt an enormous amount through my association with him. His advice and guidance has taken my research and education in directions and into fields of study that I was scarcely aware of.

Much of the source material for this work came from archived documents but I believe what makes the work come alive are the first-hand accounts of retired officers and soldiers who served as EOD operators in the 1970s. I must thank all of those who replied to my questionnaires, who sent me emails, and who answered my many follow up questions. I am particularly indebted to Lieutenant Colonel Fred Moughton of the Kineton and Didcot Branch of the Royal Army Ordnance Corps Association who put me in touch with so many people. These people not only contributed to making Northern Ireland a better place, they became the very essence of what this research is about. I salute them all.
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# Glossary

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<td><strong>A</strong></td>
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<td>A&amp;ERs</td>
<td>Ammunition and Explosives Regulations</td>
<td></td>
</tr>
<tr>
<td>ANAL</td>
<td>HME made from Ammonium Nitrate and Aluminium</td>
<td></td>
</tr>
<tr>
<td>ANFO</td>
<td>HME made from Ammonium Nitrate and Fuel Oil</td>
<td></td>
</tr>
<tr>
<td>ANNIE</td>
<td>HME made from Ammonium Nitrate and Nitro-Benzine</td>
<td></td>
</tr>
<tr>
<td>ANS</td>
<td>HME made from Ammonium Nitrate and Sucrose (icing sugar). Extensively used by PIRA in the 1990s.</td>
<td></td>
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<tr>
<td>Anti-Handling Device</td>
<td>A device intended to protect a mine and which is part of, linked to, attached to or placed under the mine and which actuates the mine when an attempt is made to tamper with or otherwise intentionally disturb the mine</td>
<td>AAP-6</td>
</tr>
<tr>
<td>AT</td>
<td>Ammunition Technician (RAOC/RLC)</td>
<td></td>
</tr>
<tr>
<td>ATO</td>
<td>Ammunition Technical Officer (RAOC/RLC)</td>
<td></td>
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<td><strong>B</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BD</td>
<td>Bomb Disposal (Obsolescent term – refers to RE EOD)</td>
<td></td>
</tr>
<tr>
<td>BDO</td>
<td>Bomb Disposal Officer (Obsolescent term - refers to RE EOD Operators)</td>
<td></td>
</tr>
<tr>
<td>Bleep</td>
<td>Colloquial term used to describe Royal Signals personnel attached to RAOC/RLC IEDD Teams to operate Electronic Countermeasures (ECM) equipment</td>
<td></td>
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<tr>
<td>Blind</td>
<td>Explosive ordnance which has been primed, fuzed, armed, initiated or otherwise prepared for action, and which has been dropped, fired, launched, projected or placed in such a manner as to constitute a hazard to operations, installations, personnel or material and remains unexploded either by malfunction or design, or for any other reason</td>
<td>JSP 364 Glossary</td>
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**Booby Trap**

A device designed, constructed or adapted to kill or injure, which functions when a person disturbs or approaches an apparently harmless object or performs an apparently safe act.

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<tr>
<td><strong>C45</strong></td>
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<tr>
<td><strong>Candle</strong></td>
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<tr>
<td><strong>CATO</strong></td>
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<tr>
<td><strong>CILSA</strong></td>
</tr>
<tr>
<td><strong>Clam</strong></td>
</tr>
<tr>
<td><strong>CMD</strong></td>
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</table>
| **Controlled Explosion** | Any occasion when an EOD Operator uses a deliberate explosive technique to neutralize an Improvised Explosive Device (IED) during Render Safe Procedures. The term may cover the use of a demolition charge to destroy the IED.

*In IEDD this term is also used whenever an IED disrupter is fired.*

| **Conventional Munitions Disposal** | The location, detection, identification, on-site evaluation, rendering safe, recovery and final disposal of unexploded EO, which includes booby traps but not IEDs. It may also include EO which has become hazardous by damage or deterioration, when the disposal of such explosive is beyond the capabilities of personnel normally assigned the responsibility for routine disposal. |
| **CO-OP** | HME made from Sodium Chlorate and Nitro-Benzine, used by PIRA in the 1970s and early 1980s. |
| **CP** | Contact Point |
| **Command Wire** | A CWIED has a physical link of wire between the firing point and the contact point. |
| **Improvised Explosive Device** |  |
| **Contact Point** | In a command initiated IED, the point where the main charge is, which the target come into contact |
with.

<table>
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<tr>
<th>CW</th>
<th>Command Wire</th>
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**D**

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<tr>
<th>Dalek</th>
<th>An early Remotely Operated Vehicle, made from bicycle components and other readily available parts. ASofA Trail No 26</th>
</tr>
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<tr>
<td>Destruction In Situ</td>
<td>The destruction of any item of ordnance by explosives without moving the item from where it was found, normally by placing an explosive charge alongside. Also called blowing in situ. JSP 364 Glossary</td>
</tr>
</tbody>
</table>
| Detonation  | An exothermic reaction at molecular level induced by the action of a disruptive wave through an explosive material causing a sudden violent increase in volume due to the evolution of gaseous products. There are 3 forms that detonation may take:  
  • High Order: Detonation at a velocity approaching the maximum stable velocity of detonation for a system.  
  • Low Order: Detonation at a velocity well below the maximum stable velocity of detonation for a system.  
  • Partial: The incomplete detonation of a high explosive caused by a physical break or lack of chemical homogeneity within the explosive material. (A&ER) JSP 364 Glossary |
| Direct Task | An EOD task where the EOD team respond immediately.  |
| Disrupter   | An EOD weapon or explosive that is used to remotely and violently break up the components of an IED.  |
| Disruption  | The effect of violently separating the components of an IED so that it can not function.  |
| DLSA        | Director of Land Service Ammunition. Brigadier that was Head of the ammunition technical trade. Superseded CILSA and was superseded by PATO LAND |

**E**

<table>
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<tr>
<th>ECM</th>
<th>Electronic Counter Measures AAP-15, quoting</th>
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Electronic Counter Measures
That division of electronic warfare involving actions taken to prevent or reduce an enemy's effective use of the electromagnetic spectrum through the use of electromagnetic energy. There are three subdivisions of electronic countermeasures: electronic jamming, electronic deception and electronic neutralization.

In IEDD terms, the detection and jamming of RCIEDs

EO
Explosive Ordnance

EOD
Explosive Ordnance Disposal

EOR
Explosive Ordnance Reconnaissance

Explosive Ordnance
All munitions containing explosives, nuclear fission or fusion materials and biological and chemical agents. This includes bombs and warheads; guided and ballistic missiles; artillery, mortar, rocket and small arms ammunition; all mines, torpedoes and depth charges, demolition charges; pyrotechnics; clusters and dispensers; cartridge and propellant actuated devices; electro-explosive devices; clandestine and improvised explosive devices; and all similar or related items or components explosive in nature.

Explosive Ordnance Disposal
The detection, identification, on-site evaluation, rendering safe, recovery and final disposal of unexploded explosives ordnance. It may also include explosives ordnance which has become hazardous by damage or deterioration.

Explosive Ordnance Disposal Incident
The suspected or detected presence of unexploded explosive ordnance, or damaged explosive ordnance, which constitutes a hazard to operations, installations, personnel or material. Not included in this definition are the accidental arming or other conditions that develop during the manufacture of high explosive material, technical service assembly operations or the laying of mines and demolition charges.

Explosive Ordnance Disposal Procedures
Those particular courses or modes of action taken by explosive ordnance disposal personnel for access to, diagnosis, rendering safe, recovery and final disposal of explosive ordnance or any hazardous material associated with an explosive ordnance disposal incident.

a. Access procedures - Those actions taken to locate exactly and to gain access to unexploded explosive ordnance.

b. Diagnostic procedures - Those actions taken to identify and evaluate unexploded explosive
c. Render-safe procedures - The portion of the
explosive ordnance disposal procedures involving
the application of special explosive ordnance
disposal methods and tools to provide for the
interruption of functions or separation of essential
components of unexploded explosive ordnance to
prevent an unacceptable detonation.
d. Recovery procedures - Those actions taken to
recover unexploded explosive ordnance.
e. Final disposal procedures - The final disposal of
explosive ordnance which may include demolition
or burning in place, removal to a disposal area or
other appropriate means.

Explosive Ordnance
Reconnaissance
Reconnaissance involving the investigation,
detection, location, marking, initial identification
and reporting of suspected unexploded explosive
ordnance, by explosive ordnance reconnaissance
agents, in order to determine further action

ExpO
Explosives Officer. Ex ATOs employed by the
Metropolitan Police as EOD operators in the
Greater London area. The Metropolitan Police is
the only UK police force with its own EOD
capability.

F
False
An object, reported in good faith to be a suspect
IED, that is subsequently proved to be totally
innocuous.

Find
The report of explosive or inert bomb making
components, weapons, ammunition and tools
found by the Police or the Security Forces (SF).

FP
Firing Point
That point in the firing circuit where the device
employed to initiate the detonation of the charges
is located

G

H
HE
High Explosive
AAP-15, quoting
NASG

High Explosive
Substance or mixture of substances which is
designed to detonate.
AOP-38-5
<table>
<thead>
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<th>Term</th>
<th>Definition</th>
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<tr>
<td>High Risk Search</td>
<td>Search undertaken by Royal Engineer Search Teams, where there is a high likelihood of there being an IED present. Now known as Advanced Search.</td>
<td></td>
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<tr>
<td>HME</td>
<td>Home Made Explosive</td>
<td>JSP 364 Glossary</td>
</tr>
<tr>
<td>Hoax</td>
<td>An object in a situation which has been conceived to deliberately deceive and or cause disruption, sometimes used in a come-on situation, which may or may not contain components normally associated with an IED, but does not contain explosive.</td>
<td>JSP 364 Glossary</td>
</tr>
<tr>
<td>Hotrod</td>
<td>A disrupter twice the size of Pigstick. Also known as Improved Disrupter (ID).</td>
<td></td>
</tr>
<tr>
<td>Hook &amp; Line</td>
<td>Techniques and equipment used to semi-remotely move objects, using string, ropes or fishing line and various attachments.</td>
<td></td>
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<tr>
<td>HT</td>
<td>High Threat</td>
<td>PATO HT SOPs for IEDD 2005</td>
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<tr>
<td>High Threat</td>
<td>HT IEDD is defined by a combination of factors and considerations some of which include IEDD operators themselves being targeted by the enemy using IEDs and when there is a high incidence in the use of RCIEDs which necessitates the routine deployment of ECM assets. The deployment by terrorists of other complex devices such as VBIEDs, VOIEDs, secondary devices and the use of ‘come-on’ tactics demonstrates their capability, intent and opportunity to target IEDD teams which must therefore deem the theatre to be a ‘High Threat’ environment. The complexity of the overall IED situation and environment is also a factor, which determines that only HT qualified IEDD operators are deployed.</td>
<td>PATO HT SOPs for IEDD 2005</td>
</tr>
<tr>
<td>HQNI</td>
<td>Head Quarters Northern Ireland.</td>
<td></td>
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<tr>
<td>I</td>
<td></td>
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</tr>
<tr>
<td>ICP</td>
<td>Incident Control Point</td>
<td>JSP 364 Glossary</td>
</tr>
<tr>
<td>ID</td>
<td>Improved Disrupter – another name for Hotrod.</td>
<td>AAP-15, quoting AAP-6</td>
</tr>
<tr>
<td>IED</td>
<td>Improvised Explosive Device</td>
<td>AAP-15, quoting NASG</td>
</tr>
<tr>
<td>IEDD</td>
<td>Improvised Explosive Device Disposal</td>
<td>AAP-15, quoting NASG</td>
</tr>
<tr>
<td>Improved Disrupter</td>
<td>A disrupter twice the size of Pigstick. Also known as Hotrod.</td>
<td></td>
</tr>
<tr>
<td>Improvised Explosive</td>
<td>A device placed or fabricated in an improvised manner incorporating destructive, lethal, noxious,</td>
<td>AAP-6</td>
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Device pyrotechnic or incendiary chemicals and designed to destroy, incapacitate, harass or distract. It may incorporate military stores, but is normally devised from non-military components

Improvised Explosive Device Disposal Those actions taken to disrupt or neutralise an improvised explosive device. JSP 364 Glossary

Incendiary An IED which contains low explosive and is primarily designed to cause burning JSP 364 Glossary

Incident Control Point A safe area, within a Police or SF cordon, from which an IEDD, CMD or BCMD operation is controlled. JSP 364 Glossary

INLA Irish National Liberation Army

IRA Irish Republican Army

J

Jack Horner An early disrupter and the immediate forerunner of Pigstick.

JSP Joint Service Publication

K

L

LE Low Explosive

Lilliput A piece of ECM equipment that could detect RCIEDs. Later versions could also inhibit them. Obsolete.

Little Willy An alternative name for Dalek, an early Remotely Operated Vehicle.

Low Explosive Explosives which burn rather than detonate. They should strictly be termed ‘propellant’ but the term Low Explosive is still widely used. JSP 333

Low Risk Search Search undertaken by units other than Royal Engineer Search Teams and where there is a low risk of an IED being present. Now known as Basic Search. JSP 364 Vol 1 Chap 11 Annex A Para 11c(4).

LCIED Light Command Improvised Explosive Device JSP 364 Vol 1

Light Command In an LCIED, the firing switch is a photo slave cell JSP 364 Vol 1
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Improvised Explosive Device</td>
<td>that provides an electric current to the initiation system. At the firing point, the perpetrator will operate a camera with a flash gun at the desired moment, causing the slave cell to work and thereby initiating the device.</td>
</tr>
<tr>
<td>LSIED</td>
<td>Light Sensitive Improvised Explosive Device</td>
</tr>
<tr>
<td>Manual Action</td>
<td>Any action carried out by an EOD operator he is still present at an IED.</td>
</tr>
<tr>
<td>Manual Approach</td>
<td>The act of walking up to a suspect IED.</td>
</tr>
<tr>
<td>Maxi-Candle</td>
<td>A specialised explosive charge designed to open cars and disrupt IEDs.</td>
</tr>
<tr>
<td>Mitigation</td>
<td>The reduction of risk by means of an applied action.</td>
</tr>
<tr>
<td>Misfire</td>
<td>Failure to fire or launch as intended resulting in the unintentional retention of the munition or weapon.</td>
</tr>
<tr>
<td>Neutralisation</td>
<td>To restore a munition from an armed to a nonarmed condition, either reversibly to permit reactivation, or irreversibly and permanently (by sterilization or demilitarisation).</td>
</tr>
<tr>
<td>No 1</td>
<td>The EOD operator in command of an EOD team, who conducts the Render Safe Procedure. Usually in the rank of Sergeant to Captain.</td>
</tr>
<tr>
<td>No 2</td>
<td>The EOD team second in command. He operates all remotely Operated Vehicles, prepares and deploys weapons and equipment and acts as an assistant to the No 1. Usually a Lance Corporal or Corporal.</td>
</tr>
<tr>
<td>OIRA</td>
<td>Official Irish Republican Army</td>
</tr>
<tr>
<td><strong>Operation BANNER</strong></td>
<td>British military operations in Northern Ireland from 1969 to 2007.</td>
</tr>
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<td>---------------------------------------------------------</td>
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<tr>
<td><strong>P</strong></td>
<td></td>
</tr>
<tr>
<td>Partial Detonation or Burn.</td>
<td>Only part of a charge is detonated or burnt. This can arise as a result of poorly produced, prepared or broken charges or ammunition.</td>
</tr>
<tr>
<td>PATO</td>
<td>Principal Ammunition Technical Officer (RAOC/RLC). Normally a full colonel.</td>
</tr>
<tr>
<td>Pig</td>
<td>A Humber 1 ton four wheeled armoured vehicle, originally used as an armoured personnel carrier but adapted to carry EOD equipment.</td>
</tr>
<tr>
<td>Pigstick</td>
<td>A disrupter that fires water at extremely high velocity.</td>
</tr>
<tr>
<td>PIRA</td>
<td>Provisional Irish Republican Army</td>
</tr>
<tr>
<td>Planned Operation</td>
<td>The calculated and deliberate clearance of an EO or IED threat, after due consideration and interpretation of all relevant factors, by discussion with all relevant agencies.</td>
</tr>
<tr>
<td>Primary Soak</td>
<td>The primary soak time is the minimum safe waiting period, derived from the current threat, to be observed before a manual approach can be made to a suspect IED.</td>
</tr>
<tr>
<td>PCIED</td>
<td>Projectile Command Improvised Explosive Device</td>
</tr>
<tr>
<td>Projectile Command Improvised Explosive Device</td>
<td>A PCIED incorporates an open switch of 2 metal plates held a short distance apart. At the desired time of initiation, the perpetrator fires a small arms round into the metal plates causing the switch to close and the device to initiate.</td>
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**Q**

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<tr>
<th><strong>R</strong></th>
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<tr>
<td><strong>RA</strong></td>
<td>Royal Artillery</td>
</tr>
<tr>
<td>Radio Controlled Improvised Explosive Device</td>
<td>In an RCIED the link between the firing point and contact point incorporates equipment which utilises the electromagnetic spectrum.</td>
</tr>
<tr>
<td><strong>RAF</strong></td>
<td>Royal Air Force</td>
</tr>
<tr>
<td><strong>RAOC</strong></td>
<td>Royal Army Ordnance Corps</td>
</tr>
</tbody>
</table>
Render Safe

1. Use of munition: To bring an armed munition to a non-armed condition.
2. Munitions design: To prevent inadvertent explosive functioning through the application of special interruption or separation techniques and tools.

Render Safe Procedure

The application of EOD principles, techniques and methods applied to neutralize or remove the possibility of an unacceptable explosion. Complete EOD may involve a number of RSP stages.

Rendered Safe

The condition of an EO or IED when the essential components have been separated or neutralized so that the EOD Operator may approach for detailed examination.

RESA

Royal Engineers Search Advisor

REST

Royal Engineers Search Team

RLC

Royal Logistic Corps

RMP

Royal Military Police

ROV

Remotely Operated Vehicle

RSIGNALS

Royal Signals

RSP

Render Safe Procedure

AAP-15, quoting NASG

S

Saracen

A heavy six wheeled armoured vehicle, originally used as an armoured personnel carrier but adapted to carry EOD equipment.

SAT


SATO

Senior Ammunition Technical Officer (RAOC/RLC). Normally a major. In Northern Ireland, SATO was also Officer Commanding 321 EOD Unit/Coy/Sqn.

Secondary Soak

The secondary soak time is the minimum safe waiting time to be observed between positive EOD action and a subsequent manual approach.

Soak Time

A period of time that an IEDD Operator must allow to elapse before making a manual approach.
These times are mandatory and are classified as primary and secondary soak periods.

**Semi-Remote**
An EOD action that entails the operator making a manual approach to deploy a weapon or piece of equipment, then retiring to a safe distance before using the equipment.

**SOCO**
Scenes Of Crime Officer

**SOPs**
Standing Operating Procedure

**Stake Out**
To insert a cordon and keep an area under surveillance. Obsolete term used in the 1970s.

**T**

| Time Operated Improvised Explosive Device | Time operated IEDs are designed to function after a pre-determined delay. | JSP 364 Vol 1 Chap 11 Annex A Para 11a. |

**U**

| Unexploded Explosive Ordnance | Explosive ordnance which has been primed, fused, armed or otherwise prepared for action, and which has been fired, dropped, launched, projected or placed in such a manner as to constitute a hazard to operations, installations, personnel or material and remains unexploded either by malfunction or design or for any other cause. | AAP-6 |

**UXO**
Unexploded Explosive Ordnance

**V**

| Victim Operated Improvised Explosive Device | Victim Operated IEDs (VOIEDs) are designed so the intended victim causes the device to function. | JSP 364 Vol 1 Chap 11 Annex A Para 11b. |

**VOIED**
Victim Operated Improvised Explosive Device

**W**

| Wheelbarrow | The family of Remotely Operated Vehicles used by British EOD teams in Northern Ireland. |  |

AAP-15, quoting AAP-6

THE DEVELOPMENT OF THE BRITISH APPROACH TO
IMPROVISED EXPLOSIVE DEVICE DISPOSAL
IN NORTHERN IRELAND

CHAPTER ONE

INTRODUCTION

The terrorist bomb, or Improvised Explosive Device (IED), has been one of the staple weapons of political extremists since the middle of the 19th century. In the British Army, the Explosive Ordnance Disposal (EOD) teams of the Royal Logistic Corps (RLC) are responsible for Improvised Explosive Device Disposal (IEDD). Before the formation of the RLC in 1993, IEDD was conducted by one of its forming corps, the Royal Army Ordnance Corps (RAOC).

IEDD was conducted in much the same way from its inception in the late 19th century until the 1970s – manually, with one or two men pitting their wits, nerves and skills against the device, or its creator. It was the painful experience of Operation BANNER (1969 – 2007), the name for the British military operation during the ‘Troubles’ in Northern Ireland, and in particular the Provisional Irish Republican Army (PIRA) bombing campaign from 1970 to 1994, that led to the development of the contemporary British approach to IEDD. 321 EOD Squadron RLC and its forebears was the unit responsible for EOD in Northern Ireland. The unit had dealt with over 56000 EOD tasks by the end of Operation BANNER in 2007, rendering safe over 6300 IEDs.

These successes came at a heavy price. 17 Ammunition Technical Officers (ATOs) and three other EOD team members were killed in Northern Ireland, and one ATO and two Metropolitan Police Explosives Officers, who were retired ATOs, were killed dealing with PIRA IEDs on the mainland. Most of these deaths occurred during the early 1970s. It must be asked why IEDD was more dangerous at that time and why did it become apparently safer in the later years of the campaign? Was it due to advances in technology, improvements in selection and training, or changes in the way ATOs conducted tasks? Although it can be said to have been a combination of all of these, this thesis argues that the most important changes were conceptual. When EOD casualties occurred, it was usually as a result of the bomb maker, or
bomb layer, successfully deceiving the ATO. Safety and success for the EOD teams came not from out-braving the bombs, although that aspect should not be overlooked, but from out-thinking the bombers. The lessons learnt were distilled and formalised into a set of principles, philosophies and rules that guided, and continue to guide, the conduct of IEDD operations.

AIM

The aim of this thesis is to explain how the EOD experience in Northern Ireland shaped the contemporary British approach to IEDD operations.

SCOPE

This thesis covers IEDD related events in Northern Ireland from 1969 to 1994. This period starts at the beginning of Operation BANNER in August 1969 and ends at the time of the 1994 PIRA ceasefire. 1994 was also the year in which the last ATO was injured in Northern Ireland. However, this thesis will demonstrate that most of the important developments occurred between 1971 and 1976 and this work will concentrate on events in those five years. Occasionally reference will be made to events outside of this timeframe where they are relevant to the subject matter.

This thesis will not discuss the wider political or security situation in Northern Ireland, except where external events directly impinged on EOD operations.

Certain technical details have been omitted and some sources have been redacted where the author judged that their inclusion would be detrimental to security or advantageous to the ill disposed. Most significantly, the subject of Radio Controlled IEDs (RCIEDs) and Electronic Counter Measures (ECM), although not ignored, will not be discussed in great technical detail as this could have an effect on current operations.

TERMINOLOGY

Current British military and ammunition technical terminology is used wherever possible. Many operational terms in use during the periods under examination have fallen from favour, but they occasionally appear when original documents are quoted or discussed.
The term ‘ATO’ is used to describe Ammunition Technical Officers and Ammunition Technicians above the rank of sergeant who have qualified and operated as IEDD operators. In this context it is synonymous with ‘EOD operator’ and ‘EOD Team No 1’, when applied to RAOC or RLC personnel.

**Doctrine.** The North Atlantic Treaty Organisation (NATO) defines doctrine as:

> Fundamental principles by which military forces guide their action in support of objectives. It is authoritative, but requires judgement in application.  

The British Army defines doctrine as:

> Military Doctrine is a formal expression of military knowledge and thought, that the army accepts as being relevant at a given time, which covers the nature of current and future conflicts, the preparation of the army for such conflicts and the methods of engaging in them to achieve success.

Doctrine can also simply be defined as ‘that which is taught’. Doctrine is not a word that is often heard among EOD operators. However it is a useful term in this context to apply to the body of instruction that guides the conduct of IEDD operations. In this thesis the italicised word ‘**doctrine**’ is used as shorthand to describe the aim, philosophy, principles and procedures that characterise and govern the British approach to IEDD. It is accepted that its use in this sense may not satisfy all of the requirements of formal Military Doctrine, but it is a useful term. Moreover, it reduces the requirement for tortuous forms of wording that might be needed to avoid its use.

**THE CONTEMPORARY BRITISH APPROACH TO IEDD**

For many years the main authoritative document for IEDD was Ammunition and Explosives Regulations (A&ERs), Volume 3, Pamphlet 21 Part 5. This has now been subsumed into Joint Service Publication (JSP) 364 – Explosive Ordnance Disposal, Volume 1, Part 2 Chapter 11. This is amplified by Standing Operating Procedures (SOPs), produced in each theatre. These instruments evolved over time to match the IED threat and the EOD capability as each developed.

The contemporary British approach to IEDD can be summarised under five main headings:
**Aim.** The aim of IEDD is to deny terrorists and criminals their objectives.\(^7\)

**Philosophy.** The Philosophy is the set of core values that underpin the entire IEDD effort. They are:

- Save Life.
- Preserve Property
- Return to Normality.
- Collect and Preserve Forensic Evidence.\(^8\)

**Principles.** The Principles are the guiding tenets that allow the philosophy to be put into practice. They are:

- Remote equipment is to be employed where possible.
- Mandatory soak times are to be observed.\(^9\)
- Operations are to be pre-planned when time allows.
- Commands\(^10\) are to categorise tasks by their level of importance.
- The EOD operator is to spend the minimum amount of time at risk from the device.
- The preferred option when dealing with an IED is neutralisation by disruption.\(^11\)
- Where possible, the EOD operator is to use remote methods to render safe a device. If remote methods cannot be used then the operator is to use semi-remote methods. Manual render safe actions should be carried out only as a last resort.\(^12\)

**Mandatory Actions.** Historically, Mandatory Actions were found in SOPs, rather than A&ERs. However, they now appear in JSP 364. They are sets of rules that accord with the Philosophy and Principles of IEDD and tailor them...
to the prevailing circumstances of a particular theatre. Mandatory Actions can only be dispensed with if there is an exemption in the SOPs or by referral to the EOD operator’s Duty Officer. Some of the current Mandatory Actions for use in High Threat theatres are:

- A primary soak is to be applied before any manual approach.
- A secondary soak is to be applied after the last positive EOD action before any manual approach.
- Manual approaches are to be a one-man risk.
- The full EOD suit is to be worn on manual approaches.
- Manual approaches are to be made using appropriate ECM equipment.\(^{14}\)
- Planned Operations are to be mounted for suspected command and Victim Operated IEDs in rural areas.
- Planned Operations are to have at least one aviation imagery sortie flown after the cordon is firm.
- Vehicles are to be remotely or semi-remotely moved their own length and jolted.\(^{15,16}\)

**SOPs and Conventions.** There are other rules and guidelines that guide the conduct of IEDD operations. Some are found in SOPs, while others may be described as conventions, or the received collective wisdom of the IEDD fraternity.\(^{17}\)

It is interesting to note that the four levels of IEDD *doctrine* correspond broadly with current British Military Doctrine. However, they were developed separately.
REASONS FOR UNDERTAKING THIS WORK

My reasons for embarking on this work can be summarised in four words: To help save lives. This might seem a lofty and somewhat pretentious ideal but I think I am justified in aiming high. I hope this work will be read and used by current EOD operators and instructors. Indeed, in its first iteration, it was aimed solely at the EOD community.

The modern British IEDD operator has what I believe to be the world’s finest and most comprehensive doctrine that he can rely on to help him achieve his aim and to stay alive while doing it. This doctrine did not come into being as part of a grand plan, but was pieced together as lessons were learnt by trial and error. All too often, the lessons were learnt at the cost of lives. There are very few people still active in the EOD world that were serving when these early lessons were being learnt. Most have long since retired. Some have passed away. With them has gone the collective memory of how the British approach to IEDD was formed. Consequently it is quite common for a newly qualified operator to know that, when dealing with a device, he must do X and must not do Y but to not understand the reasons for this. It is my firm belief that this knowledge gap must be addressed.
Conventional Munitions Disposal (CMD) can often be carried out by following a laid down procedure, but improvised devices can not be approached in the same way. The operator must first have a thorough understanding of explosives and munitions design, and that is why the Ammunition Technicians and Ammunition Technical Officers of the Royal Logistic Corps lead in IEDD. But technical knowledge alone is not enough. The operator must be able to quickly obtain all the available information then interpret it, analyse it and filter it. He or she must assess the threat posed by the device and the likely consequences of his actions. He must consider what the perpetrator is trying to achieve. Ideally he should be able to put himself inside the terrorist’s or insurgent’s mind. He must then formulate a plan and execute it in the most timely, efficient and safe way possible. All the while he knows that the perpetrator may be watching him, looking for weaknesses in his way of operating, seeking out the ‘chinks in his armour’ in order to target him or his comrades. In short, the successful IEDD operator must be able to think. And to think effectively, one must first understand. So my intention here is to show why we go about our business the way we do, so that operators may better understand the reasons for their actions.

Writing this thesis has called for some sensitivity on my part. This has taken two forms. Firstly, and perhaps most obviously, I have been very aware of the need to keep our secrets secret. This work would serve no purpose if it educated terrorists as well as soldiers. I have kept current procedures out of this as much as possible. However one can not write about how we got to where we are now without stating our current location. In doing this I have been careful to only include information that is already in the public domain – and even then I have critically examined it before including it. Most of my primary sources are military documents that still carry some protective classification – although in most cases the information contained in them is utterly obsolete. Even so, a degree of redaction has been necessary.

Secondly much of this work revolves around the lessons learnt when casualties occurred. In IEDD, ‘casualty’, usually means ‘fatality’. Few people survive an explosion at close quarters. In learning the lessons both the original investigators and I have often been, of necessity, somewhat critical of those who died. I hope I never appear disrespectful towards them or their memory. I have nothing but the
highest regard for my forebears and that includes those who made the ultimate sacrifice. I am painfully aware that I have 24 years of personal experience and over 40 years of collective memory to draw on and that hindsight is a wonderful thing that was not available to the people I write about. In the early 1970s, they were very much still finding their way and we have much to thank them for. Indeed I believe the biggest disservice that we could pay to their memory is to forget the lessons learnt at the cost of their lives.

When I first started researching this, the deaths of ATO EOD operators seemed to be a thing of the past – a historical anomaly that existed only in the abstract. I did not know any of these people personally and only one of them, WO2 John Howard, was alive when I joined the army but that was before I became involved in EOD. Having spent the last few years immersed in the reports on their lives and deaths – and reading reports they wrote before they died – I have come to feel that I do know them in some small way. With the campaigns in Iraq and Afghanistan I have also come to know how it feels when a friend is killed on EOD operations. SSgt Chris Muir was killed in Iraq in 2003, undertaking a CMD task. WO2 Gary O’Donnell was killed in Afghanistan in 2008. Capt Dan Shepherd and SSgt Olaf Schmid were killed there in 2009, Capt Dan Read and SSgt Brett Linley were killed in 2010 and Capt Lisa Head was killed in 2011. All were dealing with IEDs at the time of their deaths. All were friends of mine, although some were closer than others. I knew Chris Muir for eleven years and Gaz O’Donnell for fifteen. Dan Shepherd was my Troop Commander for the two years up to and including the time of his death and I commanded the bearer party at his repatriation and funeral. If I needed any reminders on the need for sensitivity when writing about other peoples’ deaths then these tragedies have provided them.

These recent deaths also provided me with fresh impetus to complete this work. No British operators were killed dealing with IEDs in Iraq but six were lost in a comparatively short space of time in Afghanistan. It struck me that in Iraq, EOD teams could usually deploy with all of their equipment and conduct their tasks according to the doctrine established in Northern Ireland – although obviously tailored to suit the local conditions. The insurgents in southern Iraq had ready access to technologically advanced IEDs but in my opinion were not as tactically
astute as PIRA. In Afghanistan the IEDs are generally not as technically advanced as they were in Iraq but the enemy is more cunning and tactically able. Moreover, the ground and tactical situation often means that heavy IEDD team kits can not be deployed. This often forces operators to conduct their tasks in much the same way as their forebears did in Northern Ireland in the 1970s. It should perhaps be unsurprising then, that the casualty rate is also similar to that of the 1970s. That does not mean that casualties are unavoidable. They will only become inevitable if we have to re-learn the lessons already learnt by our forebears. I believe this would be criminal as well as tragic, for these lessons do not come cheap and the only currencies accepted are blood and tears.27
EOD is an activity that predates its given name and even its former name, Bomb Disposal (BD). Unexploded explosive filled munitions have presented problems for as long as they have been a practical means of waging war. The gunpowder plot of 1605 is the earliest and most well known use of an Improvised Explosive Device in British history. The development of modern explosives and munitions in the second half of the 19th century led to new challenges as well as opportunities and it is no coincidence that EOD, as we know it, can trace its history to the 1860s. A detailed account of the development of the army’s EOD capability up to 1968 is given at Appendix A.

1867 - 1944

Irish republicans have been carrying out bombings and incendiary attacks in Ireland and England since 1867. That summer, following an abortive uprising in Ireland that was to be accompanied by a raid on Chester Castle, the Irish Republican Brotherhood (IRB) carried out a series of sabotage and incendiary attacks against railway facilities, gasworks and other infrastructure in England. One of their number, Richard Burke, was arrested in November 1867 and held in Clerkenwell Jail. In December, members of the IRB attempted to release him by placing a barrel of gunpowder against the walls and firing it. In the ensuing explosion 12 people were killed and 120 injured. This was the first Irish Republican bomb explosion in England, but it was not part of a sustained campaign.

Between 1881 and 1894, Irish Republicans carried out a bombing campaign in England and Ireland to highlight their claim for Irish Independence, which became known as the Dynamite War. They mainly struck at symbolic targets and casualties were few. At the same time, a further threat appeared. From 1881 onwards, revolutionaries, mainly anarchists and communists, conducted a vigorous bombing
campaign in Russia and mainland Europe. France in particular was subjected to many savage attacks. In 1894 the campaign spread to Britain when a bomb explosion at Greenwich injured Martial Bourdin, the anarchist who was carrying it. This event was the inspiration for Joseph Conrad’s novel, The Secret Agent.

‘Infernal machines’ were often dismantled at the scene by untrained police officers. In one case in 1885, PC William Cole carried a bomb from Westminster Hall which exploded and badly injured him. He was awarded the Albert Medal in Gold for his bravery. The organisation formally responsible for dealing with these early IEDs was Her Majesty’s Inspector of Explosives (HM IE), based at Woolwich Arsenal. These few men were mainly ex Artillery or Ordnance officers who had been trained in explosives technology at the Royal Military Academy at Woolwich.

For many years the Chief Inspector of Explosives was Lt Col (Retd) (later Sir) Vivian Dering Majendie. In 1894 he travelled to Paris to see how the French dealt with the large number of attacks they had been subjected to. On his return, Col Majendie recommended that a protected pit be dug on Duck Island in St James’ Park. Any ‘infernal machine’ discovered in London was to be transported to this pit, where it could be safely dismantled from behind armour plate by means of hydraulic presses, pull lines and extending metal arms.

Figure 2.1: Caricature of Colonel Sir VD Majendie holding a time bomb.
Although outside the scope of this work, it is worth mentioning that the New York Police Department (NYPD) formed the world's first dedicated IEDD unit, the NYPD bomb squad, in 1903. The bulk of their work came from IEDs used by criminals – both organised and acting alone - but they also encountered anarchist devices and other politically motivated incidents. The volume and breadth of criminal IEDs that the NYPD bomb squad dealt with throughout the twentieth century meant that they amassed a great deal of experience.  

In the British army, Inspecting Ordnance Officers (IOOs) and Laboratory Foremen, as ATOs and ATs were then called, of the Army Ordnance Services were responsible for the disposal of explosives and munitions. Their long scientific and technical training made them uniquely suited for the EOD role. IOOs were responsible for dealing with most of the air dropped bombs that fell on Britain during the First World War. At the same time, Royal Engineer (RE) tunnelling companies became responsible for dealing with military booby traps at the front. This was not as a result of any deliberate policy. Tunnellers often came across booby traps while underground. There was no specialists they could call on to help them, so they had to become proficient at dealing with them themselves. When tunnelling activity decreased, tunnelling units were deployed above ground as booby trap specialists. Much of the expertise they gained was lost at the end of the war, but many of the principles they formed were sound and had to be re-learned later on.

The IRA used IEDs during the Irish war of Independence of 1919 - 1921 but there is little technical evidence available of the type used and how they were dealt with. It appears that they were used tactically – ie against the Security Forces, rather than targeting the population and economy as PIRA were to later. O’ Malley wrote of blasting police stations with gelignite and making improvised grenades with the same substance in early 1920. Command Wire IEDs (CWIED), described at the time as land mines, were also used. Kee recounts an incident where two boy soldiers of the Hampshire Regiment’s band were killed when such a mine exploded underneath them. O’ Malley described these mines:

A landmine was a tin or metal container of explosive buried in the roadway and covered over; hidden wires led from it to an operator who sat on a slope. He had an
electric battery. When a lorry or armoured car passed a mark which he had selected in line with the mine he pressed the switch.\(^{17}\)

This is as good and concise a description of the make up and use of a CWIED as in any current military pamphlet. O’Malley also mentioned that improvised grenades, mortars and explosives for landmines were manufactured in ‘munitions factories’ in Limerick.\(^{18}\) The author has found no mention of who dealt with unexploded IRA IEDs, although they were encountered, as evidenced by this comment in a contemporary news report:

> A large unexploded bomb was picked up in Merrion Square yesterday. Revolvers, ammunition, gunpowder and eighty eight sticks of gelignite were captured in a combined military and police raid on a rebel ammunition store at Templemore today.\(^{19}\)

The only record of an ‘EOD’ death the author has been able to find is somewhat ironic. During a large ambush on 19 March 1921 at Crossbarry, Co Cork, an RE sergeant who had deserted and joined the IRA was killed by the army while he attempted to check his own mine that had failed to function.\(^{20}\)

After the partition of Ireland, the IRA remained an illegal organisation on both sides of the border.\(^{21}\) Led by Sean Russell, the IRA carried out a bombing campaign in England in 1939-40, known as the S-Plan. Typical symbolic and economic targets were attacked and, despite the IRA’s claim that they wished to avoid casualties, several fatalities occurred. In the worst incident, on 25 August 1939, five people were killed when an IED concealed in a bicycle exploded on Broadgate, Coventry.\(^{22}\) The devices used would have been familiar to the Fenians of the 1880s, and to PIRA in the 1970s, being mainly blast bombs consisting of gelignite main charges initiated using a modified alarm clock.\(^{23}\) Several unexploded devices were encountered and, like the campaign of the 1880s and 90s, often the first untrained police officer on the scene dealt with the device. Detective Inspector Robert Fabian, later famous as ‘Fabian of the Yard’ was awarded the King’s Police Medal (KPM) for dismantling one such device in Piccadilly after another had already exploded. PC Ernest Hayward also received the KPM for dismantling a device in Tottenham Court Road.\(^{24}\)
Figures 2.2 and 2.3: Diagrams of IRA mechanical time devices, adapted from alarm clocks, used in England in the 1939-40 bombing campaign.²⁵

Until the beginning of the Second World War, RAOC IOOs were responsible for all army explosives and bomb disposal, apart from military mines and booby traps, which were an RE responsibility. A lack of resources and manpower, plus the deep buried nature of unexploded air dropped bombs, led to RE taking on the disposal of the majority of air dropped bombs. The RAOC continued to be the lead service for the disposal of all other explosive hazards on land and its successor, the RLC, remains so to this day.²⁶

1944 - 1968

Insurgencies occurred in many of the great power's colonies after 1945. Most of the insurgent organisations claimed to have Marxist social and economic aims, but the main driving ideological forces were separatism and nationalism.²⁷ Some writers, such as Thakrah²⁸ and Pustay²⁹, have argued that post-1945 conflict in the third world represented the cold war fought by proxy. Some insurgent organisations were indeed supported by the superpowers, but a paucity of resources forced most to improvise and adapt weaponry. The IED was a principal weapon in these
campaigns. Bombings occurred in most of the anti-colonial campaigns fought against the British, but the conflicts in Palestine (1944 – 1948), Cyprus (1955 – 1959), Aden (1964 – 1967) and Hong Kong (1967 – 1968) saw the most sustained use of IEDs.

The Palestine campaign of 1944 – 48 is interesting in that it shows a clear progression in the standard of IEDs and their tactical use, and also that little is new in the IED world. Early on, many devices contained manufactured military components, such as booby trap switches. There were many of these items left over after the Second World War and, initially at least, they were readily available. RE dealt with the majority of these early devices as part of their responsibility for mines and military booby traps. When supplies of manufactured ordnance were scarce, or when the tactical situation did not suit the use of such munitions, terrorists improvised and the devices often became more complex. CWIEDs, Vehicle Borne IEDs (VBIEDs) and improvised mortars were all used, but where the Jewish terrorists excelled was in their use of Victim Operated IEDs (VOIEDs), allied to the ‘come-on’ tactic – that of luring security forces onto the device. As they did so, responsibility passed from RE to RAOC. Major Harrison, who went on to command the RAOC IEDD effort in Cyprus, mentions that some EOKA devices were similar to ones that he had dealt with in Palestine. Styles described being taught about IEDs used in Palestine when on his Inspecting Ordnance Officer’s course at Bramley in 1952. Regardless of who dealt with these devices, they were normally dismantled by hand as the following passage which discusses a ‘Jewish Road Mine’ which had a chemical initiation system, shows:

Dismantling is simple; open the lid and remove the glass tube and shake out the chemical mixture; the remainder of the mine may be disposed of at leisure.

![Figure 2.4: Improvised Anti-Lift switch from a VOIED rendered safe in Jerusalem, 22 June 1944. Similar switches were used by PIRA in the early 1970s.](image-url)
Figure 2.5: Improvised pressure plate from a VOIED used in Palestine. The plate is made of wood with a minimum of metal components to make it difficult to locate with metal detectors. Similar switches have been used by the Taliban in Afghanistan.\textsuperscript{36}

Figure 2.6: Ch Insp F W Bird with an improvised mortar in Palestine.\textsuperscript{37}

Devices were not always dismantled by hand. The following passage, taken from a military pamphlet published in 1946, discusses the disposal options available when a type of IED known as ‘suitcase mine’ was encountered:
The alternatives are:

To disarm and remove the mine immediately.

To pull it clear with suitable tackle from behind cover.

To evacuate and cordon the building, allowing the mine a period of time in which to explode before it is approached.

To destroy it on the spot with explosives.\(^{38}\)

Given the technological limitations of the day, this is sound advice and would have been recognisable to any EOD operator in Northern Ireland in the early 1970s.

The RAOC fully established itself as the lead agency for IEDD during the EOKA emergency in Cyprus of 1955 - 59. Ammunition technical personnel were seconded to the Cyprus government and came under direct police command.\(^{39}\) EOKA began their bombing campaign with simple pipe bombs, but soon developed mechanical time devices and became adept at the use of Command Wire IEDs (CWIEDs). The leader of EOKA, George Grivas, described his CWIEDs and how they were used:

An important weapon...was the electrically detonated mine... We planted these killers not only on the roads, but in trees, in walls, under bridges and anywhere else they might cause damage. Their great advantage was that they could be fired from a distance by means of a battery and electric wire: the enemy had little chance to hit back before our men escaped.\(^{40}\)

Grivas recounted a particularly vicious use of one such device at a school football field used by off duty British soldiers:

Their movements were observed by two EOKA members...who noted that at the end of the game they always washed at a tap on the edge of the field. Over the next three nights...[they].. dug a 400 yard long trench from the tap to the olive grove, in which they laid their electric cable. On the third night they buried a large bomb in front of the tap and attached the other end of the wire to a battery behind an olive tree. Next day, with a crowd of other pupils, they watched a game between two army teams. As it ended they ran to the battery while teachers shepherded the other children away.
Two girls stayed near enough to see the soldiers gather round the tap, then waved their handkerchiefs as a signal to the waiting boys. The account Grivas gives us contains all the elements of a successful IED attack. The perpetrators noticed the opportunity for a potential attack and followed this by observing their target's behaviour until a pattern emerged – in this case congregating around the tap at the end of the game. A plan was formed around this observed pattern and the device was emplaced over a series of nights. The plan placed the firing point in an area of good cover, an olive grove which offered an escape route, but there must have been poor visibility from there to the contact point at the tap. Therefore the perpetrators employed two girls to act as observers and signallers (what would later be termed 'dickers' by the army in Northern Ireland). Finally the perpetrators must have had at least the acquiescence, if not the active support, of the local population in the form of the teachers and school children. Their very presence would have reduced any suspicions the soldiers may have had and they covered the perpetrator's movements. Two soldiers were killed in this attack and it must be concluded that their (or their unit's) lack of suspicion – naivety even – and setting of patterns contributed to their grisly fate.

The EOD technique of remotely opening suspect packages using detonating cord was in use at this time and those devices that were deemed too dangerous to dismantle were destroyed in situ, but most IEDs were dismantled by hand. Main charges were usually destroyed by demolition after a sample had been taken. The principle of gaining forensic evidence from IEDs and using this to gain convictions was established during this campaign. Over the course of the campaign the RAOC IOOs and Ammunition Examiners (AE), as ATs were known at this time, rendered safe 4688 IEDS. They also investigated 4300 explosions and attended nearly 3000 recoveries of weapons and explosives. Two AEs were killed while dealing with EOKA devices in Cyprus.
The campaigns in Aden and Hong Kong developed along similar lines. The first attacks in Aden took place in 1958. They achieved little and, with a few minor exceptions, effective police action forced a lull until 1964. Thereafter attacks increased until the British withdrawal in 1967. As in Cyprus, initially IEDs were crude but quickly developed. As well as typical time devices, the terrorists deployed improvised mortars and rockets against security forces bases. From an EOD perspective, little had changed from Cyprus and most devices were dismantled by hand. The garrison ATOs dealt with over 700 IEDs in this way. It is interesting to observe the security force’s attitude to the damage of property that may occur during EOD operations at this time, as shown in the following extract from a technical report on a complex IED attack:

The 3 hours taken from their arrival for the investigating officers to gain access to the explosives was, in the circumstances, unacceptable. In this case where one time device was functioning (albeit inefficiently) the risk to the officer whose task it was to neutralise it, and to innocent persons was enhanced. It is recommended that when military assistance is sought, the civil authority should be given clearly to understand
that immediate access is mandatory even if this should mean damage to property to the extent of breaking in doors and windows, or perhaps causing some offence to civil dignitaries.\textsuperscript{49}

An unwillingness to damage property was to be a factor in the death of an ATO in Northern Ireland.

\textbf{Figure 2.8: IED in Aden, disguised in a vacuum flask. These devices were initiated by time, but also had a victim operated circuit. If the explosives were pulled from the flask, the device would function. The ATO dismantled this by hand.}\textsuperscript{50}

The terrorists in Hong Kong never achieved the level of technical and tactical ability displayed in Palestine, Cyprus or even Aden but they succeeded in causing considerable disruption due to the sheer number of IEDs and hoax devices they deployed. RAOC dealt with 8960 incidents in a 7 month period.\textsuperscript{51} One ATO was killed during IEDD operations in Hong Kong.\textsuperscript{52}
Figures 2.9 (top), 2.10 (centre) and 2.11 (bottom): IEDD in Hong Kong 1967. A remarkable series of photographs showing SSgt Les Reynolds attempting to render safe an IED, which then functions. Note how close the police remain while the RSP is being carried out.⁵³
International terrorism as we now understand it also appeared in the late 1960s and this led to a number of IED incidents in Great Britain.\(^{54}\)

**NORTHERN IRELAND**

Operation Harvest was the IRA’s code name for their campaign against British targets along the border. This border campaign started in December 1956 and lasted until 26 February 1962, when the IRA leadership ordered its full time active service volunteers to ‘withdraw and dump their arms’.\(^{55}\) Time IEDs and CWIEDs were used against Royal Ulster Constabulary (RUC) stations, customs posts, army barracks and, occasionally, RUC or army patrols. In total, 6 RUC officers and 11 IRA men were killed during the campaign. Of the IRA men, five were killed by their own devices prematurely exploding – four of them in one incident at Edentubber in the Republic of Ireland in November 1957.\(^{56}\) The RAOC had responsibility for dealing with any unexploded devices, but often untrained police officers took it upon themselves to dismantle the devices. Whether police or RAOC, the most common method of rendering devices safe was hand entry and manual dismantling.\(^{57}\)

In 1966, events in Ireland, north and south, foreshadowed, things to come. IEDs were discovered in a West Belfast school\(^{58}\) and the IRA commemorated the 50\(^{th}\) anniversary of the Easter 1916 rebellion by destroying Nelson’s Column in Dublin with explosives.\(^{59}\) In March and April 1969, the Ulster Volunteer Force (UVF) caused a series of explosions across Northern Ireland, targeting water pipelines and electricity sub stations. The attacks were intended to appear to be the work of the IRA and did play a role in the fall of Terrence O’ Neill, Northern Ireland’s Prime Minister\(^{60}\). In October 1969, a UVF member, Thomas McDowell, died from injuries he received while placing a bomb at an electricity sub-station in Co Donegal in the Republic of Ireland.\(^{61}\)

Violence continued sporadically throughout 1968 and flared into sustained rioting in 1969. The army deployed onto the streets in August 1969\(^{62}\) and the Republican IED also made its re-appearance. Most were small, crude devices at this stage but they certainly had the capacity to kill, damage property and cause disruption – a fact recognised by both the Security Forces (SF) and the terrorists. IEDD remained the
responsible of the ATOs attached to Northern Ireland’s peacetime garrison until 321 EOD Unit deployed in 1970.63

IEDs in Northern Ireland have ranged in sophistication from schoolboy crudities to professionally designed feats of engineering skill. They have varied in effectiveness from totally unviable to lethally capable and terrorists have evolved their level of skill and ingenuity throughout the conflict. PIRA, in particular, gained a reputation for technical ingenuity. More importantly, they quickly grasped the significance of tactics. They learned to observe Security Forces (SF) patterns, predict SF reactions to incidents and exploit them to lure SF personnel into killing zones – the classic ‘come on’. This ability set them apart from other terrorist organisations. Loyalist paramilitaries have occasionally displayed technical ability but rarely matched their Republican counterparts.

Throughout the campaign, ATOs and the terrorists have played a deadly game of cat and mouse - one side achieving an advantage, only to have it nullified by a technical or tactical advance by the other. Measure was met with counter-measure, counter-counter-measure and so on. PIRA recognised that successful EOD action was having a detrimental effect on their campaign. The positive publicity this was generating for the SF led PIRA to view EOD teams as prestige targets and they began specifically targeting ATOs in 1971.64

The early 1970s was the busiest time for EOD tasks and was also the period when the majority of EOD casualties occurred. However, it would be misleading to simply ascribe the number of casualties to the intensity of tasks. By this logic, casualties must be accepted as inevitable and variable with the level of EOD activity. Aside from any principled objection to this, the statistics simply do not support this theory.65

PIRA and its offshoots never lost the desire to kill EOD operators. While the overall level of tasks dropped after the mid 1970s, the terrorists’ technical and tactical expertise continued to grow. PIRA arguably reached a peak of proficiency in the late 1980s and early 1990s but overall they had little success at targeting ATOs. This brings us back to our original question: What had changed to make IEDD apparently safer in the later years?
INTRODUCTION

The author sees this thesis as a piece of research into a very specific area of recent military history. There has been much debate as to whether history properly belongs to the humanities or the social sciences. This thesis makes no effort to add to that debate. Instead, an interdisciplinary approach was taken, drawing from both traditions. The data has been collected from four main sources, discussed below. A hypothetico-deductive method\(^1\) has been deliberately avoided. Instead, concepts and theories have emerged from the data. In doing so, elements of Grounded Theory\(^2\) have been employed.

This is a qualitative and interpretative\(^3\) inquiry – it is concerned not only with the events that occurred but how and why they occurred and, most importantly, how and why protagonists responded to those events. It describes and analyses the nature of the development of the British approach to IEDD.

However, there is a quantitative\(^4\) element as well. Statistics have been used and manipulated to show the number and distribution of bombing incidents, for example, as well as the EOD casualties and other matters. These must be examined if a useful analysis is to be arrived at. However, where quantitative techniques appear, they are descriptive and are used to support the qualitative explanations.

Epistemology

Epistemology can be defined as:

 The theory of knowledge, especially the enquiry into what is to count as knowledge, the validity of knowledge, what distinguishes mere belief from knowledge, what kinds of things are knowable, and whether anything can be known for certain.\(^5\)
The starting point for this thesis is that certain key truths exist and are knowable. In this respect it borrows from the Platonic tradition of knowledge.\textsuperscript{6} The key truths in this case are that the conduct of EOD operations was informed by the extant \textit{doctrine}. This \textit{doctrine}, and hence the conduct of operations, was substantially different at the end of Operation BANNER from that which existed at its start and that this difference was brought about by reactions to events that occurred in Northern Ireland in the early 1970s.

The approach adopted has been largely an empirical one, as the bulk of the knowledge has emerged from observable evidence, provided mainly by documents. However, there is an element of constructivism, in that a proportion of the knowledge has been developed from the testimony of participants and, to a degree, their truth exists as constructs in their minds. An important task has been to reconcile differences that these two approaches have evidenced. In most cases there was little outright conflict but where issues could not be resolved that would incorporate both approaches, the empirical one has been preferred.

**Ontology and Participant / practitioner bias**

Ontology can be defined as:

> The branch of metaphysics devoted to the study of the nature of being or existence or the essence of things, including the distinction between reality and appearance and whether mathematical entities exist outside of people’s minds.\textsuperscript{7}

An issue that must be addressed early in this thesis is that of participant or practitioner bias.\textsuperscript{8} The author did not take part in any of the events under discussion. However he is a qualified and experienced IEDD operator. It may be argued that prior knowledge of the topic under examination reduces the ‘stranger value’.\textsuperscript{9} That is to say that a study undertaken by someone not connected with IEDD could yield fresh insights not available to a researcher already familiar with the subject matter. A counterpoint to this is that a practitioner in the subject area brings insider knowledge and already has some insight into the actions and decisions of those under study.
The author’s ontological position is that he possesses the benefits of both viewpoints. On the one hand, the author’s training and experience means that he knows what it feels like to tackle a live IED, therefore allowing him some genuine insight and empathy with his forebears. It also enables him to understand the raw data more readily than most and this, hopefully, means that he can translate this into prose that is readily understandable to academics, soldiers and laymen alike. On the other hand, sufficient time has passed, and the conduct of operations has changed so much, that he can also bring to bear the detachment needed to produce an objective and unbiased piece of work.

**GROUNDED THEORY**

The method employed within the qualitative methodological tradition in this thesis has its basis in Grounded Theory, in that rather than testing preconceived hypotheses using logico-deductive methods, the theory has emerged from the data. This chapter will show how a Grounded Theory approach has been used, and where the methodology has necessarily deviated from it.

Grounded Theory was initially developed by Glaser and Strauss and published in 1967 as an alternative to the, then current, trend for verification of existing theory over the generation of new theory.\(^{10}\) Grounded Theory was developed by, and for, sociologists, but it can be used for research in most social science fields. Although Glaser and Strauss saw ‘no fundamental clash between the purposes and capacities of qualitative and quantitative methods or data’\(^{11}\), in practice it is been best suited to qualitative studies, exploratory research and studies of human interaction.\(^{12}\)

This research technique was chosen for this work mainly due to its exploratory nature. Little academic work has been done in this area. The author is unaware of any relevant hypotheses to test or pre-existing theories to verify.

Another benefit of this approach has been its power to develop concepts and theories, both substantive and formal. The strength of theories that are grounded in data are that:

because they are drawn from data, they are likely to offer insight, enhance understanding, and provide a meaningful guide to action.\(^{13}\)
Substantive and Formal Theories

Strauss and Corbin described a theory as ‘a set of relationships that offers a plausible explanation of the phenomenon under study’. Substantive theories describe and explain ‘substantive and empirical areas of enquiry’ and Glaser, Strauss and Corbin offer such examples of patient care and race relations. Formal theory is at a higher level of abstraction but Glaser and Strauss describe them both as ‘middle range’, falling between minor working hypotheses and grand theory. This work produces a number of minor substantive theories – examples include explaining the events that led up to the deaths of ATOs and explaining the development of certain doctrinal tenets – as well as one formal theory. This is the theory of IEDD Risk that is developed in Chapter Nine.

The author will argue that this theory is capable of generalisation. It can be applied to operations anywhere in the world, and at any time, albeit only within the EOD arena. Like the explanation of how the British approach to IEDD was developed, it is of practical significance, both to the operators who served in the 1970s, who may find it helpful to understand why their colleagues died, and to current and future operators who will not only be able to apply the lessons learned but, equally importantly, will be able to understand why the lessons were learned at all. The IEDD Risk theory will hopefully demonstrate its face validity and find a place in the training of current and future operators.

Open Mindedness

One of the tenets of Grounded Theory is that the researcher should approach the subject with an open mind and, ideally, no prior reading so that pre-existing theories do not influence or inhibit the emergence of new grounded theories. This is clearly not possible in this case due to the author’s career history. However, every effort has been made to retain an open mind and this has been reflected in a number of conclusions that have contradicted some of the generally accepted conventions of IEDD. Moreover, an open mind does not mean a blank mind. A researcher can be aware of existing knowledge and theories, but should not use them to make sense of the data.
Theoretical Sampling and Saturation

The multi-method approach (methodological triangulation) discussed below fits well with Grounded Theory in that the choice of data sampled has been ‘controlled by the emerging theory’\textsuperscript{18}. Although the author had a broad idea of what data to look for and where to find it, the specific details of this were not planned in advance. Particularly with the primary sources, the choice of which groups of documents to examine in detail was only made after a broad survey was completed and the author began developing ideas of where the research would take him. This process continued throughout the research as the ideas developed further until the data was exhausted, or the point of theoretical saturation was reached. Saturation in this context means the point is reached ‘when additional analysis no longer contributes to discovering anything new about a category’.\textsuperscript{19}

Constant Comparison

The different sources of information can be described ‘slices of data’\textsuperscript{20} and these lend themselves well to a constant comparative method. The separate pieces of data were continually evaluated against another to tease out differences and similarities. Quite often, the juxtaposition of two pieces of data from different sources threw up contradictions, frequently requiring a judgement of some sort to be made on the reliability of either source.

HISTORICAL METHOD

Thuren\textsuperscript{21} cites seven principles of Source Criticism. Of particular use to this work was the principle that

\begin{quote}
    a primary source is more reliable than a secondary source, that is more reliable than a tertiary source and so on.\textsuperscript{22}
\end{quote}

This was important because it was often found that the primary and secondary sources differed and judgments had to be made on the reliability of each. These judgments were based on two other principles:

\begin{quote}
    The tendency of a source is its motivation for providing some kind of bias. Tendencies should be minimized or supplemented with opposite motivations\textsuperscript{23}
\end{quote}
If it can be demonstrated that the witness (or source) has no direct interest in creating bias, the credibility of the message is increased.\(^{24}\)

McDowell offers much advice on the evaluation of primary sources, which has proved valuable. The following checklist was especially useful:

- Consider whether documents were intended as a purely factual record of events.
- Observe whether documents were intended to be seen by the public or a much more restricted audience.
- Determine whether the documents were expected to remain confidential.
- Decide whether the author of a document was an expert in relation to the issues or topics discussed.\(^ {25}\)

This is important as the Northern Ireland conflict was, and remains, a deeply emotive matter to many people – terrorist, security forces and civilian bystanders alike. Many of the secondary sources were memoirs and autobiographies which carry an inherent risk of bias and self justification. Others were journalistic works and ‘popular’ histories, as well as academic texts, which relied on interviews with protagonists which can be equally hazardous as sources. However, the primary sources were treated with a degree of caution as well. The author knows from his own experience that EOD operators do sometimes exaggerate, or give a slightly inaccurate account of their actions (perhaps to conceal doing something they should not have) or simply make mistakes or incorrect assessments. They are but human.

In the case of the fatality investigation reports, much of the data is derived from witness statements, and most of these reports also contain copies of the original statements. The Royal Military Police and the ATOs of EOD Branch HQNI were trained and experienced in incident investigation and should have treated all statements with a healthy and disinterested degree of scepticism. In order to do the same, the author has relied on his own training and also drew upon Schafer’s checklist for assessing the testimony of eyewitnesses which, incidentally, is very similar to the training provided to ATOs.\(^ {26}\)
DATA COLLECTION TECHNIQUES

No single method of data collection would have sufficed for this research, so a multi-method approach has been chosen. Library based research allowed the scene to be set and the general background to the Northern Ireland conflict to be understood. Primary sources in the form of documents provided the bulk of the raw data. Questionnaires provided data based from a relatively large number of respondents and added colour, detail and personal experience. Interviews provided the same in a less structured format and allowed the author and the respondent to discuss the issues raised by the questionnaires in more depth. More data was obtained through questionnaires than interviews, due to the logistic difficulties of meeting respondents, meaning that the questionnaires offered a relatively broad sample, while the interviews gave a narrower but deeper sample of data. The use of multi-methods can be described as triangulation:

![Methodological triangulation](image)

All four sources served to complement each other. Often, differing sources served to corroborate one another but they could also be used to dispute certain accounts.

Library Based Research

The library based research consisted of a review of published open source works relevant to the subject. There is a mass of literature about the political, social, economic and broader military aspects of the conflict in Northern Ireland, but very
little has been written on the subject of IEDs and IEDD there. What has been written and was of use to this study is discussed in the literature review at Chapter Four.

The library based research served a valuable function in giving the author a sound grounding (or perhaps a refreshing) in the history and politics of the conflict in Northern Ireland. Although the political aspects of the conflict are not addressed in this work, no historical event, however minor, stands in isolation and context is the key to understanding. Of great value were the many histories and analyses of the IRA and its offshoots. Many of these books contained first hand accounts by IRA members, or interviews with them, and these were of particular value in gaining some insight into their actions and motivations. Similarly useful were biographies and autobiographies of former IRA men. Of course, all such works need to be treated with a degree of caution – as do memoirs of soldiers – due to the inherent risk of bias and self justification. Very often the information in the primary sources, which were not available at the time of the events or when the books were published, has been at odds with the details in these accounts. Many of these accounts have gone unchallenged and some of their details have been repeated unquestioned by journalists and historians.

**Primary Source Document Research**

Primary source documents were by far the largest source of data. Some of these original documents, particularly those relating to EOD before Operation BANNER, are held at The National Archive, Kew. Most, however, are held by army units and training establishments. These included letters and memoranda; EOD tasking logs; EOD incident reports; reports on the investigations into EOD casualties; current and historical military pamphlets and précis; Weapons Intelligence reports and Forensic Science reports.

The EOD tasking logs and EOD reports presented the bulk of the raw material. The HQNI EOD Branch archive, currently lodged with the 38 (Irish) Brigade G9 (Policy and Legal Branch) Operational Archive at Thiepval Barracks, Lisburn, has a copy of every single EOD incident report that was produced between 1969 and 2007, barring a small number that have been lost. That amounts to over 56000 documents.
Reports produced before 1986 have been transferred to microfiche format. The remainder are held on paper and those produced after 1998 are also held electronically.

The EOD tasking logs summarised the contents of the reports, so a survey was made of these. Those incidents deemed to be significant were coded. The criteria of significance was largely in accordance with the accepted military definition of a significant IED incident. These are incidents involving Vehicle Borne IEDs, command initiated IEDs, Victim Operated IEDs, incidents where a new device or tactic - or a development of an existing device or tactic – was used; and incidents where fatalities or serious injuries have occurred.29

Once identified as significant, the outline details would be entered onto a Microsoft Access database entitled the Significant Incident Database. The original report would then be located in the archive and the salient details of its contents would also be entered onto the database. The majority of incidents that occurred in Northern Ireland were not classified as significant, so are not recorded on the database. However what the database does is give an accurate and searchable record of how IEDs developed in Northern Ireland and, in some case, how Render Safe Procedures developed with them. Where deaths occurred, this is cross referenced to McKittrick et al.30 The database has 49 separate columns, so is too large to reproduce here. A sample is shown at Appendix B. The data from the tasking logs and EOD reports formed the basis of Chapter Five, which describes the developing IED threat in Northern Ireland, and also provided examples of specific Render Safe Procedures for Chapter Six, which discusses the IEDD situation at the start of Operation BANNER.

Chapter Six also draws heavily upon the doctrinal instruments of the day that governed the conduct of IEDD operations. These included Ammunition and Explosives Regulations and Standing Operating Procedures.

One of the most important sources of data was the reports on the investigations into EOD casualties. Every time an injury or death resulting from an explosion occurred among EOD personnel a thorough and exhaustive investigation was carried out.
The results of these investigations were compiled into reports. Usually more than one agency carried out an investigation. The Royal Military Police (RMP) conducted investigations with a view to future prosecution of perpetrators, as all deaths of security forces due to terrorist activity were treated as murders. EOD Branch of Headquarters Northern Ireland (HQNI) also carried out an investigation with a view to learning any tactical and technical lessons. On occasion higher formations also completed their own investigations, as did the Deputy Brigade Commander of 3 Infantry Brigade after the incident at Cortreasla on 17 July 1975. All of these reports, along with any original witness statements are retained by 321 EOD Squadron, RLC at Aldergrove. These reports were summarised and analysed in order to produce the case studies that make up Chapter Seven and parts of Chapter Eight, and these in turn fed into the analysis found at Chapter Nine.

**Questionnaires**

Questionnaires were sent to a number of former EOD personnel who served in Northern Ireland in the period under scrutiny, especially those who served in the early 1970s. The aim was to set the questionnaire to as many former operators as possible in order to broaden the sample. This was difficult as very few are still serving in any capacity and many have passed away. The Association of Ammunition Technicians and the Royal Army Ordnance Corps Association proved invaluable in tracking down and making contact with former operators. Due to the two Associations’ help a high proportion of those who were contacted responded in one form or another.

The same questionnaire was sent to all respondents, regardless of when and where they served. The questionnaire was made up of a mixture of closed and open questions, with open predominating, and each respondent was given space to include any other data that they felt was relevant, but was not covered by the questions. Appendix C shows an example of the questionnaire. Once all of the responses were received a consolidated data sheet was produced. The answers were laid out in the order of when the respondents served in Northern Ireland, from 1969 to 1979, with the earliest first. This chronological list of answers proved to be extremely useful as the changing answers to the same question clearly showed how each aspect of IEDD developed.
Interviews

Where possible, questionnaires were followed up with interviews. This was to allow interesting points raised in the questionnaires to be explored more fully and to offer the respondents the opportunity to expand upon their experiences and opinions. Far fewer interviews were conducted than questionnaires, mainly due to the logistics of travelling all over the UK (and in some cases abroad) to meet respondents. A few interviews were conducted over the telephone.

The interviews were conducted in a semi-structured fashion. The author had a copy of the respondents’ completed questionnaire and a list of issues to be addressed, but the interviewees were allowed full scope to discuss the areas they felt to be important. Notes were made during the interviews. The contents of the notes were reviewed and coded. In some cases, extracts from the interviews were quoted verbatim in later chapters.

Respondent Anonymity

After the research was completed, all respondents were contacted to ask if they would like to have their names cited where they have been quoted in the text, or to be cited anonymously. Four had no objection to being cited by name. Two expressed a wish to remain anonymous and the remainder did not respond. The author decided to cite all respondents anonymously and their names have been replaced by a code. Each respondent has been cited as ‘ATO’ followed by a number, eg ATO 6. The author holds a list of all the respondents’ names and which codes apply to them, should interested and appropriate parties have a need to see them.

Similarly, when incidents have been referred to, names have been redacted unless the person has given permission for their name to be published or the person is deceased. The only exceptions to this are where open source documents have been quoted and names are already in the public domain.
Aspiration to Interview Former Terrorists

It was an aspiration to interview former terrorists on their actions during the campaign and specifically their attitudes to EOD teams and their approaches to targeting them. This raised a number of problems. Firstly the author was a serving soldier for most of the period the research was undertaken, so there was an obvious security issue to be addressed. It was accepted that locating and making contact with former PIRA members would be difficult and that most would be reluctant to talk about their exploits, particularly to a British soldier. Even if they are no longer active participants in operations, most will still be confirmed republicans. Many would also be former prisoners, convicted of serious crimes, which would raise an ethical issue. Those that have not been convicted would obviously not wish to incriminate themselves. The author sought ways to fulfil this aspiration that would accord with his status and duties as a serving soldier and address the ethical issues raised, but this has not met with success. In the absence of this data, the author has relied on secondary sources to provide details of the actions and motivations of PIRA members.

Reference Database

Whenever a source of data has been used in the research its details have been recorded in an Microsoft Access database. The database is divided into six sections to aid in finding the reference. These are Articles; Books; Military Publications; Reports and Letters (other than those found at The National Archive); University theses and dissertations; and documents found at The National Archive. Not included on this database are EOD and IEDD reports. Instead, these have been entered onto the Significant Incident Database.

To explain how this Reference Database was used, let us take the example of a reference drawn from MLR Smith’s 1996 book, ‘Fighting For Ireland? The Military Strategy of The Irish Republican Movement’ which was published by Routledge, London. The section for books is divided into five columns: Author; Title; Publisher, Date of Publication and Complete Reference. The first four columns would be filled with the relevant information and into the final column would go the full reference as
cited in this work. Because of the way Access can be filtered, should the need arise to find the reference again, it can be searched for alphabetically by author, title or publisher, or chronologically by date of publication. Once found, the whole citation can be copied and pasted into the relevant place. This database also proved extremely useful when compiling the bibliography.

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*Figure 3.2: Sample of Reference Database.*
THE DEVELOPMENT OF THE BRITISH APPROACH TO
IMPROVISED EXPLOSIVE DEVICE DISPOSAL
IN NORTHERN IRELAND

CHAPTER FOUR
LITERATURE REVIEW

INTRODUCTION

On the whole, the open source literature relating to bomb disposal in general and IEDD in Northern Ireland in particular is rather limited. Most of the available literature is general and non-academic in nature. For this review, the literature has been divided into three categories. Historic and Thematic Studies covers those general histories, military unit histories and thematic studies that give partial or complete treatment to IEDD in Northern Ireland. As will be seen, some are straightforward chronological narratives of events, while others treat the subject by themes, or are a mixture of the two approaches. Memoirs and Autobiography discusses works produced by participants, mainly former ATOs, describing their actions and events that occurred during their time in Northern Ireland. Also included in this section are books made up of transcripts of interviews, some of which include contributions from former EOD operators. Works Relating to Specific Aspects of IEDD covers tracts produced on limited areas, usually technical or academic in nature, that have some bearing on this work.

An important part of the body of literature are the primary sources, such as EOD reports, casualty investigation reports, forensic science reports and military publications. These documents were discussed in Chapter Three so will not be considered further in this chapter.

HISTORICAL AND THEMATIC STUDIES

Brigadier Peter MacDonald had a long and successful career as an ATO, which culminated in his serving as the Director of Land Service Ammunition (DLSA). This was the head of the army’s ammunition profession and the lead authority for IEDD. In 1977 he published Stopping The Clock1 which is a remarkably comprehensive treatment of the subject, organised by themes. He discusses, by turn, the political organisations that used IEDs and how IEDs are made up. This is followed by two
chapters on bomb disposal men, the risks they faced and the personnel selection methods used at the time (1977). The next three chapters are the most pertinent to this work as they discuss how IEDD was carried out, what the IEDD philosophy was and what equipment was used. Finally MacDonald summarises the IED campaigns in Cyprus, Aden, Hong Kong and Northern Ireland. Obviously, given the extant terrorist threat at the time of publication, MacDonald does not go into any great technical detail about Render Safe Procedures, but there is a great deal of detail and it served as a very useful tool for this author to gain an overview of IEDD as it stood in the mid 1970s. MacDonald also offers a theory of how revolutionary terrorist bombing campaigns develop. He says they have four overlapping stages: Shocking actions that bring the revolutionary organisation to the notice of the public; publicizing the cause and convincing the target population that the revolutionaries are acting in their interests in order to attract popular support; gaining strength while organising, financing and supplying the organisation; and finally an all out assault on the forces of the state, which will weaken them and provoke them into over-reaction. He applies this theory to the IED campaigns that he discusses.

Ten years later Major Arthur Hogben offered the first attempt to provide an overarching history of the British experience of Explosive Ordnance Disposal – including IEDD – in his book Designed To Kill. This encompasses the story of bomb disposal from 1915 to 1982. However, it is largely concerned with the disposal of conventional air dropped bombs in the UK during the Second World War, with a brief chapter on EOD such as it was before 1939 at the start and a penultimate chapter on the campaigns since 1945. Finally there is a chapter which deals with the situation at the time of writing (1987), which includes a section on IEDD.

It is also largely a history of Royal Engineers bomb disposal, and this is perhaps unsurprising as the author is a retired RE Bomb Disposal Officer (BDO). Mention is made throughout the chapters on the Second World War of the contribution of the RN and RAF, but little is said of the RAOC apart from a brief mention at the start and a short account of the early stages of the siege of Malta, where two George Crosses were awarded to RAOC IOOs for the disposal of air dropped bombs. The Chapters on the war time clear up and the post war years make no mention of RAOC at all, despite their being responsible for around 70% of all EOD activity. The last chapter
is interesting not for what is says about the development of IEDD – which is very little – but what is says about the RE attitude to IEDD. It should perhaps be of little surprise that books written from a single service or cap-badge viewpoint are apt to show a degree of parochialism – both RE and RAOC centred books - and this is no exception. For example Hogben explains why he thinks RAOC were responsible for IEDD:

After the end of the Second World War and prior to 1970, explosive devices had been used against British Forces and interests in such places as Palestine, Hong Kong, Cyprus and Aden. Initially these bombs tended to lack complex fuzing systems, the most common type being a few sticks of plastic explosives with an electric detonator and a simple clock to complete the firing circuit.

For many years one of the responsibilities of the Ammunition Technical Officers of the Royal Army Ordnance Corps has been the disposal of bulk explosive which has become unsafe due to storage conditions or old age. Thus when packets of unsafe explosive were discovered, it seemed only natural, at that time, that the Royal Army Ordnance Corps should be responsible for their disposal, even if this lack of safety was solely man made. Thus the Royal Army Ordnance Corps accepted the responsibility for disposal of improvised explosive devices.\(^5\)

Hogben does not mention that RAOC and its forebears held the formal responsibility for all army EOD until 1940 and that RE only became involved when it was realised that large air dropped bombs tended to tunnel into the ground if they did not explode, and that there were too few IOOs. He also makes a very nebulous claim about ‘packets of explosive’, which seems to suggest that RAOC were only involved by default and not because of their long technical training based around the first principles of explosive theory and munitions design. The phrase ‘at that time’ is telling. It seems clear that Hogben believes that IEDD should naturally be an RE responsibility and that had complex IEDs appeared immediately, then RE would have been made responsible for their disposal. In this he is mistaken on two counts. Firstly, complex IEDs were encountered – and early on – in Palestine, Cyprus and Aden. These included VOIEDs, CWIEDs and improvised mortars. Secondly, many of the first IEDs encountered by British forces after the Second World War incorporated components or complete switches from conventional mines and booby
traps, hence in many cases sappers were called in to deal with them. As IEDs became more complex and incorporated more non standard or non military components or were deployed in more imaginative ways, responsibility for dealing with them passed from RE to RAOC who were then able to apply first principles.\(^6\)

Later on Hogben states that although RAOC dealt with all IEDs in Northern Ireland, the situation was not so clear in Great Britain:

\[
\text{the Royal Navy and Royal Air Force are, in conjunction with the civil police, responsible for improvised explosive devices on their own property and the Royal Engineers also have responsibilities in respect of these devices. Similarly, the Metropolitan Police also have their own explosives officers trained to deal with explosive devices. Consequently, in addition to the Royal Army Ordnance Corps; the Royal Navy, Royal Air Force and Royal Engineers, EOD units all have trained IED operators equipped with the latest countermeasures and may be called upon to at any time assist the civil powers.}\(^7\)
\]

Hogben was correct in that the RN, RE and RAF did, and do, contribute to the IEDD effort but simply listing all of the agencies involved does not explain where the main burden of responsibility for IEDs, and indeed the majority of EOD activity, lay and continues to lie. At the time of its writing the RN had 6 IEDD team kits in 3 locations – Rosyth, Portsmouth and Plymouth. RAF and RE each had 2 team kits in one location each – Wittering and Chattenden respectively. Each location had one team available for immediate call out at any time. The RE team was limited to dealing with IEDs within 5 miles of Chattenden. When 33 Engineer Regiment (EOD) RE moved to Wimbish in Cambridgeshire the five mile limit remained until their IEDD team kits were withdrawn in 1996. RE now have no IEDD role in the UK at all apart from search support to IEDD operations. RAOC – and now RLC - formally lead in IEDD and could field some 40 IEDD teams located across the UK. Hogben is correct in saying that formally each of the services is responsible for EOD on its own property. However, the overriding principle in tasking EOD teams is to task the nearest available team qualified and equipped to deal with that type of incident. So if there was an IED incident in, say, RAF Leuchars, the RAOC/RLC IEDD team from Edinburgh would attend, rather than send an RAF team 250 miles from Wittering.
Similarly, an IED close to Wittering would be dealt with by an RAF team despite being off RAF property.

A further ten years passed before Peter Birchall’s *The Longest Walk – The World Of Bomb Disposal* was published. Birchall is a former RAOC Ammunition Examiner and, like Hogben, he attempts to cover the whole story of bomb disposal but, also like Hogben, he gives us a viewpoint similarly slanted in favour of his own corps, the RAOC. Sadly, this is not the book it could have been, being largely devoted to anecdotes and extraneous detail. However it does offer some glimpses into the less well known campaigns – the Boer war and the post World War clear ups, for example, and serves as a useful starting point for those wishing to research these aspects of EOD.

In contrast to the rather superficial treatment he offers most of the subjects he covers, Birchall’s book also contains a surprisingly detailed and useful section on the selection and training of ATs and ATOs being deployed on IEDD operations – particularly that relating to psychometric testing. But overall this book leaves a hunger for information and raises more questions than it answers.

As can be seen from the two books mentioned above, any work that attempts to cover the entirety of EOD within the British army, or deals with the relationship between RE and RAOC, must confront the danger of exhibiting bias towards one corps and the other. This is not helped by the fact that most of the literature is written by former operators and this is compounded when we get to Unit and Corps histories – especially the official histories. In this case we have the *History Of The Corps Of Royal Engineers, Volumess IX – X* on the one hand and Fernyhough’s *A History of the Royal Army Ordnance Corps 1920 – 1945*, Phelps’s *A History of the Royal Army Ordnance Corps 1945 -1982*, and Steer’s *To The Warrior His Arms* on the other. All of these are large volumes describing the activities of large corps over a long period of time and in some detail. None are devoted solely to EOD but all make some mention of it, sometimes only in passing.

Two works that were published within a year of each other give arguably the best review of the history of IEDD in Northern Ireland. These were Chris Ryder’s *A Special Kind of Courage* and Colonel Steve Smith’s *3-2-1 Bomb Gone*. Ryder is
a respected journalist and author, while Smith was a serving ATO, actually the Principal ATO (PATO) or head of the ammunition trade, at the time of the book’s publication. Their differing backgrounds and skill set are reflected in their work. Ryder’s book is a straightforward unit history, told in chronological order. Smith deals with themes, rather than a strict chronology, starting off with a discussion of IEDD in the early years of the campaign, before moving onto specific terrorist methods, such as VOIEDs, ambushes and mortars. Finally he discusses how the threats were countered and what it is like to be an EOD operator in Northern Ireland. In many ways, Smith’s treatment of the subject is similar to that of MacDonald, albeit updated by nearly thirty years. Both Smith and Ryder contain descriptions of specific incidents and first hand accounts by former ATOs. These have proved very useful for illustrative purposes and some have been quoted later on in this thesis. These touch on the development of IEDD doctrine but do not go into any great detail. However they offer the best overall picture of IEDD in Northern Ireland that is in the public domain and the author recommends that they should be read in conjunction with one another.

MEMOIRS AND AUTOBIOGRAPHY

Five former ATOs have published their memoirs and autobiographies and, in most cases, as well as describing their own actions they offer a useful picture and some analysis of the situation at the time as they saw it. The first two were written by officers who commanded the whole EOD effort in Northern Ireland and they give a slightly different perspective from the later three which were written by authors who were operators commanding individual EOD teams.

Lieutenant Colonel George Styles GC served as a major and was the Senior Ammunition Technical Officer (SATO) in Northern Ireland from 1969 to late 1971. The second half of his autobiography, *Bombs Have No Pity*, describes how he saw the PIRA bombing campaign develop almost from its inception and how he oversaw the RAOC response. Styles is invaluable in offering an insight into how IEDD was conducted in those very early days. He provides numerous first hand accounts of his actions, as well as descriptions of tasks conducted by other operators. During this research, however, a number of discrepancies arose between the primary
sources, EOD Reports mainly, and some of the accounts offered by Styles. Most concern minor details and are inconsequential, but others were more serious, especially the events surrounding Captain Stewardson’s death. It seems likely that Styles, perhaps naturally, indulged in a degree of self justification after he retired. Styles was a man of forthright opinions and was not afraid to publish them. However, some of his views were at odds with what we now know. His contention that the Northern Ireland troubles were orchestrated by international communism\textsuperscript{16} is not supported by any current scholars. His theory that the bombing of McGurk’s bar in December 1971, in which 15 civilians were killed, was the result of the premature functioning of a PIRA device that was being prepared on the premises\textsuperscript{17} was always doubted by many and was soundly disproved when a member of the UVF was convicted for the bombing in 1978.\textsuperscript{18}

It is useful to juxtapose the accounts of operations offered by Styles with those given by Lieutenant Colonel Derrick Patrick in *Fetch Felix- The Fight Against The Ulster Bombers 1976-77*.\textsuperscript{19} Patrick was the Chief Ammunition Technical Officer (CATO) in the period covered by the title, so served in Northern Ireland five years after Styles. By 1976 the IEDD *doctrine* had changed greatly and few operations were conducted in a way that Styles would have recognised. However, the *doctrine* was still developing at this stage, so Patrick shows us examples of operations being conducted differently from how they would be done today. Sergeant Martin Walsh was killed during Patrick’s tenure and he presents a very detailed account of his death, as well as his views on what caused it. Patrick is surprisingly forthcoming on this matter and his open source account accords very closely with that found in the official records.

Peter Gurney served as a WO1 in Northern Ireland in 1972, before going on to become an Explosives Officer with the Metropolitan Police. Most of his Autobiography *Braver Men Walk Away*\textsuperscript{20} deals with his later career with the police, but one chapter describes his 1972 tour in Northern Ireland, including an account of an accident that occurred with an early Wheelbarrow. Gurney’s account shows that the Metropolitan Police Explosives Officers operated largely in isolation from their former colleagues in the army. This meant that although the army’s IEDD *doctrine* continued to develop, the Metropolitan Police’s did not, and despite having similar
equipment to the army, in many respects the Explosives Officers appeared to remain **doctrinally** stuck in 1972, well into the 1990s.\(^{21}\)

Kevin Callaghan and Peter Wharton both served multiple tours in Northern Ireland, first in the early 1970s and then in the 1980s. As such their books *A Price On My Head*\(^{22}\) and *First Light – Bomb Disposal During The Ulster Campaign*\(^{23}\) should be able to throw some light on how IEDD changed in those times. Although there are descriptions of Render Safe Procedures in both books and the reader can see the differences in approach, the changes in **doctrine** are not explicitly mentioned.

Callaghans’s account, which is co-written with a journalist, makes the claim that PIRA paid bounties to its volunteers who killed a soldier, and that the bounty for an ATO in 1972 was £10,000. Callaghan states that he was told this by RUC officers, although he does maintain it was merely folklore.\(^{24}\) In later chapters PIRA’s attitude to ATOS will be discussed and this makes an interesting point in that discussion.

Two authors, working some twenty years apart, both intended to give voice to soldiers who served in Northern Ireland. These are Max Arthur’s 1987 book *Northern Ireland Soldiers Talking*\(^{25}\) and Wharton’s *A Long, Long War*.\(^{26}\) These works are largely made up of transcripts of interviews with serving or former service personnel. They offer first hand accounts with little or no accompanying commentary from Arthur or Wharton. Arthur’s book is organised thematically and includes a chapter on bombs and bomb disposal, whereas Wharton’s work is laid out chronologically. Most of the interviews are published anonymously. During the course of this research, the author has been able to recognise many of the incidents described, and therefore identify the operators involved. However, when these accounts have been used in this work, the operator’s anonymity has been preserved.

**WORKS RELATING TO SPECIFIC ASPECTS OF IEDD**

An interesting work that predates the start of Operation BANNER by four years is Lenz’s *Explosives and Bomb Disposal Guide*.\(^{27}\) Lenz was a bomb technician with the New York Police Department (NYPD). What makes this book relevant here is that many of the ideas we think of as being invented in Northern Ireland were actually thought of first in the United States and were later taken into use and further developed by ATOS who had access to the book in Northern Ireland. These ideas
included a protective suit and the use of shotguns as semi-remote disrupters. Also, many of the device types it mentions were later used by PIRA, so one must wonder if they had access to this book as well, perhaps through the strong Irish-American community in New York.

Numerous studies have been done to address a particular aspect of IEDD, normally in an attempt to arrive at a concrete solution for a particular problem. For example, psychological studies on the ideal candidate to train as an IEDD operator and the value of psychometric testing.

Cary L Cooper undertook a study in 1982 to assess a sample of operators who had served in Northern Ireland with a battery of psychometric tests, and published the results in *Personality Characteristics of Successful Bomb Disposal Experts*, Journal of Occupational Medicine, September 1982. He divided his sample of forty operators into twenty who had notably successful tours and twenty who had more average or less successful tours. His findings revealed that there was no great difference across the whole sample when intraphysical personality traits and clinical behaviour were assessed. However it strongly suggested that successful operators were less reliant on social interaction and approval as a motivation, and were more flexible and unconventional in their approach to their work and their lives in general.

A notable recent work is Oppenheimer’s ‘IRA: The Bombs and The Bullets – A History Of Deadly Ingenuity’ In it, Oppenheimer makes a serious attempt to trace the technical history of PIRA weaponry, much of it relating to IEDs. The work also includes a brief section on IEDD, supported by interviews with former operators. It is an ambitious work, broad in scope and covering a vast subject area in some detail. Unfortunately, the book is littered with factual errors on technical matters. Let us take one example, from early on in the book:

One of the largest bombs the organisation ever detonated, the 24 April 1993 Bishopsgate bomb, contained one tonne of ANFO – an ammonium nitrate and fuel oil mixture – and had the explosive power of a 1,200 kg TNT equivalent – that is as powerful as a small tactical (around 1 kiloton) nuclear weapon.

The power of Home Made Explosives are usually expressed as a ratio of equivalency to TNT. Here, Oppenheimer ascribes ANFO with a TNT equivalency of
1.2:1, which it does not have. 0.4 – 0.8:1 is much more typical. However, this is immaterial, as the main charge of the Bishopsgate bomb consisted of ANS (ammonium nitrate and sugar), not ANFO. \(^{31}\) ANS can be made to achieve 1.1:1 TNT equivalency, but it very much depends on the quality of the mixture and lower yields are more typical. \(^ {32}\) Oppenheimer seems to be confused about his units of mass. Even if the Bishopsgate bomb did have the power that Oppenheimer imputes, 1200 kgs of TNT is a tiny fraction of the yield of the smallest tactical nuclear weapon. 1200 kg is another way of writing 1.2 tonnes. A 1 kiloton nuclear device is equivalent to one thousand tons of TNT, not 1.2 tonnes. \(^ {33}\)

There are similar examples throughout the book – almost on every page, including an incorrect description of an incident that the author was involved in during 1994. This is probably of no importance to the general reader and does not detract from Oppenheimer’s overall achievement, but it is disappointing when Oppenheimer describes himself as an expert on terrorist explosives and bombs.

**RELATION OF LITERATURE TO THIS WORK**

The literature, as it stands, is largely descriptive. It tells us what happened – from a broad historical perspective or from personal experience – or it deals with a single aspect of the subject. It rarely tells us why events or, more specifically, change happened or what the contributing factors were. None of the literature directly addresses the question asked at the start of this work. Some, especially MacDonald, Ryder and Smith, do discuss changes in IEDD *doctrine* as they occurred but usually as part of a continuous narrative and in a purely descriptive way, offering little in the way of analysis.

It is of interest that, with a few exceptions (notably Ryder and Oppenheimer), nearly all of the major published works on this subject area have been produced by writers who have served in EOD in some capacity or another, quite often at a senior level. This raises the same issues that were discussed in Chapter Three, of participant or practitioner bias. The same arguments can be put – the knowledge and experience of the subject area, not available to the layman, can be balanced against the risk of bias and self justification. The problems of an ‘outsider’ approaching the subject are amply demonstrated by Oppenheimer. Most of his sources were secondary and
sometimes contradictory. Because he had little choice but to rely on the writings of others who in most case were no more, or perhaps less, qualified to speak on the subject than he is, his work is full of technical errors. Ryder largely avoided this by seeking assistance from the EOD establishment in Northern Ireland.\textsuperscript{34}

From reviewing the literature, it is clear that three significant knowledge gaps exist. Firstly there is no single document that describes and analyses the deaths of EOD operators in Northern Ireland. Each individual death was investigated at the time, but the results have not been published and the reports were not widely circulated, even within the EOD community. The published literature mentions the deaths individually, usually with a brief – and often incorrect – description of what happened, with no analysis. Only one detailed description, accompanied by some analysis, of an EOD death is available to academics and the public and that is Patrick’s account of Walsh’s death.

Secondly there has been no over-arching analysis of the factors surrounding successful PIRA attacks on EOD teams. Or, put another way, no one has published a document that asks ‘what was it that got EOD operators killed in Northern Ireland?’ If that question is answered, we can then extrapolate by asking, more generally, ‘what is it that gets EOD operators killed?’ The answer to this, if one can be found, can then be applied to the conduct of current and future operations and the training of current and future EOD operators.

Finally no work has drawn together what lessons were learned during the conduct of IEDD operations in Northern Ireland, particularly those lessons learned from the fatalities, to explain how the current IEDD \textit{doctrine} was formed. Such a work, presented in a single document, would enable academics, military and police commanders, and EOD operators to clearly see why the constraints imposed by the current \textit{doctrine} exist, and what the possible outcomes are of ignoring those constraints are.
THE DEVELOPMENT OF THE BRITISH APPROACH TO IMPROVISED EXPLOSIVE DEVICE DISPOSAL IN NORTHERN IRELAND

CHAPTER FIVE

THE DEVELOPING IED THREAT

INTRODUCTION

This chapter will outline how IEDs developed in Northern Ireland and how the tactics of their use changed. It is important to have some understanding of this as it directly relates to how the devices were tackled by EOD teams. The period of the early 1970s will be looked at in greater detail than later years, as this was when PIRA IED capability experienced the most dramatic growth and change. It is also when the majority of EOD casualties were sustained. Unsurprisingly it is also when IEDD doctrine changed and grew.

A comment often heard in and around the contemporary (2012) army is that insurgents in Iraq and Afghanistan developed an IED capability in eighteen months that took PIRA 30 years to achieve.¹ This is simply not true. PIRA’s IED capability developed as quickly as the tactical situation required and the readily available technology of the day would allow. It is true that between 2003 and 2005 insurgent’s IED capability in Iraq developed very quickly, but it must be remembered that they (Jaish Al Mahdi [JAM] at least, who presented the main threat to British forces in southern Iraq) were supplied and trained by Iran², which already had many years of experience of conducting IED campaigns against Israel in Lebanon, via their proxies in Hezbollah.³

PIRA had no such state support. While they received shipments of supplies from Libya in 1972 and 1973⁴ and again in the mid 1980s⁵, they did not receive complete IEDs or even complete circuits or components. But in the two years between mid 1970, when the bombing campaign began in earnest, and mid 1972 PIRA went from simple igniferously initiated blast bombs to complex Victim Operated IEDs (VOIEDs) that included collapsing circuits⁶ and light sensitive switches⁷, Vehicle Borne IEDs (VBIEDs)⁸, Radio Controlled IEDs (RCIEDs)⁹ and mortars¹⁰. A list showing the first kind of significant incident illustrates just how quickly PIRA developed:
Table 5.1: Significant PIRA IED ‘Firsts’.

The first attack listed was something of an isolated incident. It occurred before PIRA split from the ‘Official’ IRA and before the start of Op BANNER. So if that is set aside we can see that PIRA started its campaign in earnest in 1970 and had reached a considerable level of both technical and tactical sophistication within 18 – 20 months. We must ask both how and why?

NATO defines Improvised Explosive Devices (IEDs) as:

Those devices placed or fabricated in an improvised manner incorporating potentially destructive, damaging or lethal chemicals, designed to destroy, disfigure, distract or harass. They may incorporate military stores, but are normally devised from non military components.
There are many ways to categorise IEDs, but one useful way is to consider their intended target effect. Using this system of classification, IEDs may be anti-property - intended to cause damage and disruption, or anti-personnel - intended to kill or maim. Despite the terrorists’ alleged intention, there have been countless occasions when anti-property IEDs have killed. An example of this would be the attack on the La Mon hotel on the outskirts of Belfast on which killed 12 people on 17 Feb 1978. Similarly, many anti-personnel IEDs have destroyed property at the same time as lives. The bomb that killed 11 people on the Shankill Road, Belfast on 23 October 1993 was intended as attack on the UDA leadership but it also destroyed Frizell’s fish shop, the offices above the shop and damaged other property for several hundred metres around.

**WHY USE IEDS?**

The bomb, in its various forms, is an ideal ‘terror weapon’. The definition of terrorism is contested but if we accept it as the use or threat of violence to induce fear into a population or government to achieve political or ideological aims, we can see that causing explosions suits this perfectly.

Terrorists and insurgents choose to use improvise their explosive devices for a number of reasons. The most obvious is that they may not have access to conventional weapons and are therefore forced to make their own. Weapons and explosives are available on the black market, but the terrorists may have difficulty in smuggling them or simply affording them. Examples of terrorists replication conventional weaponry are PIRA grenades and mortars which, in the early years of the campaign, were often used in much the same way as manufactured ordnance.

Conventional weapons that are available to terrorists may not suit their specific needs. PIRA has successfully imported large quantities of weaponry into Northern Ireland, some of it quite large, and could have obtained conventional mortars if it so desired. But these would have been expensive and would have imposed tactical constraints on PIRA that it sought to avoid. It would also be difficult for terrorists to obtain and deploy any conventional weapon that can achieve the same result as a large Vehicle Borne IED (VBIED), for example.
Terrorists do sometimes find a willing supplier and a suitable conduit to receive the supplies. An obvious example is the support Libya offered PIRA.\textsuperscript{30} Despite the large amounts of manufactured weapons and military explosives available to them, PIRA continued to develop and deploy IEDs and home made explosives (HME). This can be explained by a sense of frugality – PIRA restricted the use of Semtex-H to smaller IEDs and boosters for large main charges of HME – and a reluctance to depend on one, possibly unreliable, benefactor.

A further reason is that once terrorists begin to establish a reputation for improvisation and engineering, there is prestige and propaganda value to be gained by designing, manufacturing and deploying ever more effective IEDs. PIRA’s proficiency with IEDs gained them a world-wide reputation and led to potentially profitable contacts with other terrorist organisations abroad.\textsuperscript{31} Three alleged PIRA members were arrested in Colombia in 2001, accused of providing mortar technology to the Colombian terrorist organisation FARC\textsuperscript{32}. The United States House of Representatives Committee on International Relations concluded a report on PIRA - FARC activity with the statement:

New techniques in urban terrorism are being employed by the FARC in car bombings which target police explosives teams and other first-responders whose job is to dismantle or neutralize these deadly devices. (The police have lost more than 10 percent of their bomb technicians to bombings in the last 12 months.) This is a typical IRA method of operation. The use of mobile mortars on trucks and pickups, which the FARC is getting increasingly effective at using, is also strikingly similar to known IRA explosive techniques and practices. Neither committee investigators nor the Colombians can find credible explanations for the increased, more sophisticated capacity for these specific terror tactics now being employed by the FARC, other than IRA training.\textsuperscript{33}

**THE AIMS OF THE PIRA BOMBING CAMPAIGN**

PIRA’s bombing campaign did not stand in isolation, but fitted into their overall political and military strategy. Strategy can be defined as the ‘use of available resources to gain any objective’.\textsuperscript{34} Liddell Hart described strategy as the ‘art of distributing and applying military means to fulfil the ends of policy’.\textsuperscript{35} Clausewitz
defined strategy as ‘the theory of the use of combats for the object of the war’. In PIRA’s case, their objective was a British withdrawal from Northern Ireland and the creation of a 32 county Irish Republic.

PIRA stated what their strategy was in their own doctrinal handbook, called the Green Book:

1. A War of attrition against enemy personnel which is aimed at causing as many casualties and deaths as possible so as to create a demand from their people at home for their withdrawal.
2. A bombing campaign aimed at making the enemy's financial interest in our country unprofitable while at the same time curbing long term financial investment in our country.
3. To make the Six Counties as at present and for the past several years ungovernable except by colonial military rule.
4. To sustain the war and gain support for its end by National and International propaganda and publicity campaigns.
5. By defending the war of liberation by punishing criminals, collaborators and informers.

In any conflict there is a balance between ends and means to be struck by the protagonists. Whatever their political aims, and despite its grand title as an ‘army’, PIRA’s leadership knew it could never hope to take the field against the British armed forces in open battle. The result would be as one sided as it would be predictable. Even during the so called ‘Tan War’ or War of Irish Independence of 1919-21, most IRA actions consisted of assassinations of police officers and the destruction of undermanned or empty Royal Irish Constabulary (RIC) barracks. The highest tactical level of IRA operation was the flying column, usually of around platoon strength, which conducted ambushes. No attempt was ever made to seize or hold ground, or to exploit successful ambushes in any conventional military sense.

PIRA assessed that the only way they could take on the British state was by piecemeal attacks in an attempt to exhaust its patience and to make the cost of governing Northern Ireland exceed any perceived benefits. They cited Robert Taber, who wrote ‘the object of the guerrilla is not to win battles, but to avoid defeat. Not to
end the war, but prolong it, until political victory, more important than any battlefield victory, has been won'.\textsuperscript{41} They had observed Britain’s withdrawal from empire and paid particular attention to the campaigns in Cyprus and Aden.\textsuperscript{42} Their assessment was that in each case a few hundred determined men had beaten Britain out of a territory that she would not have otherwise have given up.\textsuperscript{43} Initially the PIRA army council decided on a target of killing thirty six British soldiers, which was the military death toll in Aden, but this was later raised to eighty and was easily surpassed by the time of the PIRA ceasefire in June 1972.\textsuperscript{44}

In 1970, Sean MacStiofain, PIRA’s Chief of Staff, drew up a three phase strategy. The first phase was defence of catholic areas from incursions by loyalists and the army. The second was a defensive posture combined with retaliatory attacks against the security forces. The third phase was offensive operations against the British forces. MacStiofain also planned for a campaign of what he called ‘sabotage operations’ ie bombings to be carried out at the discretion of local and national commanders.\textsuperscript{45} Of these sabotage operations, MacStiofain wrote:

\begin{quote}
Sabotage operations had begun in spring. They were strictly selective bombings by a small number of units and originally confined to Belfast. …striking at communications and power supplies in enemy occupied territory. Later, as British saboteurs on the continent had done, they broadened their operations to attempt retaliatory attacks against the occupying troops.\textsuperscript{46}
\end{quote}

MacDonald argued that bombing campaigns develop in four overlapping stages.\textsuperscript{47} These were discussed in Chapter Four. Applying this to Northern Ireland, he said stage one occurred in 1970 and stage two in 1971. Stage three took place in 1972 while stage four was in 1973 and 1974.\textsuperscript{48} While broadly accurate, this perhaps oversimplifies things and ascribes a degree of control of events to the PIRA leadership that, in 1970 and 1971 at least, they did not actually possess.\textsuperscript{49}

MLR Smith presents a more sophisticated model of the whole PIRA strategy in his book \textit{Fighting For Ireland? The Military Strategy of The Irish Republican Movement}.\textsuperscript{50} Smith explains that ‘the Provisionals were realistic enough to accept that, given the disparity of resources between themselves and the British, they would never be able to defeat the British army in any military sense. However, they did believe it would
be possible to wage a limited form of war’ that would bring the British government to the negotiating table. PIRA’s strategy consisted of medium and long term goals to be progressively achieved by military means. Smith expressed this early PIRA strategy diagrammatically:

Figure 5.1: PIRA Strategy 1970-72.
At the time of their commission, terrorist acts are often condemned as senseless or mindless. However, if we accept the points made in the foregoing paragraphs, then it is easy to see how PIRA’s use of IEDs fitted neatly into their overall strategy. It was rarely their aim to cause mass civilian casualties, although examples abound where they did occur. Speaking of bombing operations in 1970 and 1971, Billy McKee, at that time the PIRA Belfast Brigade commander said:

Every time the British army attacked our people, we got volunteers into the town centre and set bombs off there. Actually most were during the night. There was hardly a civilian casualty during that period.\(^{53}\)

However, as Alonso noted, ‘although the IRA has stated that it never intended to cause victims amongst “non-combatants,” the facts show that the group’s needs not to limit its actions overrode the alleged protected status of non combatants. Its activists deliberately caused many civilian casualties, despite the fact that ultimately this damaged the IRA’.\(^{54}\) Some PIRA members later expressed regret at the loss of innocent lives\(^{55}\) although others simply accepted them as inevitable in a ‘war’.\(^{56}\) In theory at least, PIRA did not consider that it was conducting a sectarian campaign.\(^{57}\) It was difficult for them to persuade anyone else of this, especially when the brunt of their campaign against commercial and economic targets largely affected the unionist community. Similarly, PIRA justified attacks on the Royal Ulster Constabulary (RUC) and the Ulster Defence Regiment (UDR), whose members were mainly drawn from the protestant community, as well as attacks on civilians working for the security forces, as legitimate strikes on crown forces and their collaborators. Unsurprisingly, the unionist community saw these as a campaign of sectarian murder and loyalist terrorist groups such as the Ulster Defence Association (UDA) and the Ulster Volunteer Force (UVF) responded with even more horrifying attacks on catholic civilians, most of whom had no connection to PIRA. Former PIRA volunteer Jim Gibney recognised this:

I think if you’re talking about hurting the unionist community, the IRA probably hurt them more by killing RUC men and women, UDR men and women, members of the Crown forces who were also members of the unionist community. Also, the bombing campaign of the IRA, it was largely against towns where there were Protestant business people. So, of course, a campaign of that nature leaves a legacy
behind, a legacy wherein there was deep pain and hurt on the unionist side. We’d be fools not to recognise it.\textsuperscript{58}

Each type of IED attack can be fitted into PIRA’s strategy. Pipe bombs and improvised grenades were used in riots or thrown at patrolling troops – which Republicans characterised as the defence of nationalist areas.\textsuperscript{59} Another example would be the booby-trapping of physical defences. Before Operation MOTORMAN cleared away the ‘no go’ areas in June 1972, Victim Operated IEDs (VOIEDs) were sometimes encountered that had been built into barricades. On 11 Aug 1971, an ATO rendered safe one such device, a Victim Operated improvised claymore in a barricade in Belfast.\textsuperscript{60}

The purpose of most anti-property bombings was to damage the economic and commercial viability of Northern Ireland. In this PIRA were trying to make the British government accept what Maurice Tugwell describes as the ‘theory of asset-to-liability shift’ ie to make Northern Ireland more trouble and more costly than it was worth.\textsuperscript{61} Shops and factories were the most common targets, but the railways and public utilities such as water and electrical supplies were also frequently targeted. This was justified on two levels. The first and more concrete explanation was that PIRA wished to make the cost of continued British involvement in Northern Ireland prohibitive. Compensation claims and extra security precautions added to the British government's financial burden.\textsuperscript{62} On a slightly more abstract level, PIRA saw the Northern Ireland economy as a colonial construct with the benefits going to England instead of Ireland. PIRA’s Green Book said:

\begin{quote}
Economic imperialism is evident on every main road and city street of Ireland: in Banking, Insurance, Merchant Marine, the Motor Industry, Mining, Fisheries, Industry in general, I.C.I.\textsuperscript{63}
\end{quote}

Purely symbolic targets were also struck which, perhaps, could be seen as PIRA's attempt at ‘propaganda of the deed’. An early example was the destruction of the statue of the 19\textsuperscript{th} century Presbyterian minister Reverend Hugh ‘Roaring’ Hanna in Belfast in 1969, but government offices and installations were more common targets. In some cases, targets were selected as being of both symbolic and economic significance. The repeated attacks on the Europa Hotel in Belfast would fall into this
category,\textsuperscript{64} as would the attempt to fell one of the Harland and Wolff cranes in Belfast docks that dominate the Belfast skyline.\textsuperscript{65}

An additional benefit of symbolic and economic bomb ings was that they tied down large numbers of security forces, who had to clear the affected areas while the device was dealt with, or remove the debris after a device functioned. This kept troops from working in republican areas, affording PIRA freedom of movement in those areas, as well as allowing PIRA to claim that they were responsible for an absence of security forces ‘attacks’ on the nationalist community.\textsuperscript{66}

IED attacks on the Security forces, particularly the army, served several purposes. They could be seen as defence, retaliation or an attempt at gaining local tactical superiority. However they also served a strategic aim of ‘sickening’ the British government and public, prompting public calls for a withdrawal. Danny Morrison, a former PIRA volunteer and head of publicity for Sinn Fein in the 1980s, said:

\begin{quote}
What the IRA was trying to do was kill soldiers who were occupying their streets and that the bodies going back to England would create a mood like the troops out movement in America. And that what the IRA was trying to do, trying to create a troops out movement, trying to get the English people, the British people to realise that they just weren’t winning this war. But the IRA just never managed to crack that nut.\textsuperscript{67}
\end{quote}

\textbf{MAKE UP OF IEDS}

Before going on to discuss the types of IEDs that were used in Northern Ireland, it is necessary to explain how IEDs were constructed. The possible range of IED designs is almost limitless, and is bounded only by the terrorist’s ingenuity, technical ability and the materials available to him. However, experience has shown that most terrorist IEDs are based on an electrical circuit and incorporate the following components:

The \textbf{Main charge} achieves the terrorist’s desired effect on the target, and is usually some form of explosive. Explosives are divided into Low Explosives (LE) that burn and High Explosives (HE) that detonate. HE is much more powerful than LE.
The **Initiator** begins the explosion process, usually on the completion of an electrical circuit. HE usually requires a detonator, while LE can be initiated using a heat source or flame.

The **Power source** provides the power for the IED. Batteries are the most common type of power source.

The **Firing switch** completes the circuit, allowing power to flow to the initiator. It is also the component that classifies the type of IED and determines how the device will be used. There are three types of firing switch. **Time** devices allow a delay to initiation, so that the perpetrator can be elsewhere when the device functions. **Victim Operated** IEDs (VOIEDs) are initiated by some action performed by the target. **Command** initiated IEDs feature some form of separation between the main charge at the Contact Point (CP) and the firing switch at the Firing Point (FP). They allow the terrorist to choose the optimum moment of initiation, making them ideal for use in ambushes, although they have been used in other roles. Typically, the terrorist waits at the FP, observing the CP until the target presents itself. He then initiates the device as the target passes the CP. The most common command initiated IEDs are command wire and radio control, but other systems are available.

The **Arming Switch** is an additional break in the circuit that provides safety for the perpetrator during production, storage, movement and deployment.

The **Container** holds all the other components together in a deployable form. It may also serve to disguise the IED as an innocuous object and if it is made from a hard or flammable material, may also contribute to the target effect by producing fragmentation or flame.
Some IEDs are chemically or igniferously initiated so do not have an electrical circuit, power source, firing switch or arming switch. Others may incorporate an electrical circuit, but not have a container or, for the foolhardy terrorist, an arming switch.

**DESIGN, PRODUCTION AND DEPLOYMENT OF IEDS**

In the early years of the campaign, most IEDs were made by individual bomb makers, designated Engineering Officers or Explosives Officers (EOs), to their own designs. PIRA arranged training packages on the basics of bomb building, run by senior EOs, but once this basic knowledge was imparted it was largely left to brigade, battalion and company EOs to use their own initiative and ingenuity. In some cases EOs also delivered the IED to the target, but more commonly this was done by other, more expendable, people. PIRA had far more low ranking volunteers than EOs and were loath to risk the skills and knowledge of valued personnel.

The main problem with individuals producing IEDs to their own design was the varying standards of IED construction. This manifested itself in unreliability and danger to the user. Many IEDs failed to function and at least 132 terrorists in Northern Ireland have been killed by their own bombs.
Much of this can be attributed to incompetence on the part of the bomb maker or layer. As IEDs became more complex, the probability of failure or premature functioning increased. To counter this, PIRA established an Engineering Department, which oversaw the development of IEDs. They instituted a policy of developing IEDs of a standard design, then manufacturing these on a ‘cottage industry’ basis. One person would make the containers, another the circuitry, and another would prepare the explosives. The IED would be assembled and issued to the Active Service Unit (ASU) who were to carry out the attack. Styles mentioned this process in 1975, and was discussing devices made as early as 1971.

This standardisation allowed the SF to allot mark numbers to PIRA IEDs. This was done on an ad hoc basis until the early 1980s, when the system was overhauled. The authority for allotting mark numbers to IEDs originating in Northern Ireland now rests with the Forensic Science Agency of Northern Ireland (FSANI), previously known as the Department of Industrial and Forensic Science (DIFS) and then the Northern Ireland Forensic Science Laboratory (NIFSL).

Despite the emphasis on standardisation, the Engineering Department never stood still. They continued developing and experimenting in order to further improve efficiency and effectiveness. They also introduced new IEDs to meet SF counter-measures, exploit new technology and to seize new opportunities for attacks. The Engineering Department did not have a monopoly on development, however. Individual EOs, particularly those in areas such as South Armagh, continued to develop IEDs to suit their own tactical needs. Often, these would be offered up to the Engineering Department who could then proliferate the design.

**TIME AND POWER UNITS**

One of the most important developments was the introduction of standard Time and Power Units (TPUs). These are integrated units that contain all the necessary non-explosive components to initiate an IED. Typically, they would comprise the power source, the arming switch, the firing switch and the associated circuitry, all mounted on a board in early designs, and later in purpose made wooden boxes. The most recent models are housed in plastic containers, mainly ‘Tupperware’ type lunch boxes or electrical surface mount boxes. All that was required to be added was the
initiator, main charge and, if necessary, a container. TPUs were most commonly used in the time role, but with a little adaptation they could be converted to the VO role, and many command IEDs also incorporated a TPU.\textsuperscript{76}

Figure 5.3 (left): PIRA Mk 1 TPU\textsuperscript{77}. Figure 5.4, (right): Sketch and comment from a PIRA training manual, showing what SF eventually referred to as the Mk 4 TPU.\textsuperscript{78}

Figure 5.5 (left): PIRA Mk 5 TPU\textsuperscript{79}. Figure 5.6, (right): Sketch from a PIRA training manual, showing the components of a TPU circuit. These particular components would correspond to the Mk 8, Mk 13 and Mk 14 TPUs.\textsuperscript{80}

Figure 5.7 (left): PIRA Mk 15 TPU.\textsuperscript{81} Figure 5.8 (right): RIRA Mk 19 TPU.\textsuperscript{82}
ANTI–PERSONNEL IEDS – ‘COME ONS’ AND THE IMPORTANCE OF PATTERNS

In order to kill people with IEDs, the terrorist must be able to either deliver the explosives to within range of the target, or draw the target to within range of the explosives. VBIEDs and mortars are examples of the former, while the latter case applies to most other anti personnel IEDs. The terrorist needs to position his device at a point he knows the target will visit. Alternatively, he can lure the target to a point of his choosing where an IED is waiting.

Terrorists observed SF activity and reactions to incidents. Where he recognised a weakness, he could exploit this to his advantage. In particular, he was looking for the SF setting patterns. People like to have familiar routines and it is easy to fall into habits. The terrorist simply had to identify an action that was carried out repetitively by a potential target to turn it into an opportunity to kill. Examples of pattern setting for patrolling infantry or police could include using the same cordon positions, using the same patrol routes at the same times or lying up overnight in the same shelter. Where an EOD team is targeted, patterns could include the EOD team using the same Incident Control Point (ICP), always establishing the ICP at a set distance from the target or using the same safe waiting periods.

As well as simple routines, personnel may develop bad habits or fail to observe safety precautions. Examples for patrolling troops might include failing to search their immediate area when they stop (known as 5 and 20 metre checks), refusal to use patrol Electronic Counter Measures equipment (ECM) or picking up attractive items. Examples for EOD teams might include carrying out manual actions at the target unnecessarily, the operator not searching suspicious areas when the situation demands it or failing to use ECM. If the terrorist were to note any of the above actions, he could then deploy an anti personnel IED, most likely a command or VOIED, to exploit the weakness. Examples of these actions leading directly to deaths, injuries and near misses among EOD operators will be given in Chapters Seven and Eight.

Closely linked to patterns is the tactic of the ‘come on’. This is a two or more phase attack. The terrorist stages an incident, which may be a hoax phone call, a hoax
device or a genuine attack. Regardless, the intention is to draw SF into range of a shoot or IED attack. The IRA had used the tactic with some success in the 1956-62 border campaign. On 03 March 1970, two explosions occurred at an unoccupied garage on the Falls Road. Describing the incident, Thomas Hennessy wrote ‘for some reason’. The reason was that they were intended to draw the security forces onto a third device. On opening the garage, the ATO discovered an improvised claymore type device, consisting of 0.5 Kg of HE and a quantity of shrapnel all inside a milk bottle. The device was to be initiated by a long length of safety fuse. This was the first known ‘come-on’ IED attack during Operation BANNER. Although perhaps not an auspicious start for the terrorist, the precedent was set and PIRA went on to develop the tactic into an effective means of causing SF casualties. In fact, the ‘come-on’, in its various forms, was used in most of the incidents that led to deaths among EOD teams.

**PIPE BOMBS AND GRENADES**

Among the earliest and simplest of IEDs is the pipe bomb. One exploded and three intact examples were found in the grounds of St Mary’s Training College in Belfast in 1966, but the earliest confirmed use during Op BANNER was on 12 December 1969. This was also the earliest recorded use of a chlorate/sugar main filling. Most pipe bombs were Low Explosive (LE) filled and igniferously fused. They could be placed as anti property devices or thrown like an anti personnel grenade. Pipe bombs were extremely common in the early 1970s, but tended to fade from PIRA’s arsenal as more sophisticated devices became available. Unable to obtain large quantities of High Explosives (HE), Loyalist terrorists returned to the pipe bomb in the early 1990s and it remained common until the end of Op BANNER.
Two simple pipe bombs, rendered safe by the author. The device in Figure 5.9 (left) was a loyalist VOIED recovered in Maghera in February 2002. The device in Figure 5.10 (right) was a RIRA igniferous time IED found in Newtownstewart in December 2006.

A close relative of the igniferously fuzed pipe bomb were the early improvised grenades. These were also similar to the early time IEDs in that they consisted of a small HE charge initiated by a short length of safety fuze onto a plain detonator. A very common early variation was to fill a drinks can with explosives and wrap this with corrugated cardboard, into which nails had been inserted to provide a fragmentation effect. Sean Keenan, who was the Bogside Explosives Officer in early 1972 described such devices during the Bloody Sunday inquiry:

You make a nail bomb by using full or half sticks of gelignite, depending on how powerful you want it to be. You tape the sticks together then tape nails onto the sticks of gelignite. Alternatively you wrap the gelignite in rough cardboard and tape the nails to that. Then you use a pencil to push a hole into the gelignite, into which you put the detonator and fuse. All that is necessary then is to light the fuse…Once the fuse had been lit you could not stop it except by cutting the fuse below where it had burned to, or by pulling the detonator out with the fuse attached.
PIRA also produced grenades from converted military grenades bodies. They then began designing and manufacturing their own grenades. Initially, these were still initiated with matches and safety fuze, but soon grenades with firing mechanisms incorporating safety pins appeared and fly off levers were being fitted by 1974. These went through various marks until the Mk 14 grenade of the late 1980s. In 1991 PIRA introduced the Mk 15 grenade, housed in a glass jar and incorporating an electrical circuit. When the grenade was thrown, the glass broke, allowing a depressed microswitch to reassert itself, completing the circuit and initiating the device. These are similar to three glass jar grenades thrown on 09 August 1975 in Belfast. The earlier grenades worked on the same principle, but the firing switch was two layers of tin foil, one inside the glass, the other outside which were designed to come into contact, thus completing the circuit, when the glass jar broke on impact.\textsuperscript{92}
In the earlier years of the campaign, grenades were most frequently used during riots. Later they were thrown at passing patrols and occasionally over SF base walls. In the mid 1980s, PIRA developed a series of Improvised Anti Armour Grenades (IAAGs), employing the shaped charge principle. These were fitted with drogues or fins, depending on the mark, and were thrown at, or dropped on, SF vehicles. The army countered this by introducing top cover sentries on mobile patrols. Hand delivered grenades of all sorts present a risk for the terrorist in that the user must be within throwing distance of the target, which would usually be armed SF personnel who can return fire.

**TIME IEDS**

The time IED is principally an anti-property weapon, although it can be used in the anti-personnel role. The first time device of the ‘troubles’ was found on 22 April 1969 outside RUC Springfield Road in Belfast and was rendered safe by a local priest before the arrival of the ATO. This incorporated a modified alarm clock as a mechanical timer and was very similar to the time devices used by the IRA in the 1939 – 40 campaign on the mainland and no doubt to countless ‘infernal machines’ before then.

More typical of early time IEDs were simple igniferously initiated devices made up of a charge of commercial explosive initiated by a length of burning safety fuse onto a
plain detonator. ‘Blue Sump’, ‘AILSA’ and Bickford Safety Fuses were the most common types encountered. The terrorist lit the fuse and either placed or threw the device. Devices of this sort remained common until the mid 1970s. These devices were as simple as it is possible for an IED to be but had several disadvantages. The time delays were often unpredictable – or unknown to the bomb layer – and despite their simplicity, there is a modicum of skill required to accurately time and efficiently light the fuse, especially in the pressurised situation of an active bomb laying mission where an armed policeman or soldier may appear at any moment. Consequently many devices failed, either through the fuse being lit and then extinguishing itself, or the fuse not being lit at all. Another disadvantage is the once the fuse is burning, the smoke and distinctive smell given off could betray the device’s location. These IEDs were simple to render safe. The ATO would simply remove the fuse and detonator by hand. This led to its own difficulties later on.

Another simple time IED was the acid/chlorate incendiary incorporating a chemical switch. Sulphuric acid was contained in a test tube or a wax phial. This was placed inside a condom, which was then placed into an incendiary mixture made from sodium chlorate and sugar. When the glass or wax was broken, the acid would slowly corrode its way through the condom. Eventually the acid would come into contact with the chlorate/sugar mixture, which would then spontaneously combust. These were first encountered in Belfast on 04 Apr 1970. This first device was contained in a bottle, but before long cigarette packets became the standard container. These IEDs were used to attack retail premises, typically being slipped
into garments or inside furniture towards the end of the working day to allow the device to function when the premises were empty, giving the fire the best chance to take hold.\textsuperscript{102} Like igniferous time devices they were often unreliable and had unpredictable delays. They also had the disadvantage of being prone to premature initiation while still on the terrorists’ person. A further, and less obvious, problem was that in the early 1970s it was difficult for Roman Catholics to obtain condoms in their own communities without arousing interest.\textsuperscript{103}

A more reliable and simple to operate system was required and the obvious solution was to incorporate an electric detonator or other initiator into an electrical circuit using some form of timer. The old IRA had experience of similar devices in the 1939 – 40 bombing campaign on the mainland\textsuperscript{104} and the 1956 – 62 border campaign.\textsuperscript{105}

An early development was the use of the clothes peg/solder wire switch. The clothes peg had drawing pins inserted into the jaws. These were connected to the circuit and acted as electrical contacts. The jaws were held open and a length of solder wire was wrapped around the rear of the peg to hold it in the open position. The clothes peg spring would naturally try to reassert itself and in doing so would stretch the solder wire at a predictable rate. Eventually the wire would stretch enough for the contacts to touch, allowing current to flow and initiating the device. The delay could be varied by adjusting the gap between the jaws or using more or less solder wire. Evidence of this simple switch was first found on 18 February 1970 after a small device exploded outside Crumlin Road Courthouse in Belfast.\textsuperscript{106} The existence of the switch was confirmed when a complete switch was recovered after a small explosion on North Boundary Street, Belfast, two days later.\textsuperscript{107} This switch became very common for a while. On 27 June 1970, an IED incorporating one such switch had the dubious honour of being the first IED to function while the ATO was dismantling it. Fortunately it was an incendiary device and the ATO suffered nothing more serious than a few minor burns.\textsuperscript{108} The first known device fitted with an arming switch was found on 29 November 1970. It simply had two clothes peg/solder wire switches wired in series, and also had two detonators wired in parallel.\textsuperscript{109}
Mechanical timers began to appear more frequently from late 1971. Most were similar to the first device described above. A cheap brand of alarm clock, called ‘Jock Clocks’ was one of the more common firing switch. Larger main charges and arming switches became the norm. In 1971 PIRA began incorporating anti-handling switches into some time IEDs to prevent ATOs from dismantling them and to dissuade brave or foolhardy members of the public from removing devices from their targets. The first such device was found at the Portland Cement Factory in Cookstown on 09 April 1971.
Parking timers and kitchen timers also began to appear in late 1971, although clocks were still frequently used for a long time after this. Electronic timers first appeared on 22 November 1976. On this occasion they were found fitted to a new TPU, initially designated the Mk 7 but later re-designated as the Mk 12. These reappeared in a modified form during bomb attacks on the mainland in the 1990s. By far the most common use for electronic timers was in small incendiary devices. Programmed to function after 10 – 12 hours (11 hours 15 minutes was the most common delay), these devices were used in the late 1980s and 1990s to target retail establishments in much the same way as their chemical predecessors. Perhaps the most well known use of an IED incorporating an electronic timer was the attack on the Grand Hotel in Brighton on 12 October 1984. It was concealed behind a bath panel some three weeks before the Conservative Party conference and functioned during the night with the intention of killing Margaret Thatcher and other members of her government. She survived but five people were killed. A similar device was found and rendered safe at the Rubens Hotel in London in 1985.
The majority of time IEDs were contained in bags or cardboard or plywood boxes. Some IEDs, particularly those used by loyalist terrorists, were metal cased, being packed into pipes or gas cylinders.
In the early 1970s, a typical bombing mission would require a team consisting of a driver, one or more bomb layers, depending on the size of the device, and one or more armed cover men. The team would drive to the target in a stolen or hijacked car. The cover men would alight and threaten the occupants of the target and bystanders with their weapons. The bomb layer would place the device inside the building, set the timer or light the fuze and retire. The cover men would usually, but not always, shout a warning before getting into the car and the driver would drive the whole team off to dump the car. These tactics had the disadvantage for the terrorist of limiting the amount of explosives that could be deployed and increasing the chance of being challenged by the public or SF. The solution was to pack the main charge into cars, and for a while the car bomb became PIRA’s prestige weapon of choice. The VBIED will be discussed in a separate section below.

By the mid 1970s, the car bomb was being used less and less. It had been replaced as an anti-property device by the blast incendiary. This incorporated a HE main charge, often metal cased, attached to a container of petrol or similar fuel and initiated with a TPU. On functioning, the IED produced a massive rolling fireball, devastating anything within range. These IEDs were typically used in multiples and were often hung with hooks or coat hangers on the outsides of business premises. One such device was used on 17 February 1978 in an attack on the La Mon House hotel, on the eastern outskirts of Belfast. Twelve civilians, all protestants and all members of the Irish Collie Club which was holding its annual dinner at the hotel, were killed and thirty were injured. Most of the dead were so badly burned that their bodies could not be recognised.

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As well as their more usual anti-property role, time IEDs can be used in the anti-personnel role. In order to be effective, the terrorist must be sure that the target will be near the IED when it functions. For this reason, time IEDs can not generally be used against moving targets. A typical use would be an IED smuggled into an SF base or left where the terrorist knows troops will congregate at a given time. The device that killed 11 Royal Marines bandsmen at Deal on 22 September 1989 is an instance of the former, while the explosion that killed 11 civilians at Enniskillen on 08 Nov 1987 typifies the latter. In 1991, PIRA placed an IED in a sheep pen that had possibly been used as a lay-up point by SF patrols. This was termed a Remote Time device. The TPU was separated from the main charge by a command wire that ran to a distance of 1400 metres. At the end was a standard Mk 15 TPU with a very large battery pack. The terrorists planned to observe the targets occupy the pen, then set the timer running so that they could be well away from the scene when the device functioned. Luckily, no patrol occupied the sheep pen and PIRA abandoned the device.

Time IEDs have also been used in the ‘come-on’ role. Usually an incident, either real or hoax, is staged and the IED is left in likely cordon and ICP positions. Dissident Republican terrorists have used this tactic as recently as 2010.
VEHICLE BORNE IEDS

Vehicle Borne IEDs (VBIEDs), more commonly known as car bombs or lorry bombs, allow the terrorist to easily deploy large quantities of explosives. Vehicles offer mobility and concealment and the car’s structure and fuel adds to the target effect. PIRA is often credited with inventing the car bomb. Bishop and Mallie wrote:

The credit for its invention was subsequently given to Seamus Twomey, who had taken over from Joe Cahill after internment. Twomey was highly enthusiastic about the device. In fact the car bomb seems to have been invented in response to the problem of self inflicted injury and death caused by existing bomb practices. IRA engineers had discovered the recipe for a powerful explosive that required only fertiliser and other ingredients (gelignite was now in short supply). The drawback was that much larger quantities were needed. In discussion in Belfast of how best to solve the transportation difficulties, the notion of making the car itself into a bomb was born.\cite{132}

However this is not the case. Although Twomey was indeed enthusiastic about its use, neither he nor anyone else in PIRA can claim to have invented it. The first known bomb in a vehicle was used in a Royalist assassination attempt on Napoleon Bonaparte in Paris in 1800. It consisted of a large barrel of gunpowder and scrap iron loaded onto a horse drawn wagon. Napoleon, on the way to see an opera, was travelling along Rue Saint Nicaise. As his carriage passed the wagon it exploded, killing several bystanders, but he was unharmed.\cite{133}

Possibly the first bomb in a motor vehicle was used in the attempted assassination of the Sultan of the Ottoman Empire, Abdul Hamid II in 1905. In that case the device was placed in either a carriage or a motor car (sources differ) and consisted of dynamite packed into a metal chest and initiated using a timer. It was parked in the square of the Hamidieh Mosque and exploded, causing many fatalities, while The Sultan was at prayer. The Sultan avoided death because he stopped to talk to Sheik Ul-Islam, thus delaying his departure from the mosque.\cite{134}

On 16 September 1920, a similar device to the one used in the assassination attempt on Napoleon exploded in Wall Street, New York, killing 40 people and injuring another 200. Unlike the Paris wagon bomb, this horse drawn VBIED
contained high explosives, probably some kind of dynamite used in quarrying. It was the work of an Italian anarchist, Mario Buda, who was protesting at the imprisonment of a number of his co-conspirators.\textsuperscript{135}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{image.png}
\caption{The scene after a large IED in a wagon exploded in Wall Street, New York in 1920.}\textsuperscript{136}
\end{figure}

If the bomb used in the attempt on Sultan Abdul Hamid’s life was in a horse drawn carriage rather than a car, then the claim for the first motor-car bomb passes to a group of Catalan anarcho-syndicalists who, in 1921, attempted to attack a military parade in Barcelona with a taxi loaded with explosives.\textsuperscript{137} After the Second World War, both the Irgun and their offshoot LEHI (also known as The Stern Gang) used VBIEDs against the British and Arabs in Palestine in 1947 – 48\textsuperscript{138}. The FLN and OAS used them in Algeria\textsuperscript{139} and extensive use was made of car bombs in Vietnam in the 1950s and 60s.\textsuperscript{140}
The exact details of how and when PIRA came to use the VBIED seem confused, with many writers offering differing accounts. However, it is generally agreed that PIRA stumbled on the idea of the car bomb, rather than deciding on the policy beforehand. In his book ‘Provos’, Taylor writes that soldiers found the first car bomb – ‘a car packed with explosives’ on the Lower Falls in Belfast on 20 February 1972. However, there is no EOD report that corresponds to this date and location. Besides, The VBIED in Northern Ireland had a longer gestation period than that.

According to Bishop and Mallie, Sean MacStiofain, the ‘old’ IRA’s head of intelligence, and later PIRA’s Chief of Staff, led a team that attacked Crossmaglen Police Station on 17 August 1969. They drove a van loaded with explosives at the police station, abandoned it and, amid shooting, attempted to initiate the explosives by throwing a hand grenade at it. This, somewhat predictably, failed. An ATO later dealt with the van. This ATO was Captain Bob Willcox, who gives a slightly different account of the event:

55lbs of gelignite, laced with cordtex, connected to two separate detonators, which were to be initiated by a particular type of burning fuse called ‘blue sump’. The whole bomb was buried under quarry dust on the back of a stolen lorry. What happened was that an IRA gang made an armed attack on Crossmaglen RUC station…. When the RUC emerged they found the lorry parked against the walls. I attended as the lorry was suspect. Sticking out of the pile of quarry dust were two ends of safety fuse, each surrounded by a pile of spent matches. The gang had run

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**Figure 5.26: The scene after a VBIED exploded in Saigon in 1965.**
out of matches, not knowing that an ordinary flame match doesn’t light blue sump fuse.\textsuperscript{145}

In the 1919-21 and 1956-62 campaigns, explosive charges were often placed against police station walls as part of an assault on the station. This seems to have been a logical extension of that tactic.

The first EOD report of an explosion in a vehicle during Operation BANNER was in Belfast on 20 November 1969. In this case main charge was fairly small and the vehicle was probably the target, rather than part of the weapon.\textsuperscript{146}

The two incidents above occurred before PIRA split from the Official IRA. After the split, PIRA first used IEDs in cars as anti-personnel weapons. On 12 August 1970, two RUC officers were killed when they opened the door of an abandoned car near Crossmaglen. The car contained a VOIED probably using the courtesy light as a firing switch.\textsuperscript{147} In June 1971, two VBIEDs were initiated by Command Wire on separate occasions. Both cars had main charges of approximately 20 – 25 lbs of commercial explosives concealed within them. In the first attack, food was found at the firing point, suggesting that the terrorists had laid up overnight in wait for a target. Both devices were fired against military Land Rover patrols, although in the first attack, the ATO assessed that the intended target was the RUC who the terrorists expected to investigate the stolen car. When no police arrived, they attacked the first target of opportunity.\textsuperscript{148}

Jack McCabe, an IRA ‘explosives expert’, died on 19 December 1971 in the Republic of Ireland. He had been mixing a HME when an accidental explosion occurred. Brendan Hughes, a former senior member of PIRA’s Belfast Brigade,\textsuperscript{149} said that before he died he told his colleagues what had happened. There was an IED with a main charge of this HME already placed in a car, ready to be deployed. The PIRA members considered this to be too unsafe to deploy by hand in the normal way. Instead, they drove the car into Belfast city centre, set the timer running and abandoned the car with the bomb still in it. When they saw the effects of the explosion they realised they had a devastating new weapon.\textsuperscript{150}

The above story may be true, but it is does not accord with the known use of VBIEDs as recorded in the EOD logs and reports. The first bomb encountered in a car after
McCabe’s death was a possible VOIED that exploded when an attempt was made to render it safe on 23 Dec 1971\textsuperscript{151} There were not one, but two, time VBIEDs explosions in Belfast on 24 Dec 1971, five days after McCabe’s death.\textsuperscript{152} In addition, there had been ten VBIEDs deployed before McCabe’s death. Two were the devices used at Crossmaglen in 1969 and 1970. Two were the Command Wire IEDs (CWIEDs) with the main charge contained within cars mentioned above. The remainder were time devices,\textsuperscript{153} two of which were rendered safe.\textsuperscript{154} A further VBIED, with an estimated main charge weight of 100 lb, exploded in Belfast on New Years Eve of 1971. If we exclude the van that was probably a target rather than a weapon, terrorists had deployed twelve car bombs in Northern Ireland before the start of 1972.

Even Sean MacStiofain dates the introduction of the VBIED as early 1972. He wrote of his car bombs:

The car bomb was also introduced early in 1972, both for strategic and tactical reasons. The strategic aim was to make the government and administration of the occupied North as difficult as possible, simultaneously striking at its colonial economic structure. The tactical reason was that the introduction of the car bomb tied down large numbers of British troops in the centre of Belfast and other large towns.\textsuperscript{155}

It must be said that 1972 was a special year for the car bomb in Northern Ireland. Whereas twelve had been deployed before the year began, another twelve were used in January 1972 alone.\textsuperscript{156} This fell to eight in February,\textsuperscript{157} but in March the figure jumped to thirty eight.\textsuperscript{158}

July suffered the highest number of VBIED incidents, with 54, and also the highest number of deaths, at 19.\textsuperscript{159} This is due to what became known as ‘Bloody Friday’. On 21 July PIRA mounted a massive and complex bombing operation. Sources differ on the exact figures. McKittrick \textit{et al}, put the number of bombs at twenty one and explosions at twenty. They correctly list the dead as nine.\textsuperscript{160} Coogan says there were twenty two explosions within a one mile area in Belfast. In one of his works he says they occurred over a forty five minute period,\textsuperscript{161} and in another over seventy five minutes.\textsuperscript{162} Bowyer-Bell puts the number of explosions at twenty one, but states
that eleven were killed.163 Taylor agrees with Coogan over the number twenty two, but says that two bomb disposal men were killed.164 Two soldiers were killed that day, but they were not EOD personnel.165 (Perhaps he was thinking of Cracknell and Butcher - see Chapter Seven). Bishop and Mallie also say twenty two bombs – mostly hidden in cars.166 The EOD tasking log and file of reports lists seventeen VBIEDs,167 one of which was rendered safe168 and another which functioned during the render safe procedure.169 As well as the VBIEDs, three other devices exploded in Belfast that day and a 160lb IED underneath the Albert Bridge was rendered safe.170 There were also two car bombs in Londonderry,171 two in Castlederg172 and one in Pettigoe.173 In total, nine people were killed in Belfast,174 as a result of two of the VBIED explosions: one outside Cavehill Road Shopping Centre175 and the other at Oxford Street Bus Station.176

The number of VBIED incidents decreased after Bloody Friday, but there was no sudden ‘ban’ on its use, as some sources have claimed.177 The VBIED remained PIRA’s anti-property weapon of choice in the early 1970s and continued in favour until the mid 1970s, when its use decreased. However, it never entirely vanished and made a come-back in the late 1980s and early 1990s. In its early days, main charge sizes were relatively small, typically 50 kg or less.178 They quickly grew into the hundreds of Kg and by the 1990s main charges of 500 – 1000 kg were common, while some were as large as 3500 kg.179 To accommodate charges of this size, commercial vehicles had to be used instead of cars.

In the very early 1970s, main charges were often commercial explosives. These could be packed in their own wrappers under seats, in boots or into body cavities, but quite often were simply placed into bags or boxes and left on the back seats or placed in the boot.180 When HME came into widespread use, the terrorists often packed the charge into beer kegs or milk churns and placed them in the boot.181 By the late 1980s plastic ‘wheelie bins’ were being used as containers, but sometimes, the HME was simply shovelled loose into the vehicle’s load area.182

Like the early hand delivered time devices, the first few VBIEDs were initiated using plain detonators and safety fuse.183 Before long these were replaced by Parkway timers184 and ‘Jock Clocks’.185 Later devices incorporated standard TPUs.

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As the campaign progressed, EOD teams became more adept at dealing with VBIEDs. PIRA realised that if an EOD team arrived before the device had functioned, there was a good chance that it would be neutralised. To counter this, they began to shorten the delay times. By the early 1990s, it was common for VBIEDs to have delays as short as 15 minutes.\textsuperscript{186}

Time VBIEDs have also been used in the anti-personnel role. Unlike anti-property VBIEDs, no warnings are given. On occasion terrorists have succeeded in getting the vehicle close to, or even inside, SF bases. On 28 October 1974 a VBIED functioned outside the fence next to the Sandes canteen at Ballykinler training centre, killing two soldiers and injuring thirty.\textsuperscript{187} A later example is the double VBIED attack on Thiepval Barracks, Lisburn on 07 October 1996. PIRA was able to get two cars onto the camp. One functioned on a car park causing several casualties. The second device was positioned next to the Medical Reception Station and the functioned several minutes later. This was a deliberate attempt to catch first responders and casualties as they arrived for treatment. One soldier died of injuries sustained in both explosions.\textsuperscript{188}

**VICTIM OPERATED IEDS**

Victim Operated IEDs (VOIEDs) are initiated by some action performed by the victim, and are sometimes referred to as booby traps. PIRA’s use of VOIEDs has a special, if unpleasant, place in this work as they caused more casualties among EOD operators than all other forms of IED combined.

The first VOIED was found on 13 January 1970. This had a 1 Kg chlorate/sugar main charge and was initiated by a clothes peg and tripwire switch.\textsuperscript{189} Like many IEDs, the idea for this device was probably taken from a military pamphlet.\textsuperscript{190} This simple clothes peg switch remained in use throughout the campaign.
The majority of VOIEDs were as simple as this, although the main charges soon consisted of HE and grew in size. Most were intended to kill SF personnel as they carried out patrols or searches. As already noted, two RUC officers were killed by a VOIED in Crossmaglen in Aug 1970. Five civilian workmen were killed on 09 February 1971 when their Land Rover initiated a large VOIED operated by trip wire acting on a clothes peg switch. They were going to check a BBC transmitter on Brougher Mountain and it is believed that the device was left for an army patrol that used the same route.

Of more direct concern to EOD teams were IEDs fitted with anti handling switches. These were intended to deter SF or the public from removing an IED from the intended target, and to kill ATOs.

Shane O’Docherty, a former PIRA bomb maker, suggested that they were first used as a means of protecting time IEDs:

We had to figure ways to deter the army bomb squad from defusing them during their 55 minute run until they exploded. So, groups of EOs – as we called our
people, like Explosives Officers – came together to discuss ‘how do we stop this?’…and that’s when the ingenuity came out.\textsuperscript{194}

PIRA also saw them as a way of adding value to an anti-property IED:

The idea of putting your bomb inside a wooden box, screwed down all the way around, meant that first of it couldn’t be easily seen, what was going inside it. That was the first part. And then people were saying, you know, ‘well, hell, you know, if its an army bomb disposal team, lets give them something to work for, like, lets not aim just for the building in which we’re trying to get our bomb to explode’. That’s reason enough to put an anti-handling device on.\textsuperscript{195}

Macstiofain mentioned these devices in his memoirs:

The IRA Engineers worked hard…. They were making fast progress in anti-handling devices which made it impossible to defuse certain bombs without setting them off.\textsuperscript{196}

He was right about the fast progress. As well as the clothes peg switch, PIRA developed a simple anti lift switch consisting of a cotton reel bobbin or wooden dowel with a metal conductive piece secured to the top to form an improvised plunger. A hole was cut in the base of the IED container, which had electrical terminals on either side. If the package was lifted, the plunger stayed on the ground. The contact piece on top of the plunger would touch the terminals and the circuit would be completed. A find of these switches was made on the Falls Road on 04 July 1970.\textsuperscript{197} For some unknown reason, IEDs fitted with such plunger switches weren’t encountered for a whole year after the find, by which time, more advanced anti lift devices incorporating micro-switches had already been seen. The first of these plunger devices was rendered safe in Belfast on 29 July 1971 and contained one switch.\textsuperscript{198} The following day another was encountered. This one had a switch in the same place as the previous device, but also had a second switch in a compartment concealed underneath the main charge, and was clearly intended to catch the ATO out.\textsuperscript{199}
A month before, two VOIEDs, one inside a Saxa salt container and the other in a food tin, were encountered. These were fitted with anti-lift micro-switches and were specifically designed to target ATOs. The second device partially functioned as it was being laid, injuring the terrorist. These devices appear to have been the forerunners to the ‘Castlerobin’ type VOIEDs discussed below.

Figure 5.30: VOIED incorporating anti-lift micro-switch. The clothes peg/solder time switch was wired in parallel – it was independent of the anti-lift switch and was intended to fool the ATO into thinking it was a simple time device.
At least sixteen VOIEDs were deployed between 01 January 1970 and 08 September 1971. Of these, eight were IEDs with concealed anti-handling circuits that were targeted against ATOs or anyone else interfering with the device. There may have been more time devices with anti-handling switches that simply exploded when the timer ran down.

On 09 September 1971 Captain David Stewardson was killed by a new kind of VOIED at Castlerobin. He was the first ATO to be killed on Operation BANNER. It later transpired that the IED incorporated anti-lift and anti-open micro switches. Several more ‘Castlerobin’ devices were deployed and all functioned during remote EOD action. A terrorist was also killed placing a ‘Castlerobin’ in Lisburn. Eventually two ‘Castlerobins’ were rendered safe. PIRA introduced variations with relocated switches and clutter circuits. A further variation, entitled the ‘Midlander’, was first deployed in November 1971. As well as the anti handling switches, these also included a collapsing circuit, designed to initiate the device if a wire was cut, and possibly to act as a timer. All of these were rendered safe.

![Figure 5.31: Castlerobin VOIED incorporating anti-lift and anti-open micro-switches.](image)
Light sensitive devices appeared in mid 1972, as did those incorporating pressure mats. The majority of VOIEDs continued to be relatively simple devices, but this did not detract from their lethality. VO switches were also fitted into other devices, either as a means of protecting them from being rendered safe, or as a way of catching out the ATO. MacStiofain, writing about VBIEDs said ‘anti-handling devices of increasing effectiveness were incorporated in the car bombs.’ He went on to say that they were also incorporated into CWIEDs:

> From the autumn of 1972 all landmines were fitted with anti-handling devices, and although some mines were discovered…several enemy bomb disposal technicians were killed or injured trying to dismantle them. After coming across a number of these sensitised landmines in position, the British learned not to try and shift them, but to blow them up in situ.

As usual, MacStiofain was slightly inaccurate – Captain Young and WO2 Clark were killed by VOIEDs in typical CWIED main charge containers in the summer of 1972. In both cases it was doubtful if PIRA ever made any serious attempt at a CWIED
attack with these devices. They were simply meant to catch an ATO. He is correct in saying that, at that time (mid-late 1972), most main charges in rural areas were destroyed in situ, or were moved a short distance with hook and line and then destroyed. However, there were instances of CWIEDs being dismantled in this period and no VO element being found.

Throughout the whole of Operation BANNER, the most common type of VOIED was the Under Vehicle IED (UVIED), sometimes referred to as an Under Car Booby Trap (UCBT). Early devices operated on the clothes peg switch system, with the IED secured to the underside of the car, and the clothes peg insulator fixed to a static object by a wire. Alternatively, the device could be placed on the ground and the wire attached to the car. In either case, when the vehicle moved off the insulator was pulled out and the device functioned. The earliest such device recorded, on 12 April 1972, had its pull line attached to the car’s prop shaft. A year later, five off-duty soldiers were killed by a similar device, placed under their car at the Knock-Na-Moe hotel in Omagh. A variation was to wedge the clothes peg under a tyre with the jaws open. If the car moved forward the peg was released and the jaws snapped shut. If the car reversed the peg was crushed and the contact made that way. Later devices used a mercury tilt switch as the firing switch. Mercury tilt switches had been seen as early as 1972, but it was not until 08 February 1976 that one was used in a UVIED. Since then they have been the standard firing switch in such devices. At least 88 people were killed by UVIEDs during Operation BANNER.

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Figure 5.33 (left): An INLA UVIED that incorporates a clothes peg switch. Figure 5.34 (centre) A UVIED in position. They were not usually as large and visible as this. Figure 5.35 (right): Typical PIRA UVIED of the 1980s and 1990s.
In 1991, PIRA obtained a piece of SF ECM equipment and from this developed a VO electronic switch (VOES). This initiated an IED when SF patrol ECM came within range. The VOES IEDs met with some success but could only remain in use until a countermeasure was devised, which was not long in coming.  

Another example of the constant technical and tactical battle between the SF and the terrorists was the pressure mat or switch. PIRA had achieved some notable successes with these, particularly in combination with the ‘come-on’ tactic. These included the murder of two ATOs. On 07 November 1974 SSgt Vernon Rose and one of his infantry escort were killed by a large pressure mat initiated IED. They were investigating an earlier explosion at an electricity substation near Stewartstown, which was a ‘come on’. Fourteen years later WO2 John Howard was killed in similar circumstances. He was clearing the site of a fatal explosion at a swimming baths in Belfast on 08 Jul 88, when he stepped on a pressure mat linked to an IED left at the scene.

To counter the ‘come-on’ to a VOIED threat, ATOs and RE Search Teams (REST) developed search techniques using trip wire feelers and metal detectors. PIRA observed this and introduced low metallic content pressure plates and wooden rocker boards connected to tilt or trembler switches, intended to catch out ATOs and RESTs. A number were deployed, but none were successful.

Dissident Republican Terrorists have continued to use VOIEDs. Two large devices operating on pull switches were rendered safe on 12 September 2000 at Magilligan Ranges and on 17 January 2001 at Claudy RUC Station. A security guard was seriously injured by a device hidden inside a military water bottle at Magilligan ranges on 08 February 2002. It is believed that the firing switch was a mercury tilt switch. A similar device, this time concealed inside a lunch box, killed a civilian employee at Caw Camp in Londonderry on 01 August 2002. A tilt switch initiated IED was placed inside a ‘wheelie bin’ outside a married quarter in Ballykelly on 04 February 2004. This device was rendered safe. On 07 October 2008, a CWIED main charge was found to incorporate VOIED operated by a pull switch. This was designed to catch out the ATO and marked a return to the tactics of the early 1970s.
COMMAND IEDS

Command initiated IEDs are used in the ambush role. The terrorist selects a location that the target is likely to pass. Often this will be where vehicles have to slow down point or some other vulnerable point (VP). Experience has shown that main charges are nearly always within 20 metres of a VP. Terrorist also normally use some form of marker to identify the position of the main charge, so that he can initiate the IED at the optimum moment.

PIRA referred to their command initiated IEDs as ‘Landmines’, as the old IRA had done in the 1919-1921 and 1956-1962 campaigns. Command IEDs were used in both the rural and urban environment. In rural areas, the main charges tended to be bigger – often in the hundreds of kilogrammes and sometimes over a tonne. Such charge sizes would exhaust supplies of commercial explosives in a very short time so, like VBIEDs, bulk charges of Home Made Explosives (HME) were used. Macstiofain, writing of Spring 1972, described how the development of HME affected the operational opportunities for command initiated IEDs:

IRA engineers working in the Supply department reported at last that they were in a position to manufacture unlimited quantities of two types of explosive mix. This increased operational potential to a very considerable extent. It meant that both anti-personnel and sabotage operations could now be contemplated on a much wider scale. Plans were quickly drawn up for a landmine offensive. The new landmines were brought into action and played hell with the British not only in the border areas but all over the North.  

There are many different ways that an IED can be initiated by command, but by far the most common are by Command Wire (CW) and by Radio Control (RC). Command Wire IEDs (CWIEDs) are the simplest command initiated IEDs. The Contact Point (CP), where the main charge is, and Firing Point (FP) are linked by an electrical wire, along which the firing current is sent. The main advantages for the terrorist are simplicity and that they are not affected by Electronic Counter Measures (ECM). The main disadvantages are that they are time consuming to correctly lay and there is a physical link which the SF may break or follow to the FP.
The first recorded CWIED of Operation BANNER was encountered on 13 February 1971 in Belfast. The main charge on this occasion was an electrically initiated ‘nail mine’ and a soldier was injured in the explosion.²⁴¹ Before long, PIRA deployed improvised ‘claymore’ devices. The first true claymore, as opposed to the ‘box’ type nail mines was found on 14 May 1971.²⁴² Larger main charges were usually packed into milk churns. When milk churns were replaced by tanker deliveries, the terrorist turned first to beer kegs, then to plastic ‘wheelie bins’. A favourite location for main charges was inside the culverts that cross many of the roads in rural areas.

The command wires were usually buried to aid concealment, sometimes weeks or months in advance of attacks. On other occasions they were run through streams, along pipes and sewers and sometimes they were simply laid on the surface. Command wires were usually 100 – 300 metres long but could be much longer. In one well planned but particularly unpleasant incident, PIRA used the body of a UDR soldier, Cpl James Elliot who they had abducted and murdered, as a ‘come on’. Knowing that the police had to recover the body, they laid out a CWIED consisting of four 85 – 100 lb main charges in drums and six 10 lb claymore charges. The command wire was over a mile long and led across the border into the Republic of Ireland. This was rendered safe on 19 April 1972.²⁴³ To overcome the resistance of such a long wire, the power source needed to be large. Car batteries were often used, as were packs made up of multiple household batteries. The firing switch was usually a bell push in the early 1970s, but later devices used domestic light switches.

As well as investigating and dealing with CWIEDs, EOD teams could be targets of them. On 08 January 1972, an ATO responded to an explosion at an Electricity Board transformer at Clady, Co Londonderry. As the ATO approached a CW initiated claymore functioned, causing light damage to a Humber ‘Pig’ armoured vehicle, but no casualties.²⁴⁴
Realising that the SF would follow up any wire after a CWIED attack, PIRA took to deploying VOIEDs on firing packs, command wires and main charges. A firing pack with a VOIED concealed inside was recovered on 26 July 1972. On 17 April 1973, an ill concealed command wire was found to have a trip wire stretched across it, which led to a claymore type device concealed in nearby rushes. On 02 December 1974 an EOD team pulled a command wire with hook and line and a device attached to the wire functioned. An ATO, WO2 John Maddocks, had been killed earlier in the same task by a VOIED concealed inside the main charge.

PIRA also began deploying multiple CWIEDs. The first would be used to engage a target and then act as a ‘come on’ for responding SF. For example, on 24 November 1974, a device was rendered safe that consisted of two CWIEDs, one to attack the railway line at Jonesborough, while the other was intended to attack any responding SF.

Although CWIEDs are usually associated with the rural environment, they have frequently been used in urban areas. Shorter wires are usually used and on some occasions the firing pack has been replaced by a domestic plug in a mains socket.

CWIEDs have several disadvantages for the terrorist. They are time consuming to lay and require a physical link between the terrorist and the target, both of which increase the risk of the SF capturing the terrorist. To overcome this PIRA developed the Radio Control IED (RCIED). RCIEDs have a transmitter at the FP and a receiver at the CP. The attack signal is sent using a radio transmission. Systems have varied
from servos used in model cars to digital mobile telephones. The main advantages for the terrorist are that they can be pre-prepared, so are quick to lay and there is no physical link between the CP and FP. The main disadvantages are that RCIEDs are complex and can be detected and inhibited by ECM.

RCIEDs had been used by terrorists and criminals outside Northern Ireland before Operation BANNER. In one case on 13 September 1964, criminals used a simple RCIED to blow open a safe in a post office in Manchester. PIRA used its first known RCIED on 19 January 1972 at Auchnacloy. A 30 lb device hidden in a Mini car was unsuccessfully used to target an EOD team. The next RCIED appeared a month later. In that attack a hooded tailor’s dummy was left by the side of the road, intended to fool police into thinking that it was a body. An RC initiated claymore functioned when the police approached. There were a further 11 attacks or attempted attacks with RCIEDs in 1972 and they were used at a rate of about one a month until the mid 1970s, and then one every few months thereafter. In total 245 RCIEDs have been recorded in Northern Ireland.  

The very early devices used servos taken from radio controlled models to operate the firing switch. They were somewhat unreliable and, more seriously for the terrorist, were susceptible to initiation by spurious signals. If another RC transmitter of a similar type was used in the area the device could accidentally initiate. To circumvent this, PIRA developed various forms of encoders and decoders. This meant that only the terrorist’s transmitter could initiate the device. RCIEDs went through many variations, which space does not permit full description of. Recent examples have incorporated mobile telephones, deployed in Londonderry on 01 April 2001, and radio scanners, in Londonderry again on 15 June 2003 respectively and another scanner in Jonesborough in 2008.
PIRA sometimes deployed RCIEDs with the receiver positioned away from the main charge and connected to it by wire or detonating cord, a technique known as ‘remoting’. The first confirmed use of this technique was on 19 April 1973 at Forkhill. It is often assumed that ‘remoting’ was employed as a means of overcoming SF Electronic Counter-Measures (ECM) equipment. The idea was that target, with its ECM would be at the CP, while the ‘remoted’ receiver was outside the effective range of the ECM. However, the available information does not bear this out in the majority of cases. Surprisingly few RCIEDs have been remoted – the recorded figure is 20 - and the distances have tended to be short, with 2 to 10 metres being the norm. This suggests that in most cases the ‘remoting’ was to aid signal reception. This was not always the case, however. The longest remoted RCIED was recovered in on 16 September 1991 at Camlough. The receiver was 320 metres from the main charge. Another on 30 March 1993 at Omagh was remoted by 120 metres.

Received wisdom in the IEDD community has it that remoted RC packs will always include a Self Destruct (SD) charge. In fact, roughly half have had SD charges, while they have also appeared on RCIEDs that have not had the receiver ‘remoted’. It appears that the inclusion of an SD charge usually depends on the size of the main charge and the proximity to the receiver. For example two consecutive RCIEDs in South Armagh in 1985 were remoted. The first, on 05
February in Crossmaglen, was placed in a car. The main charge was a 1 Kg Blast incendiary, was ‘remoted’ by 2 metres and included an SD charge. The next, on 19 March had a 60 Kg main charge in milk churns, also ‘remoted’ by 2 metres, but did not include an SD charge. In the former case the small main charge would not have destroyed the receiver pack, so an SD charge was fitted to prevent SF from recovering and exploiting it for technical intelligence and forensic evidence. In the latter case the large main charge would have destroyed the receiver, so the SD charge was unnecessary.

On occasion, PIRA has mounted complex attacks that involved a combination of CW and RC IEDs. On 19 April 1973 a three phase attack was mounted near Forkhill in South Armagh. Phase one consisted of a hoax device placed on a lorry that was parked by the side of the road. This was intended to act as a ‘come on’ for Phase Two, which was a CWIED with two milk churns, each containing 50 Kgs of explosives, as the main charge. The CW was ill concealed and PIRA hoped that, after the device functioned, follow up SF would follow it to the battery pack at the FP, which acted as a ‘come-on’ for Phase Three. This was a ring of 8 explosive filled gas cylinders, connected by detonating cord, surrounding the battery pack. They were to be initiated by an RC receiver pack, remoted by 30 metres. In this case, troops took a flanking movement to the battery pack, preventing Phase Two from being initiated. Phase Three was fired but caused no serious casualties.

While CW and RC are by far the most common means of initiating a command IED, other methods have been used. One is Command Pull, which is a simple variation on the clothes peg VO switch. Rather than have the target trip a wire to remove the insulator, the terrorist has hold of the other end of the line and pulls it when the target presents itself. This was first used in Belfast on 13 May 1973. The main charge was a claymore, which was separated from the battery and switch by a long buried wire. The pull line then ran across an alley to the FP. It is assessed that his method was chosen in this case as it would have been difficult to conceal a CW running across the alley.

More complex methods have also been used. One is the Projectile Command IED, which involves firing a bullet at the IED – normally at a vertically mounted pressure mat – to initiate it. Another is the Light Command IED (LCIED), whereby a flash gun
is fired at a photo-slave unit incorporated into the device, this causing it to function. This was used on 14 occasions between 30 March 1990 and 09 January 1994. In the early 1990s PIRA attempted to use an Active Infra Red (AIR) security system known as Pulnix as a means of command initiating an IED. Two attempts were made in 1992 and one in 1994 but without success. PCIEDs, LCIEDs and AIR systems are, by their very nature, limited to short range attacks, but they can not be inhibited by ECM.

Another unusual method that met with more success was the Command Collapsing Circuit (CCC). Like a VOIED with a collapsing circuit, when power is removed from one part of the device it is supplied by another and the device functions. On the three known occasions PIRA used CCC it was fired by means of a power cut that the terrorist induced. It was first used on 29 June 1982. On that occasion, the device functioned, demolishing the house it was hidden in, while the ATO was clearing a mortar nearby. The technique was not used again for a further twelve years, but reappeared on 19 March 1994 when it was successfully used to fire an improvised mortar which brought down a hovering army Lynx helicopter at Crossmaglen. The same technique was used again on 12 July 1994 as an RAF Puma helicopter hovered over Newtownhamilton SF base.

MORTARS

When troops first deployed to Northern Ireland, they were accommodated in police stations and requisitioned schools, factories and mills. As these had little or no protection, they were easy to attack with standard IEDs. When SF bases obtained protection, the terrorist had to find new ways of delivering explosives to the targets. The first attempt was a crude propelled spigot grenade, which appears to have been based on a design found in a US Army pamphlet. It was fired from a shotgun and was initiated with safety fuze. The terrorist had to load the grenade into the muzzle of the gun, light the fuze, then aim and fire the weapon. The first example was found in Belfast on 15 July 1971 but was not used operationally for another year. It was then used six times over a three week period starting on 20 Aug 1972.

PIRA then developed the Mk 1 improvised mortar. This was similar to a military mortar, with characteristics of both light and medium systems. It was aimed by hand.
and the bomb was dropped down the barrel onto a fixed firing pin. This was first encountered in Belfast on 26 June 1972, when a mortar and six misfired bombs were found. PIRA rapidly progressed through a series of modifications to the Mk 4. The main problem with these early mortars was a lack of safety for the user. On one task blood was found at the firing point after a bomb exploded in the barrel. The lack of safety features on the Mk 2 mortar led to the death of an ATO, SSgt Ron Hills, while dealing with a hung up mortar bomb after an attack on Kitchen Hill Barracks, at Lurgan on 05 Dec 1972. The bomb fell from the tube and exploded when he approached. There were also reports of PIRA members being ‘knee capped’ after refusing to use mortars.

Figure 5.40 (left) PIRA Mk 1 mortar bomb. Figure 5.41 (right) PIRA M 2 mortar bomb.

Figure 5.42 PIRA Mk 3 Mortar and mortar bomb.

The Mk 5 mortar was bomb was made up of plumbing components. It was never used, but found in a workshop in Cushendall on 14 May 1974 and is believed to have been still under development. The Mk 17 mortar of the late 1990s was very similar to the Mk 5 and may have been the result of an old idea being resurrected.
Loyalist terrorists also experimented with a mortar bomb made up of plumbing components and arrived at the idea before PIRA, deploying their weapon in June 1973. Like the Mk 5 and Mk 17, this also reappeared in the late 1990s, complete with the same design flaws – the fins were wider than the bomb body.

1974 also saw the development of two short lived PIRA mortar systems. The 40 mm mortar was a scaled down version of the Mk 4. It was used on only one occasion, against Flax Street Mill SF Base in August 1974. Eight bombs were fired, of which only 3 functioned. The second system was the 40 mm bombard, a direct fire anti-armour weapon with a large warhead based on the HESH principle. This bombard was the first weapon to use electrical method of initiating the propulsion unit.

PIRA’s first truly successful mortar was the Mk 6. This incorporated a screw vane arming system and achieved good range and accuracy. It was first used on 28 Sep 1974 at Drumackavall. 30 bombs were fired, with 23 functioning on impact. Initially the Mk 6 was still used like a conventional military mortar, with the terrorist dropping bombs down the tube. This had a serious disadvantage in that the terrorist had to remain at the firing point and run the risk of being killed or captured by responding SF. To counter this, PIRA replaced the firing pin means of propulsion initiation with an electrical system similar to that used in the 40 mm bombard. Mortars could then be deployed singly or in salvos and fired remotely, usually after a time delay but occasionally by command. This was first used on 06 March 1976, when PIRA attacked Belfast International Airport with 14 tubes fired in 3 salvos.

The Mk 6 underwent continuous development and appeared in several sub marks. It gradually fell into disuse as PIRA chose to sacrifice range and accuracy for larger...
payloads. However, it was brought back into service for a multiple base plate attack, using long delay timers, on Heathrow Airport in March 1994.294

Figure 5.45 (left): PIRA Mk 6 Mortar and bomb of 1974295. Figure 5.46 (right) One of the PIRA Mk 6 Mortar bombs used to attack Heathrow Airport in March 1994.296

The Mk 7 and 8 both appeared in 1976, and were attempts to increase the payload. The Mk 7 was simply a longer Mk 6, while the Mk 8 was longer still and incorporated a sliding collar fin system. The Mk 8 was first used against Crossmaglen SF base on 30 August 1976.297 The Mk 9 appeared on 23 Oct 1976298 and remained in use until 1979. It was considerably larger than any previous PIRA mortar. It consisted of a gas bottle welded to a fin assembly and had a very simple and reliable electrical means of bomb initiation.
The upward trend in mortar bomb sizes continued with the Mk 10, which was made from large diameter sections of steel pipe. It could be fired singly or in deployed in multiples, usually mounted on the back of a lorry. Incidents involving as many as 16 or 18 tubes, although not common, were encountered on a number of occasions. It became PIRA’s longest serving mortar system, being first used on 19 March 1979 at RUC Newtownhamilton, when 9 bombs were fired, all functioning and killing one policeman. The Mk 10 continued in use until 1992. Like the Mk 6, the MK 10 went through several sub marks, as changes were made mainly to the fuzing systems. Its two most notable uses were at RUC Corry Square in Newry in 1985, when 9 bombs were fired but a single bomb struck a temporary rest room and killed nine police officers, and when 3 bombs were fired at Downing Street on 07 February 1991.

The Mk 11 Mortar, first seen on 13 May 1989, was simply a shortened version of the Mk 10, designed to increase the system’s range. The Mk 12 was a different weapon entirely. Unlike all of the previous mortars, which were indirect fire weapons in the traditional military sense, the Mk 12 fired its projectile directly at its target on a flat trajectory, like a direct fire gun. Strictly speaking it was not a mortar at all, but was classified as one for reporting purposes. It incorporated a shaped charge warhead and was designed to be fired at armoured vehicles. The size of the main...
charge (1 – 2 Kg of Semtex-H) was sufficient to overmatch the armour on any vehicle in use by the SF in Northern Ireland and would probably defeat most conventional armoured fighting vehicles. It was first used in conjunction with the Mk 11 Mortar in an attack on Crossmaglen SF base on 26 October 1989.\textsuperscript{308}

The Mk 13 was a departure from the evolutionary chain of mortar development and was an attempt to massively increase the payload of an improvised mortar. It resembled a naval depth charge system. The main charge was usually contained in a 55 gallon oil drum, filled with up to 400 kg of HME, sat on a massive pusher plate. Its main disadvantage was its very short range. The baseplate vehicle had to be driven right up to the fence of an SF base of the system was to have any chance of lobbing the bomb over the fence. It was first used at Dungannon on 22 May 1990 and then was only seen a few times after that.\textsuperscript{309}

\textbf{Figure 5.51 (left): PIRA Mk 12 Mortar and bomb, disassembled.}\textsuperscript{310}  \textbf{Figure 5.52 (right) PIRA Mk 13 Mortar system.}\textsuperscript{311}

The Mk 14 appeared on 31 May 1992 and used a gas cylinder as a main charge.\textsuperscript{312} Like the Mk 13 it was also only used on a few occasions, but was the forerunner of a much more successful system, the Mk 15 ‘Barrack Buster’.

The Mk 15 was made from large gas cylinders and could be filled with up to 120 kg of HME. It had a maximum range of 300 metres, although operational ranges were typically 50 – 150 metres. It was first seen on 07 December 1992 in a failed attack on Balleygawley police station.\textsuperscript{313} Like earlier marks, it went through a number of variations, mainly concerned with the fuzing arrangements. It could be used singly or in multiples, the most being used in a single attack being ten. This was at Kilkeel
09 October 1993. This was the mortar system that was used to attack the two hovering helicopters, using the Command Collapsing Circuit firing system mentioned above. The Mk 15 Mortar was used in 58, incidents, with a total of 85 attempted bomb launches. Dissident Republicans continued its use after the PIRA ceasefire and it was last seen in 2001.

Figure 5.53 (left): PIRA Mk 15 Mortar tube, fixed to a tractor. This was the baseplate used to attack a Lynx helicopter at Crossmaglen on 19 March 1994. The author was the No 2 on the EOD team that dealt with this incident. Figure 5.54 (right) RIRA Mk 10 Mortar bomb, used at Bessbrook on 15 May 2001. This was the last Mk 15 Mortar to be used.

The Mk 16 Mortar was a development of the Mk 12, in that it was a direct fire weapon with a shaped charge warhead. It was smaller than the Mk 12, and therefore more economical with explosives, yet was still perfectly capable of overmatching the armour on most SF vehicles used in Northern Ireland. Rather than being of welded construction, as was the Mk 12, the Mk 16 was made up of pipe sections that could be screwed together, so simplifying production. It was first used on 14 July 1993.

The Mk 17 Mortar was Dissident Republican system, used after the PIRA ceasefire. It was a return to small indirect fire systems. At first it was seen as a simplified Mk 6 Mortar, being made up of screw threaded plumbing components, but actually it was a revival of the stillborn Mk 5 design. There have been several mortar attacks
from the late 1990s onwards, with the Mortar mark number now standing at 21. However, these later mortars have been very poor, crude attempts and have not matched PIRA’s achievements in this area.

CONCLUSION

This chapter began with the statement made by some that insurgents in other theatres had, in the space of twelve or eighteen months, reached a level of IED proficiency that took PIRA thirty years to achieve. It should be apparent now that PIRA experienced a remarkably quick evolution in tactics and techniques in the first two years of the campaign and, in the early 1970s, were really only held back by the available technology of the time. Had, for example, Passive Infra Red switches been as widely and cheaply available in the 1970s as they were to JAM in Iraq in the 2000s, then PIRA would doubtless have used them. What PIRA did do was to continually develop their IEDs and, more importantly, their tactical employment of them. They also displayed a remarkable level of ingenuity and improvisation. If a new piece of technology became available, PIRA would assess it and if it suited their needs, exploit it. If PIRA saw a weakness in SF patterns they would exploit with new technology, new tactics or a combination of the two. They never stood still and, consequently, nor did the EOD teams tasked with dealing with their work.

Insurgents and terrorists always have the advantage of having the initiative in this respect. They choose when and where to strike and they choose what weapons to strike with. The SF in general and EOD teams in particular can, in most cases, merely react. In the absence of much solid intelligence, which was the situation that prevailed in the early 1970s, EOD teams spent much of the time ‘playing catch-up’. PIRA developed and deployed new IEDs and tactic and the EOD teams had to deal with them as best they could when they appeared.
INTRODUCTION

This Chapter describes the IEDD doctrine as it existed at the start of Operation BANNER and how that was translated into the conduct of operations. It will be argued that EOD operations were doubly hampered by the doctrine of the time. Firstly it was found to be inadequate for the circumstances prevailing in Northern Ireland. Because of this, more often than not, the doctrine was ignored both by the chain of command whose responsibility it was to promulgate and enforce it, and by EOD teams who were supposed to be guided by it. This led to EOD operators conducting their operations as they saw fit. The courses of action open to an EOD operator were limited by a lack of equipment, which meant that most devices were rendered safe manually. In the majority of cases this worked out well enough, but it relied on an operator’s skill and judgement and drew heavily on reserves of courage and luck, of which no man has a limitless supply. When any one of these was exhausted, tragedy could and did occur.

THE DOCTRINAL INSTRUMENTS

Ammunition and Explosives Regulations

Ammunition and Explosives Regulations (A&ERs) Volume 21 Pamphlet 5 was the main doctrinal authority for IEDD operations. The February 1970 edition was in force during this period and remained extant – with much amendment – until 1978. Its original contents would come as something of a surprise to the modern EOD operator, but it is perhaps more striking in its brevity and in what it does not say. Sections 3 and 4 – ‘Phases in EOD Operations’ and ‘Guide to EOD Procedures’ respectively – are the parts of the text that guided the conduct of operations and they consist of a mere five pages between them. The key provisions will be dealt with at some length here as these influenced the way IEDD operations were conducted in this early period.
Section 3 began with a warning that:

Disposal is an inherently dangerous task safety and for its success requires strict
adherence to sound safety practices. The safety of the public, supporting personnel
and EOD personnel are to be considered throughout disposal operations.¹

Although this idea remains extant, the message, particularly with regard to the safety
of the EOD operator, had to be strongly reinforced by the end of 1972.

Section 3 went on to discuss the phases of an EOD operation. These were:

a. Immediate action phase.

b. Approach phase.

c. Contact phase.

d. Access and render safe phase.

e. Transportation phase.

f. All clear phase.

g. Disposal area phase.²

The similarity to the conduct of a Conventional Munitions Disposal (CMD) task is
striking. An example of this is that, during the ‘contact phase’, the regulations
required the operator to inspect the Explosive Ordnance (EO) to determine the
disposal method and then advise the local commander on protective measures,
including evacuation. In other words, the operator must walk up to what may or may
not be a live IED, examine it, then decide what to do about it – both in terms of public
safety and of devising a Render Safe Procedure (RSP). Apart from a small mention
of forensic evidence, the remainder of Section 3 could be applied to a routine CMD
task without any modification.

It appears that IEDD was approached from a purely technical point of view, rather
than a joint technical and tactical one. This implies that this was acceptable in the
earlier campaigns. Later events were to show the inadequacy of a purely technical
approach in Northern Ireland.
Section 4 continued in the same manner, going on to discuss allied and foreign ammunition and explosives. At this stage mention was made of the fact that ATOs are able to apply ammunition and explosive design principles to items they are unfamiliar with. This still holds true today and is the main reason that the RLC lead in IEDD.

Another paragraph which remains applicable to this day is the division of IEDs into categories of Time, Victim Operated and Command. The terminology has changed, but the meanings remain much the same. The pamphlet describes devices which:

- can be triggered in one or more of the following ways:
  a. When the device is being handled.
  b. At a predetermined time.
  c. By remote control.\(^3\)

The most revealing series of paragraphs were those under the heading ‘Courses of Action’. These were:

- Destruction in Situ; by the detonation of a suitable demolition charge placed as close as possible to, but not touching, the device.
- Opening the device in situ by explosive means so that the contents can be inspected and the most suitable RSP decided.
- Pulling the device clear with a suitable rope or cord to an open area and carrying out the appropriate disposal procedure.
- Using the special EOD equipment designed to enable the make up of the device to be established and from this deciding the most suitable RSP to be adopted.\(^4\)

The ‘special EOD equipment’ mentioned was x-ray and gamma ray equipment that was then coming into service.\(^5\) At this point both equipments were heavy, cumbersome and required the use of wet chemicals to develop prints. Neither was on general issue to EOD teams and had to be specially tasked if needed.\(^6\)
In practice, the second and third options were the most commonly used, along with another which is alluded to, but not explicitly mentioned. This was hand entry using simple tools, followed by the manual dismantling of devices:

When a device container has been opened and the contents inspected, or a radiograph has been made of the device and its contents established, the A.T.O. is to decide the procedure to be adopted to neutralize and dismantle the device.\(^7\)

Whatever guidance was offered by the regulations, they explicitly placed the responsibility for conducting the operations on the shoulders of operators:

The A.T.O. is solely responsible for determining the proper procedure to be used to accomplish disposal of any explosive ordnance. It is essential that sound judgement and common sense backed by technical knowledge and experience of ammunition and explosives is applied to all EOD tasks.\(^8\)

**Standing Orders, Standing Operating Procedures and Technical Bulletins**

Ammunition and Explosives Regulations provided the over-arching *doctrinal* framework, but they were general in nature, applicable world wide, and therefore could not stipulate rules and conventions that were special to the circumstances of each individual theatre. To do this, the chain of command must produce Standing Orders and Standing Operating Procedures (SOPs). In later years, The Chief ATO’s SOPs (CATO SOPs) for IEDD in Northern Ireland became well established and were seen throughout the Ammunition Technical and EOD community as the ‘gold standard’ of how IEDD operations should be conducted. Later SOPs for operations in Great Britain, Iraq, Afghanistan and other theatres were based on these SOPs, albeit with amendments suitable to the conditions of each theatre.\(^9\)

At the very start of Operation BANNER it appears that no such Standing Orders or SOPs existed. As events progressed and the army settled down for a long campaign this situation could not continue. Some form of Standing Orders were in use by November 1971, as there are documents dating from this period that make reference to them.\(^10\) However, the author has been unable to find any surviving copies of these. When several ex-operators from this period were interviewed, none could recall ever seeing any such orders.\(^11\) It appeared that the conduct of
operations was largely left to the operators on the ground to decide, with some
guidance from the chain of command. 12

On occasion, this guidance was not only different from modern IEDD doctrine, but
apparently at odds with the doctrine of the day. ATO 3, who served in Northern
Ireland in early 1972 and again in 1978, said that on his first tour he was told to
ignore the collection of forensic evidence:

I called police in to look for fingerprints inside tape on nail bombs & was told by
CATO I was wasting time. I still have the odd clock at home somewhere as
souvenirs. 13

Further evidence that SOPs existed, but that the guidance given was of less use
than it might have been, is offered by Bob Harvey who, as a WO2, attended the Pre-
Operations EOD course in December 1971:

The only area which caused the course to stand in unanimous disagreement with the
Standing Operating Procedures (SOPs) was the meticulous, time consuming
approach and method of entry to a suspect car. The general consensus of opinion was
that time was a precious commodity that should not be frittered away, especially if a
timer had been fitted. It was eventually made clear that the individual in the field
would, of necessity, fit the SOPs to the circumstances as they may arise. 14

As the campaign progressed, new devices and terrorist tactics appeared and new
procedures and equipment were introduced to counter them. This information
needed to be disseminated to the EOD Teams and the method used was technical
bulletins. These came in two forms. For information specific to Northern Ireland, the
Senior ATO (SATO), and later the CATO, would produce bulletins for publication in
theatre. Very few of these survive, but SATO Bulletin No 7, which dealt with anti-
handling IEDs, does and its contents are discussed below. For information
applicable to the whole Ammunition Technical trade, the Chief Inspector of Land
Service Ammunition (CILSA), later renamed Director Land Service Ammunition
(DLSA), 15 would publish Technical Ammunition Bulletins (TABS). Most TABS related
to routine ammunition technical and management matters, but they could give
direction on any subject that fell within DLSA’s remit and this included IEDD.
TAB 21/1163, Terrorist Explosive Devices, issued in 1966, warned that:

> It is stressed that the task of R.A.O.C. is the safe disposal of these devices. They should not, therefore, be broken down unless this is necessary as part of the safest method of disposal.¹⁶

One of the most important TABs for IEDD was TAB TAB21/1725, dated 08 December 1972, which amended A&ERs Vol 3 Pam 21 Pam 5. This contained many of the lessons learned from 1969 to 1972 and formed the bedrock of the current doctrine. It is discussed fully in Chapter Ten.

**ORGANISATION AND TEAM MAKE-UP**

Until 321 EOD Unit deployed in 1970, all IEDD was carried out by the ATOs posted to Headquarters Northern Ireland (HQNI), supported by those at the Ammunition Sub Depot at Ballykinler. These ATOs dealt with devices in addition to their more routine ammunition duties.

When 321 EOD did fully deploy, it was split into three sections. No 1 Section was based at Girdwood Park in Belfast, No 2 Section was in Londonderry at No 3 Section went to Lurgan. Each section had an officer and between two and five Warrant Officers (WOs) and Senior Non Commissioned Officers (NCOs) to act as operators.¹⁷ Although the officer was in command of the section, the individual EOD Teams acted with considerable independence once deployed on an EOD task.¹⁸

The EOD Teams were based around each of the operators. Each team consisted of an EOD operator, a driver, an infantry escort and, later on, a Royal Signals Electronic Countermeasures (ECM) operator, known as a ‘bleep’. Officially, the operator did all of the EOD work, while the driver drove and maintained the vehicle. In most cases, the operator trained the driver to act as an EOD assistant, or No 2 operator. As there were no Remotely Operated Vehicles (ROVs) such as Wheelbarrow at the time, this was limited to preparing and managing explosives, ‘hook and line’ equipment and hand tools. In No 1 Section in Belfast the situation was slightly different in that usually two or three operators would deploy on a task. The idea behind this was that, due to the higher operational tempo in Belfast, the operators could take turns at operating and thereby avoid becoming excessively
fatigued. How this worked in practice varied. On some teams the operators would change over at the end of each task, while on others they would share each task, taking turns at making manual approaches as a way of spreading the risk.\textsuperscript{19} Having two or more operators could have its advantages, especially when it came to mentoring and guiding less experienced personnel, as Mike Coldrick who operated in Belfast in 1972 noted:

Some of it was learning on the job, for the newcomers, but when there were two, the other could restrain you from doing something perhaps foolish.\textsuperscript{20}

However, having two or more operators could have its disadvantages as one former ATO said:

When I was in Belfast in ’72 I found that number ones always went out with the same number twos. The same people were always paired together. We did change round: Fred would be number one and Bill number two and the next day Bill would be number one and Fred number two. These two always wanted to go out together and it got to the stage where it would almost be unhealthily superstitious.\textsuperscript{21}

Another more serious issue was that of command and control. If there were two operators of equal or similar rank or seniority, which one was in command? While having a second opinion was always valuable, it was found that what often happened was ‘EOD by committee’. Sometimes, stronger personalities with rash ideas could unduly influence more sensible but less forceful operators. Rather than restrain his partner from doing something foolish, as Coldrick had suggested, he could encourage him. This was one of the factors that directly led to the deaths of SSgt Cracknell and Sgt Butcher on 15 March 1972.\textsuperscript{22} (See page 163).

\textbf{CONDUCT OF OPERATIONS}

In the early years of the Operation BANNER, IEDD operations were conducted in the time honoured fashion in much the same way as they had been in Hong Kong, Aden and Cyprus. The EOD experience in Hong Kong led to the development of some new ideas and equipment. Among these were the use of protective clothing\textsuperscript{23} and a variety of protective shields.\textsuperscript{24} However, events were to show that these had little
influence on the conduct of most IEDD operations in Northern Ireland in the early 1970s.

There were no ROVs at this time. The only remote capability came from the use of ‘hook and line’ equipment. At first, even this had to be extemporised on the ground using string, fishing line and hooks and the like, as there was no issued equipment. There were no disrupters, either. Explosive opening techniques, using detonators and detonating cord (referred to as ‘cordtex’), were used and as often as not it was found that these could have a disruptive effect on device circuitry.

An ATO who served in Northern Ireland in 1970 described the situation at that time:

In the early days, bomb disposal was very much with crossed fingers. We were all feeling our way. The kit we had was exactly the same kit as we had in Hong Kong and consisted more or less of a Stanley knife and a pair of wire cutters. I remember I carried all my kit in the left hand flak jacket pocket. Fortunately they were feeling their way too.

D H Green, who was a WO2 in Belfast in the second half of 1971, echoes this:

All IED disposal work was carried out manually. Operators relied on conventional explosives and equipment, mainly the Stanley knife, wire cutters and Cordtex. Knowledge was sparse, but we learnt – the hard way sometimes ... forensic recovery was poor (lack of knowledge). The aim of most operators at that time was survival.

*Figure 6.1: WO2 Jackson, recovering a nail bomb and ammunition in 1971.*

ATO 1 was a captain serving in Northern Ireland in late 1969 and 1970. He said of that time:

There were no laid down RSPs. We made our own up as we went. There was no set philosophy. If anything it was get in quickly and remove the problem. Operators seemed to be more expendable. The need was for the operator to do hands on RSP due to lack of equipment. [Returning the situation to normality] was considered important. It was not well received if your actions destroyed the commercial target. [The collection of forensic evidence was] not considered necessary.\(^{31}\)

ATO 2 was a Captain in Northern Ireland in 1971 and conducted over 400 tasks. By his time things had moved on slightly. He described the philosophy of EOD as:

Try to preserve forensic evidence but not at excessive risk of life. Risk of life only justified if leaving the device to go off would have injured civilians e.g. at a hospital – Rule generally ignored.\(^{32}\)

He also said there was no laid down soak times until:

After I had written the first guidance. Our timings were based around clothes pegs, park ray timers and about 50 mins for the minute hand to travel around the clock to a pin. Secondary soak if the device was moved and possibility that a mechanical timer might have been re-started.\(^{33}\)

It is possible to describe a typical RSP used in the period 1969 – 1971. For a suspicious package the procedure might involve the following:

The EOD team would arrive at the Incident Control Point (ICP). The operator would be briefed by the incident commander. He would then advise on the size of the cordon and question the incident commander and any witnesses. The operator may choose to apply a safe waiting, or ‘soak’, period. This was entirely at his discretion.
The operator, wearing normal combat clothing and flak jacket, would walk up to the device. Once there he would make an assessment of the device. He would then normally enter, using hand tools, and either cut into the circuit or interrupt the explosive train, for example by cutting out a section of detonating cord. Finally he would remove the initiator by hand and possibly also remove the main charge.\textsuperscript{34}

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{image}
\caption{An ATO begins his manual approach, accompanied by his infantry escort, 1971.\textsuperscript{35}}
\end{figure}

\textbf{Render Safe Procedures 1971 - 1973}

Tactics evolved with the worsening situation in Northern Ireland and with the appearance of VOIEDs targeting ATOs, but not by much. From mid 1971 to 1973, a typical RSP might involve the following:

The EOD team would arrive at the Incident Control Point (ICP). The operator would advise on the size of the cordon and question the incident commander and any witnesses. The task location (ie republican or loyalist areas) and the current overall situation (public order, sniper and grenade threat etc) would dictate some aspects of the task conduct. If in a ‘safe’ area, a 30 minute soak may be applied, but this was entirely up to the operator. If in a republican area, usually no soak was applied in order to minimise the time spent on the ground.

The operator, wearing normal combat clothing and flak jacket, would run into the device. He would usually place a hook and line loop around the device, then attach a detonating cord opening charge to the top before retiring to the ICP. Once back at
the ICP, the No 2 would pull the device clear of the target, then fire the opening charge, or vice versa. Again, depending on the situation, the operator may or may not choose to apply a secondary soak before running back to the device.

The operator would then neutralise the device by hand. A battery may be disconnected or a wire cut. A common technique was to cut detonating cord in order to isolate the main charge from the initiator, so minimising the explosive event should the device function before it could be rendered safe.\(^\text{36}\)

![Figure 6.3: ATO running onto the target, wearing flak jacket and helmet. This picture was taken in Birmingham in 1973, but the procedure in Northern Ireland would have been the same.\(^\text{37}\)](image)

This is supported by the RSP code list in force until 07 May 1972. (Until 1972, RSPs were described fully in EOD reports. As these could be produced as evidence in court, it was decided to encode the RSPs to prevent terrorists and their supporters from learning how IEDs were dealt with.) The RSP code list shows the following codes, which implies that these were the accepted RSPs of the time:
101 Injector alone 102 Injector with Little Willie
105 Remove Detonator 106 Cut Out Detonator
107 Opened Explosively 108 Opened with Knife
109 Take Out Battery 110 Cut Out Battery
111 Cut Into Circuitry 112 Cut Into Explosive Train

Table 6.1: RSP Codes in force in early 1972.\textsuperscript{38}

Codes 101 and 102 referred to the first disrupters, Jack Horner and its successor, Pigstick. BB stated that these were only used in special cases, such as when a complex VOIED was suspected or when the risk of an explosion was unacceptable. For the remainder of tasks, the traditional methods were used.\textsuperscript{39} Before the introduction of disrupters, complex VOIEDs were either initiated by pulling or explosive means, or were x-rayed and rendered safe by what would now be considered ‘Advanced Manual Techniques’.

Time IEDs

Most time devices were dealt with as described above, with manual techniques being the norm. Igniferously fused devices were usually dismantled by the simple expedient of pulling the fuse from the device and separating the detonator from the fuse.\textsuperscript{40} Devices with electrical circuits were cut into and the circuit or explosive train then cut, before the detonator was removed and the rest of the device dismantled.\textsuperscript{41} Even with simple devices this was not always as straightforward as it was presented on the EOD reports. On 27 June 1970, SSgt Hill was tasked to a suspicious package in Victoria Square, Belfast. On investigation, he found it to be an incendiary device using a single clothes peg/solder wire time switch. He began dismantling it, but as he did so it burst into flames. Fortunately he was not seriously hurt. This was the first instance of an IED functioning during the RSP\textsuperscript{42}.

In the absence of any remote means of disabling the device, the only protection an operator had from a time device was to not be near it when it was likely to function. This protection came from applying ‘soak times’ or safe waiting periods. Until early
1972, there were no mandatory soak times. Therefore, the operator was free to decide whether to apply one and, if so, what time to wait. One method of working out a suitable soak time was to assess when the device was likely to function and to use this assessed time to work out a ‘safe window’ when the timer was still running, but not when it was likely to run down and initiate the device. As most time devices at this time used clocks as the firing switches, operators often assessed that the device would function on or near the hour. Mike Coldrick, who was an operator in late 1971 and early 1972, described how he used run up to IEDs in this safe window:

    The quicker you were in and out, the least you were exposed to danger.\textsuperscript{43}

On 24 November 1971, WO2 Davies was killed by a time device after approaching it without observing a soak time.\textsuperscript{44} Maj Calladene was killed on 29 March 1972 when a car bomb exploded as he approached it without waiting.\textsuperscript{45} Early in 1972, the application of soak times was made mandatory and operators had to wait for them to expire before any approach could be made. This meant no more approaches in an assessed ‘safe window’, unless there was reason to believe there was a very long delay timer. It also meant that in many cases, bombs were simply left to function. For example Capt Watson and Sgt Dolman were tasked to a VBIED at Grestmont Stocking Factory on Donegall Street in Belfast on 23 May 1972. While they were waiting their soak time the device, assessed to be over 100 lbs of HME, functioned.\textsuperscript{46} This did protect operators - no more were killed by time devices running down while they were at the device – but it was not popular with many others, especially those whose property was being destroyed and lives disrupted. Nor was it popular with the troops whose job it was to man the cordons while the EOD task was ongoing. The longer they were there, the more danger they were in from gun and bomb attacks and from rioting. Coldrick said of the introduction of mandatory soak times:

    On two occasions, not long afterwards, I was accused point blank of cowardice.\textsuperscript{47}

**Vehicle Borne IEDs (VBIEDs)**

VBIEDs presented operators with especial difficulties. They are difficult to gain access to without disturbing the car, there are many places where IEDs could be concealed and they could hold large quantities of explosives.
As was discussed in Chapter Five, the car bomb was not invented in Northern Ireland and it seems that the EOD Teams were alive to the threat of the VBIED long before PIRA began using them in earnest. The 321 EOD Unit tasking logs for 1970 and 1971 are filled with entries for ‘Car Searches’, usually accompanied by the comment ‘no damage’ or ‘damage to...’ in the remarks column.\(^{48}\) ATO 3 opined that, when clearing cars, operators were expected to risk their own safety in order to preserve property:

> We had to gain entry to cars with minimum damage. I used to break side window with a crowbar. At one stage we were told to cut out rear screens & not to break glass by CATO. We had to unscrew rear seats to gain entry to boots to avoid damage.\(^{49}\)

Another former ATO supports this, but with an additional reason:

> My favourite way of getting in those days was literally to take the windscreen out in one piece, because it couldn’t be booby trapped without being visible.\(^{50}\)

Not everyone agreed with this softly-softly method or, indeed, obeyed the orders to follow it. Harvey, on his first car clearance in Londonderry in early 1972, took a quicker and altogether more violent approach:

> It got zapped in quick time. Next morning, the captain appeared displeased that explosives had been used to clear a suspect car. He offered to show Keith and myself the ‘right’ way to clear a car. I declined the invitation.\(^{51}\)

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**Figure 6.4:** An EOD Team opening a car boot, using detonating cord. The operator would have applied this to the car on an earlier manual approach.\(^{52}\)
After the deaths of SSgt Cracknell, Sgt Butcher and Maj Calladene, orders were issued that all suspect cars were to be dealt with remotely or explosively. The first Wheelbarrow ROV was just coming into service at this time, but its capabilities were limited to attaching a tow-rope to a car so that it could be towed away from its target. Moreover, only one or two were available at any one time. The Pigstick disrupter had also appeared by that time, but was not in general use. This meant that, in most cases, the only available methods of dealing with a car were to use explosives or fire. The operator could blow the doors and boot open using cordtex or he could attempt to burn the car out using a Destructor Incendiary, a military store that burns fiercely, in the hope that the main charge would not burn to detonation. A further method was a combination of the two - the ‘PE bomb’. This was a charge of plastic explosives enhanced with petrol – in effect a blast incendiary. In the absence of ROVs, all of these had to be delivered to the target manually, but were fired from a safe distance – what is known as a semi-remote method. Capt Scourfield-Evans operated in 1972 and described these activities:

Incendiaries were used on cars to burn them out – an attempt to burn out the CO-OP mix without it detonating. This often failed. Car boots were often opened with cordtex under the lip. Prior to this a hole was made for the cordtex by the ATO using a .38 service revolver. There was an incident involving one ATO where the .38 bullet bounced off the boot lid. Subsequently all ATOs were issued with 9 mm pistols. However the practice of shooting holes in car boots also ceased.
Two of the many VBIEDs that were deployed on 21 June 1972 - ‘Bloody Friday’ - were rendered safe and it is instructive to see how it was done. One was in a tipper truck parked on Finaghy Road North Bridge in Belfast. The main charge, assessed to be 50 – 100 lbs of HME, was hidden in the tipper body which was left in the raised position. ATO 4 wrote in his report:

Incendiary having burnt out cab, destroyed hydraulic system. PE bomb had no effect but flames eventually burnt explosives to detonation.

Elsewhere in the city, another ATO took a different approach to a green Austin Maxi that had been abandoned on the Sydenham By-Pass flyover. He applied a soak of two hours and forty five minutes, starting from when the vehicle was abandoned. Then he shot at the car with small arms fire – the author assumes he fired a shotgun against a window. After this he made a manual approach and used a Pigstick, although the report does not say what against – probably a TPU but possibly the boot, door or window. He then used hook and line to move a blanket which, presumably, was covering the device. Finally he cut out the detonator by hand.

PIRA was well aware of the difficulties that their VBIEDs presented to EOD Teams. Sean Macstiofain, who was Chief of Staff of PIRA from its formation in 1969-1970 to his arrest in 1972, wrote:
It [the developing bombing campaign] also put a heavy load on the British bomb
disposal experts. Several of them were killed or injured trying to beat the anti-
handling devices. They wasted endless time examining completely harmless cars
reported to them as suspicious. As British resources became more strained and their
casualties increased, they could no longer spend hours carefully dismantling a
suspected car bomb. Instead they used cruder methods, blowing up a door or a lid
open with a small controlled charge, or even exploding the car altogether by firing a
bazooka at it after clearing the street. 59

MacStiofain’s mention of anti-handling devices brings us neatly to the problem of
Victim Operated IEDs.

**Victim Operated IEDs (VOIEDs)**

On 09 July 1970 an ATO was tasked to a find of IRA nail mines at Old Lock,
Stranmillis. These were wooden boxes filled with commercial explosives and nails.
The firing switch was a modified clothes peg with drawing pins inserted into the jaws
to act as electrical contacts. These were separated by a piece of card which acted
as an insulator. The card was attached to a trip wire to form a VOIED. When the
wire was tripped, the card was pulled from the jaws of the clothes peg, which allowed
the contacts to meet and current to flow, thus initiating the device. When describing
his RSP, the ATO wrote in his report:

> I carefully levered off one side of boxes and emptied the boxes of steel stampings and
> explosive. I dealt with each box in a similar manner. 60

These devices were found in a cache, rather than being deployed at a target. The
first deployed VOIED to be rendered safe was dealt with on 09 February 1971 at
Smithfield Market, Belfast. The clothes peg switch was used again, this time there
were two of them, acting as anti-open switches on the lid of a box containing a main
charge of Sodium Chlorate (SC) mixed with sugar. The ATO simply wrote:

> I removed the igniter from the sugar/chlorate mixture. 61

He was remarkably reticent, considering that this was the first IED to specifically
target the ATO. The same day, Capt Goad was tasked to a nail mine similar to the
ones that had been recovered in July 1970. The device was deployed on the junction of Finaghy Road and Andersonstown Road in west Belfast. Capt Goad was rather more circumspect in dealing with it:

I did not want to move the device as I suspected that the circuit had closed and I felt that further movement might cause the device to function. I built a ‘hive’ of sand bags (approx 30 bags) to a height of 4 ft around the device and place a cordtex opening charge on top. The charge fractured the box and split the battery severing one connection to the detonator. I cut the other lead from the battery to the detonator and removed the detonator from the explosive.62

This was the first recorded occasion when a detonating cord opening charge was used in Northern Ireland. However, manual RSPs remained the norm. When the first Time IED protected by a VO circuit was found at a Portland cement factory in Cookstown on 09 April 1971, the operator described his actions thus:

a. Mechanical time circuit checked for secondary circuit, and removed from main cordtex link. Clock re-started when moved.

b. Charges, with exception of one with anti-lift device, checked for anti-lift devices and cut out of circuit and removed.

c. Detonator removed from Anti-lift device, battery disconnected, remaining charge removed.

d. Charges emptied to ensure complete neutralisation.63

One ATO dealt with two VOIEDs, targeting the ATO, on consecutive nights in Belfast. Both were contained in cardboard boxes and incorporated an improvised anti-lift plunger switch. He rendered the first one safe at a filling station on Grosvenor Road on 29 July 1971:

Box cut open, det wires cut, battery removed.64

The following night a very similar device was found in Donegal Square North. This time there was an extra concealed compartment underneath the main charge. The
terrorist doubtless hoped that, after neutralising the visible switch, the ATO would think that the device was safe and move it. The ATO was not so easily fooled:

The bomb had a brown paper bag covering the top with the word ‘bomb’ written on it – This was removed by slicing the adhesive tape with a Stanley knife. This revealed the top of the box which was well taped down. The end of the box nearest to me was removed with a knife – this revealed the first switch and circuit. I disconnected the battery and the switch – the detonator was not visible at this time.

I inspected the sides of the box (with difficulty!) and the other end (not easy owing to its position) and very gently pulled the box towards me to enable me to cut open the left side (which revealed the platform and switch), then the right side and finally the top.

I disconnected the second switch and battery. I then gently removed layers of explosive to find the detonators buried in the centre.65

From a modern perspective it seems remarkable that, although they knew that PIRA were targeting them with fairly complex VOIEDs, ATOs still mainly used manual techniques. They were becoming more suspicious, though. The same ATO dealt with another VOIED containing a plunger switch. This was inside a military ammunition box found in Milltown cemetery on 06 August 1971. This time he radiographed the device first but still rendered it safe by hand.66 Two days later a different ATO dealt with a VO claymore in Springfield Road in Belfast. He said ‘it was treated with great suspicion’. Yet he also said that his EOD action was to ‘dismantle and make safe’.67

Speaking of the anti-lift devices, Maj George Styles, who was the Senior ATO (SATO) at the time, wrote in his memoirs:

However, in the violent back-wash of internment, the IRA had decided on a new target – the RAOC Ammunition Technical Officer. At the beginning of Autumn we found four devices that were built solely to kill us.
If the IRA were laying these sort of bombs I realised it was inevitable that the RAOC bomb teams were going to take some casualties.\textsuperscript{68}

SATO Bulletin No 7, produced in August 1971, suggests that if Maj Styles thought that, he had a strange way of reacting to it. This document lists the anti ATO VOIEDs that had appeared to date and their methods of operating, then goes on to discuss how such devices should be dealt with:

a. **Fish hook and line**

   In the past the first IA for a device has been to attach a fish hook and line, retire and pull. This has been adequate. Now, however, fairly large (5lb) charges are being used with anti – lift switches and this technique will no longer suffice.

b. Whenever there is a possibility that pulling the device will cause it to detonate and damage the target, the area must be cleared and the RUC, and Bde warned. When possible devices should be disarmed to accumulate evidence and intelligence and not be allowed to function as planned. Should it prove impossible to deal with the device other than by detonating and causing damage, SATO is to be asked for permission. This will not normally be given unless photographs and radiographs are available.

c. Should it be possible to detonate the device without damage e.g, in a field or by careful sandbagging, SATO’s permission is not required. Thought should be given to pulling the device into a ‘behive’ of sandbags angled across, not towards, the target to limit the effects of a possible detonation.\textsuperscript{69}

From the above passage it is clear that operators were expected to take risks – ie manually cut into IEDs they suspected of containing anti handling switches – in order to save property. Or in other words, property was ranked above life.

On 09 September 1971, Capt David Stewardson was killed while attempting to manually enter a VOIED. This type of device was fitted with two micro-switches, one on the base acting as anti-lift, the other under the lid acting as anti-open. The EOD teams named these IEDs ‘Castlerobins’ after the village hall where Capt Stewardson
was killed. Their appearance had an immediate effect on the way in which IEDs were dealt with.

The day after Capt Stewardson’s death, an ATO was tasked to a VOIED on Foyle Road, Londonderry. This device incorporated a tripwire acting on a bare wire loop and was much less complex than a Castlerobin. It was aimed at patrolling troops, rather than the ATO. Even so, the ATO took no chances:

1. It could be plainly seen that the fishing line was not tensioned and could not be a release line. To prevent accidental actuation of the device, it was cut at an early stage.

2. A closer reconnaissance of the device was undertaken. Without disturbing the sacking the basic circuit could be seen through a fold. (There must have been an attendant danger when the device was armed, thus the battery and copper ring were conveniently placed for this arming action.)

3. It was at this stage that the tenuous hold of the sellotape could be seen and it was appreciated that this hold could easily be broken during the removal of the sacking. Permission to demolish the device in situ was requested. That permission was given as long as sufficient safeguards were taken.

4. Safeguard action was initiated as follows:
   a. RUC were instructed to clear the estimated danger area and warn the local civilian population of the possible hazards. Ie keep away from glass etc.
   b. Sandbags were called for and subsequently 50 bags arrived and were placed in position around the device to minimise blast and fragment hazards.

5. The EOD operator decided to remove the sacking remotely by attaching the fish hook and line to the sacking, retiring the maximum possible distance, getting under cover and giving one clean, strong pull. This was done. It was at this point that the device might have been expected to detonate.
6. The device was approached and it was seen that the circuit was totally exposed, the sacking not having dragged and disturbed the copper ring during the removal operation. The detonator was gingerly (!) isolated by first cutting the lead to the negative terminal thus the danger of disturbing the copper ring while the circuit was live was avoided and then cutting the lead attached to the copper ring. The battery was then removed.

7. The next stage was the remote movement of the cardboard box to initiate any possible anti-handling devices. This was done using the fish hook and line again. The detonator was located, removed and the device completely dismantled.  

Having manually cut the tripwire, (a method that would not be acceptable today), the ATO then used a semi-remote hook and line technique and intended to destroy the device in situ. However he was happy to manually dismantle the device once he had seen all of the circuit.

Two days after Capt Stewardson’s death, another Castlerobin device was found and was dealt with by Capt Thomas. Like the earlier device, this was sandbagged and then pulled with hook and line, whereupon it functioned. No one was injured. SATO promised X-Ray equipment for the third such device to be found. However, this was not to be. A further six confirmed Castlerobins were encountered between 16 September and 02 October 1971. One functioned as it was being placed, killing the terrorist, 19 year old Terrence McDermott. Of the remaining five, one functioned on being pulled with hook and line, two functioned when detonating cord was used in attempts to explosively open them and two were simply destroyed in situ. A further device, contained in a blue sports bag, also functioned on being pulled and was probably also a Castlerobin. What is important is that no attempts were made to hand enter one and therefore, no one other than a terrorist was killed or injured.

Later devices in the Castlerobin series, and the more complex ‘Midlander’ were manually rendered safe, after being x-rayed. However special, and very lengthy and involved, techniques were used. Most VOIEDs were technically much more simple than the Castlerobin and Midlander series, but were usually deployed with greater cunning. With a shortage of ROVs and disrupters, but a growing reluctance to cut into packages or move
objects by hand, the only options available were explosives and hook and line. On 25 March 1972, WO2 Coldrick was tasked to Lowes Barn in Deragh after an anonymous tip off about weapons being stored in the barn. He was suspicious from the start:

The worry was that the information was a leak to draw us in and injure or kill members of the security forces but after a careful search of the barn I found the bomb hidden halfway up the pile of hay bales, wedged under two bales. It was too deep to reach by hand so I pulled the bales off with a line and as I did so the device exploded.

Command IEDs

As with other types of IED, most command IEDs were dismantled manually. The first Command Wire IED (CWIED) to be recovered, near Newry on 14 May 1971, was found by sappers from 4 Field Squadron RE – untrained in EOD - who picked it and brought it back to their base. The ATO dismantled it there. A similar incident occurred a year later when RUC officers found and dismantled a CWIED on 31 March. Apart from the obvious danger to themselves, brave but foolhardy actions of this sort also set patterns which PIRA could exploit. They were not only putting themselves at risk, but also the next ATO who had to clear a similar device.

In essence, there are only two ways an operator can be protected from a command device. One is to have troops or police dominate the surrounding areas and likely firing points in order to deter the terrorist from attempting to initiate the device. The other is to interfere with the means of passing the firing signal to the device. With a CWIED, this usually means breaking or cutting the wire. With a Radio Controlled IED (RCIED) this may be disrupting the receiver, cutting the wire between the receiver and the main charge, if the receiver has been ‘remoted’, or by jamming the signal using Electronic Counter Measures (ECM). Ideally an operator would seek to have all of these measures in place before making a manual approach. In the early 1970s, this was rarely possible. ECM equipment did not appear until 1972 and when it did its capabilities were limited to sending a signal that was intended to deliberately initiate any RCIED. Wire cuts or disruption of receivers could only take
place after a manual approach as there were no ROVs available to do this. In effect, the only real protection was domination.

An early example of this occurred on 08 June 1971. An ATO was tasked to a CWIED at Christian Place in Belfast. Troops had disturbed and scared the terrorists away from the Firing Point (FP), and once the cordon was in place, domination of the FP was assured. The ATO tersely described his actions on his report as:

IED dismantled by cutting into it, removing HE and then dets.\textsuperscript{84}

The dangers of manually dismantling command IEDs, where there was plenty of scope and space to conceal a VOIED, were made painfully obvious by the deaths of Capt Young on 15 July 1972\textsuperscript{85} and WO2 Clark two weeks later on 03 August 1972\textsuperscript{86}. They were killed in remarkably similar incidents when they attempted to dismantle main charges by hand. Operators became more circumspect when dealing with command IEDs. If a device was in a rural area, the operator would often destroy it in situ.\textsuperscript{87} Sometimes he would dismantle it first, usually using hook and line, then destroy the main charges.\textsuperscript{88}

RCIEDs presented special danger in that there was no physical link between the FP and Contact Point (CP), so the terrorist could fire the device from anywhere, as long as he was within range and had sight of the CP. Domination, therefore was especially important. On most tasks in rural areas, a sweep would be made with what ECM equipment was available, then a manual approach would be made. As with CWIEDs, some devices were manually dismantled. On 25 April 1972, an ATO manually rendered safe an RCIED in Londonderry without any ECM cover at all.\textsuperscript{89} Sgt (later Lt Col) GJ Lawrence did the same on 04 November 1972\textsuperscript{90}. It is believed that the only reason Lawrence survived was that the terrorist had been frightened away by the SF presence.\textsuperscript{91}

This had obvious dangers, which the operators were all too aware of. If the point needed any reinforcement it was provided by the death of SSgt Brammah who was killed while investigating an RCIED on 18 February 1974.\textsuperscript{92}
CONCLUSION

By the end of 1971, few ATOs could have doubted that the terrorists were resourceful, adaptable and imaginative. ATOs were acutely aware that PIRA’s more capable bomb makers intended to murder them. They only needed to drop their guard briefly for PIRA to exploit any opportunity. Against this backdrop, the behaviour of some ATOs seems inexplicable. Whether it was through over-confidence, fatalism, fear or an inability to imagine the consequences, the risks taken by some ATOs are difficult to justify. There was a fine line between bravery and panache on the one hand, and an almost suicidal recklessness or naivety on the other. Those who fell too heavily on the wrong side paid with their lives. It became apparent\textsuperscript{93} that the character of an individual had as much role to play as his training, experience and technical aptitude and this aspect was eventually countered by the introduction of psychometric testing. A combination of factors, which included the rapid tempo of PIRA IED technical and tactical developments, the presence of operators with arguably unsuitable personality traits, the paucity of remote equipment and an inadequate doctrine combined to make 1972 the worst year for 321 EOD Unit. Six ATOs were killed between March and December.
INTRODUCTION

This chapter consists of brief case studies on the deaths of all EOD team personnel who were killed while undertaking EOD operations on Operation BANNER. It forms the centrepiece of this work as it is the author’s contention that nearly everything that we know and do in IEDD stems from the lessons learnt when these men were killed.

Each case study is broken down into four parts. **Situation and Actions Before Arrival** describes the events that led up to the EOD team being deployed. **Actions At The Scene** describe events that occurred from when the EOD team arrived at the Incident Control Point (ICP) to up to, or just after, the death of the personnel concerned. These two sections have mainly been drawn from the official reports on the investigations that were conducted after each death. Additional material has been found in EOD reports, forensic reports and in some case published open source books. **IED and Perpetrator’s Intent** assesses the nature of the device as well as the intentions of the terrorists. This has also been drawn from official reports, but in some cases the author has added his own assessment. Finally **Analysis and Comments** is an overview of the incident and some remarks on what went wrong.

**CAPTAIN D STEWARDSON, 09 SEPTEMBER 1971, CASTLEROBIN, CO ANTRIM**

![Figure 7.1: Capt David Stewardson](image)
Situation and Actions Before Arrival

Capt Stewardson was the HQNI reserve ATO. As such, he was fully trained, but inexperienced. A suspect package had been found outside the Orange Hall at Castlerobin, Co Antrim at 0830 hrs. The package was a rectangular wooden box, approximately 10.5 x 7.5 x 6 inches. It was standing on its end and was bound in black tape. What appeared to be a length of fuse protruded from the top.

Actions At The Scene

Capt Stewardson, accompanied by a driver and escort, arrived around 1000 hrs. Witnesses reported that after being briefed, he approached the suspect device accompanied by a police constable. He climbed over a wall, then asked the constable to dress back to the cordon position, which was 25 metres away. He proceeded to the device alone and examined it for 15 minutes. Using a knife, he cut away a rectangular area of tape from the front of the package. He produced an awl from his pouch, crouched over the package and bored two holes into the lid. He then stood up, took out a reel of fishing wire and unwound a few metres of line, but did not use it. He then asked the police and troops present to move further away. When this was done he unravelled some more fishing line but, after standing and looking at the suspect device for a while, put the line down. Then he produced a junior hacksaw from his pouch and sawed at the front left corner of the box, just below the lid, for 20 – 30 seconds. He stopped sawing, turned to his equipment, the hacksaw still in his hand, and turned back again. He resumed sawing for 3 – 4 seconds, then an explosion occurred, killing him instantly.²

Figure 7.2: The scene of the explosion at Castlerobin Orange Hall. Notice how little structural damage the building has sustained.³
**IED and Perpetrator’s Intentions**

It transpired that this was the first in a series of complex VOIEDs specifically designed to kill ATOs. EOD teams named them ‘Castlerobins’ after the site of Capt Stewardson’s death. They incorporated GPO fuzes in a neat arming system, which was operated by the depression of a rod protruding from the box lid. This was made to resemble a length of fuse in order to make the IED appear to be an igniferous time device on which the fuse had burnt out. Such failed IEDs were common at the time and would be relatively safe to move by hand. The device had two separate firing switches. These were an anti-open micro-switch under the lid and an anti-lift micro-switch at the base.

![Diagram of internal circuitry of a later recovered ‘Castlerobin’ IED.](image)

*Figure 7.3 (left): Drawing of exterior of the Castlerobin IED that killed Capt Stewardson*. Figure 7.4 (centre): Diagram of internal circuitry of a later recovered ‘Castlerobin’ IED. Figure 7.5 (right): Exterior of later recovered ‘Castlerobin’ IED.

**Analysis and Comments**

From a modern perspective, and with the luxury of hindsight, several aspects of this task stand out. The first is that the terrorists knew that the ATO would probably attempt some kind of hand entry. Without this knowledge, deploying this device would have been pointless. Terrorists stopped using these kinds of devices when disrupters and wheelbarrows came into widespread use and if such a device were encountered today, it would present an EOD team with few problems – it was, after all, literally ‘a box in a doorway’ – and terrorists moved on to other means of
attacking EOD teams, usually involving secondary devices. It is significant that devices incorporating anti handling circuits to target EOD operators are now only common in countries where remote means and disrupters are not normally used by EOD teams. However, if British IEDD teams reverted to hand entry as a first response, we could expect anti handling circuits to reappear. The same holds true for most of the current doctrine and procedures that were introduced to counter threats that have not been seen for some time, but which need to stay in force to prevent the re-emergence of these threats.

Another striking aspect is the almost haphazard way that Capt Stewardson went about the task. He followed the accepted procedure of the time by inspecting the device first. There appeared to be no effort to minimise the mount of time spent at the device and no pre-planning at the ICP. In fact, one wonders if there was any planning at all. Capt Stewardson apparently changed his mind on the RSP twice while he was at the device. Had he continued with the fishing line option, the device would have functioned on being pulled, damaging the Orange Hall, but he would have survived.

Although this was the first ‘Castlerobin’ type device, it was not the first VOIED. Nor was it the first device to be specifically targeted against ATOs. In fact, sixteen such VOIEDs had been encountered previously, six of them in the four months before Capt Stewardson’s death. One former ATO interviewed by the author stated that even if Capt Stewardson suspected the device to be booby trapped, he would have decided against pulling it because of the pressure to avoid damaging property. This is supported by SATO Bulletin No 7, produced by Maj Styles in August 1971, discussed in Chapter Four.

In his 1975 book, ‘Bombs Have No Pity’, Maj Styles described Capt Stewardson’s death (he consistently mis-spells his name as Stewartson). He wrote:

    Capt Stewartson (sic) had moved the bomb with his pulling line to test if it had an anti disturbance device. He reckoned it hadn’t.

We know from the witness statements, on which my account is based, that Capt Stewardson did not pull the device. The only logical reason he did not was because the SATO Instruction forbade it if an anti handling device was suspected. With the
gift of hindsight it appears that it wasn’t just the bombs that made casualties inevitable. Maj Styles’ insistence that they be tackled manually must have been a major contributory factor as well.

However, Styles wrote that immediately on Capt Stewardson’s death, he issued orders that all ‘Castlerobin’ type devices were to be sandbagged, X-rayed and pulled.\textsuperscript{10} Several more were encountered over the next two months and various methods were attempted to gain access to the device, including hook and line and explosive entry, but all caused the devices to function, thankfully without casualties.\textsuperscript{11} Finally two were rendered safe and recovered intact on 03 October 1971. PIRA responded with bigger and more awkwardly placed devices and Maj Styles was awarded the George Cross for commanding the dismantling of two such devices. Later variations incorporated timers, intended to function during the time it took to manually render a ‘Castlerobin’ safe, and collapsing circuits designed to function if a wire was cut. A terrorist was killed placing a ‘Castlerobin’ that functioned prematurely,\textsuperscript{12} but no more operators were killed by ‘Castlerobin’ type devices.

WO2 C L DAVIES, 24 NOVEMBER 1971, LURGAN, CO DOWN

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{WO2_Colin_Taff_Davies.png}
\caption{WO2 Colin ‘Taff’ Davies.\textsuperscript{13}}
\end{figure}

Situation and Actions Before Arrival

WO2 Davies was an experienced operator, who was based at Lurgan. He had already successfully rendered several devices safe, some of them quite complex. On 24 November 1971 he was tasked to Fisher’s furniture showroom in Lurgan. Armed men had entered the building carrying a wooden box. They said the device would function in 2 or 5 minutes.
Actions At The Scene

WO2 Davies arrived at the scene 25 minutes later and was briefed by the incident commander and witnesses. No one seemed certain of the device’s location. Within a few minutes of his arrival, he entered the building to look for the device and was accompanied by his driver. Both emerged from the building after 2 minutes, and WO2 Davies asked more questions about the device’s location. Again, both WO2 Davies and his driver entered the building. Davies went to the manager’s office, while the driver stayed outside, some 2-3 metres away. The box was on the manager’s desk. WO2 Davies put his ear to the box, without touching it, and listened. He told his driver that he could hear a clock ticking and that they should let this device soak for 30 minutes or an hour. He turned towards the door and began walking away, but had only gone a few steps when the device functioned. The building collapsed around him. He was trapped under girders and rubble. Five to ten minutes after a search started a second, much smaller, explosion occurred, accompanied by a sheet of flame. At first this was thought to be another device but was later proved to be a gas cylinder. WO2 Davies died from multiple injuries across his chest and pelvis, caused by the falling debris. The driver was also injured.14

IED and Perpetrator’s Intentions

This was a fairly standard anti-property attack on a commercial target. The ATO was not the intended target, but had simply been unlucky.

Figure 7.7: Drawing of Time IED that killed WO2 Davies.15
Analysis and Comments

Again we see the EOD operator approaching a suspect device to inspect it. WO2 Davies decided to apply a soak time after he had inspected the device, but did not apply one before his initial approaches. He also took a member of his team into the danger area with him. The SATO, Maj Bernard Calladene, wrote a report into this incident which absolved WO2 Davies of any blame, but said his only mistake was to take his driver with him into the building. The report mentioned SATO SOPs and SATO Bulletins, which apparently referred to soak times and one man risks. A SATO Bulletin was produced which reminded operators that:

a. Reconnaissance of all IEDs is a one man risk.

b. Soak based, not upon timings given by the terrorist, but by past experience of timing devices (e.g., Parkway timer, Jock Clock etc) and the time at which the ATO/AT arrives at the target. The terrorist may aim to trigger the device at the time the ATO/AT can reasonably be expected to be nearby.\textsuperscript{16}

Techniques began to be developed to prevent a recurrence. As will be seen, more ATOs were to die before complete success could be claimed. The themes covered in the above paragraphs surfaced in most of the EOD deaths that occurred over the next 17 years. The most common themes are a lack of pre-planning and/or the changing the plan while at the device, carrying out manual actions at the device and setting patterns that the terrorists can observe and exploit.

SSGT C CRACKNELL AND SGT A BUTCHER, 15 MARCH 1972, BELFAST, CO ANTRIM

Figure 7.8 (left): SSgt Chris Cracknell.\textsuperscript{17} Figure 7.9 (right): Sgt Tony Butcher.\textsuperscript{18}
Situation and Actions Before Arrival

On 15 Mar 1972, SSgt Chris Cracknell, Sgt Tony Butcher and ATO 3 were tasked to a suspect car abandoned outside Grosvenor Rd Police Station in Belfast after an anonymous phone call had been received. The car was a Ford Corsair and had a box on the back seat.

Actions At The Scene

They arrived at the scene at 1705 hrs, and decided to apply a soak time. They went to deal with another task and returned at 1900 hrs. An RCIED was considered to be a possibility, so a C45 sweep was attempted with negative results. C45 was an early form of ECM designed to cause deliberate initiation.

At this point, in Belfast at least, ATOs deployed in pairs or threes and took turns at being No 1 and No 2. SSgt Cracknell made a manual approach at 1930 hrs to inspect the car. He made another approach to explosively open the boot and approached again to check the results. He then called Butcher and ATO 3 to the boot of the car. The boot contained an empty cardboard box. All three then retired to the ICP.

Sgt Butcher then approached and opened the offside rear door with hook and line. An attempt was made to extract the box from the car with hook and line and, although the box was moved, it stayed on the seat. At this point, ATO 3 was tasked to another incident and left the scene. Sgt Butcher approached the car again. He observed that the device appeared to be an RCIED that had failed. He originally planned to attempt another pull on the IED with hook and line, but, deeming the device to be safe, changed his mind and called SSgt Cracknell forward to help him pull the box from the car manually. Butcher leaned into the car, with Cracknell stood behind him. The device functioned, killing them both instantly.19
Figure 7.10: Scene of the explosion that killed SSgt Cracknell and Sgt Butcher. The car is destroyed but there is relatively little damage to the surrounding area.\textsuperscript{20}

**IED and Perpetrator’s Intentions**

It is not known if the RCIED element of the device was a genuine failed device or a decoy, but it is believed that a VOIED, concealed within the main charge, functioned when the box was moved.

**Analysis and Comments**

This incident may have had a precedent. Three months before, on 23 December 1971, a red Ford Cortina was abandoned at the junction of Grosvenor Road and Durham Street, 200 metres from the scene of this fatal incident. Under the seat of the Cortina was a box wrapped in tape. The ATO entered the car using explosive and hook and line techniques. He then used a cording opening charge on the box but when it was fired the device functioned. This incident followed three similar incidents that involved hoax devices. Although no one can be sure, it is entirely possible that this was a VOIED similar to the one that killed SSgt Cracknell and Sgt Butcher. The overall scenarios were very similar.\textsuperscript{21}
The principle of all tasks being conducted as a One Man Risk was already established and was mentioned in the report into WO2 Davies’ death, but this tragedy served to reinforce this. Again, the phenomenon of an operator changing his mind while at the device and carrying out a manual action is a key factor in these deaths. A factor combining the above two points is the issue of two or more ATOs of similar ranks operating without a clear command structure. ATO 3 stated that although Cracknell was the higher rank, Butcher was a stronger personality and was more likely to lead a task. This is colloquially known as ‘EOD by committee’. It was officially frowned on even in 1972, but apparently was allowed to take place. The practice of having two ATOs operating together was stopped soon after this.

MAJ B CALLADENE, 29 MARCH 1972, BELFAST, CO ANTRIM

Figure 7.11: Major Bernard Calladene.

Situation and Actions Before Arrival

Following the deaths of SSgt Cracknell and Sgt Butcher, the SATO of 321 EOD Unit, Maj Bernard Calladene, decided to attend the next similar incident. Two weeks later, on the evening of 29 Mar 1972, an abandoned Austin 1800 was found in Wellington Street, Belfast at 2206 hrs. The operator originally tasked to the incident made an approach to the car after applying a 30 minute soak time and saw a box on the back seat. The box was described as being 10” x 10” x 3 ½ - 4” and wrapped in brown parcel tape. A clear plastic container that appeared to hold four coils of wire was affixed to the box. Given the similarity to the Cracknell/Butcher task, he called in the SATO.
Actions At The Scene

Maj Calladene arrived at 2340 hrs, received a briefing from the operator and, carrying a torch, made an approach to inspect the car. The device exploded at 2350 hrs, as Maj Calladene neared the car. He was thrown through a shop window and was severely injured but alive. He was taken to hospital where he later died.\textsuperscript{27}

\textit{Figure 7.12: Diagram of IED that killed Maj Calladene.}\textsuperscript{26}

\textit{Figure 7.13: The scene of the explosion in Wellington Street that killed Maj Calladene.}\textsuperscript{28}
IED and Perpetrator’s Intentions

It is not known what caused the device to function. The most likely cause is that a timer simply wound down as Maj Calladene approached. If this was the case, then Maj Calladene, like WO2 Davies, had simply been unlucky. The explosion occurred 1 hour 44 minutes after the car was found. At this point, PIRA had not standardised on one hour timers, as they were to later on. Most mechanical time devices at this point incorporated a modified alarm clock, giving either a 1 hour or a 12 hour maximum time delay. Parking and kitchen timers were also used giving 1 or 2 hour maximum delays. In practice, the majority of time devices functioned 30 – 40 minutes after being laid, but there were plenty of examples of two hour delays being used.

There was some suggestion that the device was an RCIED. However, Wellington Street is a tiny side street with poor line of sight into it for the terrorist to observe the ATO approaching. The original operator had carried out a ‘test’ (either using C45 or Lilliput) which proved negative. In addition, he had already presented himself as a target when he made his first manual approach.

The street was dark and Maj Calladene was carrying a torch, so there is a possibility that this was a Light Sensitive device. The first confirmed LSIED was encountered later that year. However, the EOD team was parked at the end of the street, shining the headlamps of their vehicles at the suspect car. This does not completely rule out an LSIED, as the device was on the back seat, below the level of the windows.29

Analysis and Comments

There are few clear lessons to be drawn from Maj Calladene’s death, given the lack of remote equipment available at the time. One is that the 30 minute soak times being used were inadequate. Short soak times, or none at all, were common when EOD tasks were conducted in hard areas, in order to minimise the time spent at risk from sniper attack, but this was in Belfast city centre and a longer soak time would have been acceptable. Maj Calladene had only to wait another 20 or 30 minutes and, had the device not functioned, a 2 hour timer could be discounted and the assessment could move on to other threats. If it did function in that time, he would have been safely at the ICP.
Perhaps the only other thing that might have saved him was the use of protective clothing. The Mk 1 EOD suit had been developed after experience in Hong Kong. It was trialled in 1968 and had been available since 1970. However, it seemed that no ATOs used it in Northern Ireland at this stage. In fact, it was not until the Mk 2 suit was introduced in 1974 and its use made mandatory that ATOs began wearing protective clothing as a matter of course. The device that killed Maj Calladene was not large – it was assessed to have contained 5 Kg of explosives. He was several metres from the car when it functioned, so had he been wearing an EOD suit he may well have survived.

CAPT J YOUNG, 15 JULY 1972, SILVERBRIDGE, CO ARMAGH

While the car bomb was causing much difficulty in urban areas, PIRA was successfully deploying command and victim operated devices in the rural environment. Main charges were often contained in milk churns and steel drums. These offered different, but still daunting, challenges to the EOD operator. On 15 July 1972, Capt John Young was tasked to a suspect milk churn at Silverbridge, near Crossmaglen, Co Armagh. The churn had been found by the side of the road at 0645 hrs. It was reported that black double strand wires led from it across the road and terminated in a field.

Figure 7.14: Captain John Young.
**Actions At The Scene**

Capt Young and his team arrived at the scene at 1045 hrs. The cordoned area was extremely small, with EOD team members being positioned only 15-20 metres from the device. Capt Young’s first action was to pull the churn into the centre of the road with hook and line. He approached the churn and attempted to remove the lid by hand. When this failed, he tried using a magazine knife (a large non ferrous knife with a brass blade normally used in ammunition processing tasks), but had no more success. Capt Young then asked his driver for a hammer. He took the hammer and returned to the churn. Using an upward stroke, he struck the lid five times. He paused for a few seconds, then struck the lid twice more. On the second strike, the device exploded, killing him instantly.

**IED and Perpetrator’s Intentions**

The milk churn contained a VOIED intended to kill the ATO. Its make-up remains unknown, but it probably included an anti-open switch on the lid.

**Analysis and Comments**

Capt Young had dealt with an IED contained in a milk churn six weeks before his death. The log does not record how he entered the churn, but it does say he removed the detonator and then moved the main charge to a field for destruction. Five weeks before his death he dealt with an IED that consisted of a series of main charges. On pulling them with hook and line one charge functioned but the others did not. It was assessed that the charge that exploded had an anti-handling circuit fitted. Capt Young dismantled the remainder by hand. Three weeks before his death, he rendered safe a large main charge of CO-OP in a culvert. There was no command wire and again, the detonator was removed by hand.

It is reasonable to assume that the terrorist had observed him carrying out these actions and may have noticed a pattern of first pulling with hook and line and then hand entering. Having seen an opportunity, PIRA successfully exploited it. Capt Young was dead within 30 minutes of arriving at the scene.
From a modern perspective, it is difficult to find any redeeming features in the conduct of this task, apart from the raft of lessons that can be drawn from it. Sadly, the next EOD fatality occurred just over two weeks later in circumstances so depressingly similar that the lessons from both tasks can be considered together.

**WO2 W CLARK, 03 AUGUST 1972, CLADY, CO LONDONDERY**

![Figure 7.15: WO2 William Clark.](image)

**Situation and Actions Before Arrival**

At 2235 hrs on 02 August 1972, Strabane RUC station received a report of two men carrying a drum into the Old Clady School. A further anonymous call at 0005 hrs reported a drum with wires attached. A patrol found a 10 gallon drum 7-8 feet from the Sion Mills to Clady Road, on a grass track leading to a field, at 0540 hrs the next morning. Wires led from the drum to behind a hedgerow.

**Actions At The Scene**

The ATO, WO2 William Clark, arrived at 0730 hrs. He carried out a C45 sweep with negative results, and began a series of manual approaches. On each approach he was accompanied by his infantry escort or driver, who stopped 8-10 metres short of the target. WO2 Clark’s first approach was to inspect the device. He made a second approach and used hook and line to draw the drum to the edge of the road. On his third approach he placed detonating cord around the lid. He retired to the ICP and fired the charge, which successfully removed the lid. He approached again, and manually removed two bags from the drum. Each was full of white powder and smelled of marzipan. He placed these on the road and retired. He made a remark about a wooden compartment inside the drum and said he intended to use hook and
line again. Then he said “hang on a minute”, returned to the bags, leant over them and cut out an electric detonator, saying “I’ve got the det”. He then returned to the drum and shortly afterwards an explosion occurred, which killed him.\textsuperscript{37}

**IED and Perpetrator’s Intentions**

In both this case and that of Capt Young, a VOIED was concealed within a metal container, positioned so that it would be found. Neither was a time or command device protected by a VO element. They were there for no other purpose than to draw the ATO to the scene and then catch him out. Both had wires coming away from them and running a short distance. These were probably arming wires.

**Analysis and Comments**

Again, we see the disastrous results of a lack of pre-planning, changing the plan at the target and carrying out manual actions. The key issue in both cases, is that the devices were located in rural areas, well away from any habitation and had been in position at least overnight. Therefore, there was no time factor and no immediate risk to life or property, so there was no need to rush to the scene, make immediate decisions and launch into an RSP. It would be entirely feasible to wait, meet with all agencies beforehand and plan the operation in detail, while not under any pressure. In this cooler environment, a more considered, more methodical RSP could be formulated. This might involve an attack on the arming wires, followed by the explosive opening of the containers and extraction of the contents, all conducted semi-remotely. Another option in each case might have been destruction in situ, an entirely acceptable course of action at the time, which would have lost forensic evidence, but not lives. This delayed, considered approach became the norm in future rural operations. The idea that operations are to be pre-planned when time allows became enshrined in IEDD principles, and it became a mandatory for planned operations to be mounted for suspected command and Victim Operated IEDs in rural areas.\textsuperscript{38}
Situation and Actions Before Arrival

On 05 December 1972, HQ 3 Inf Bde at Kitchen Hill Barracks in Lurgan was attacked with a PIRA Mk 2 mortar. The mortar base plate was in a school yard nearby. Two attempts were made to fire the weapon. The first bomb exploded prematurely 4 metres from the base plate. The second bomb hung up at the muzzle. A trail of blood, presumably the terrorist’s, was found leading from the base plate to a solicitor’s office.

Actions At The Scene

The ATO, Sgt Hills, arrived at 2015 hrs. He was briefed by an infantry subaltern, who also volunteered to assist him. There was a wall 1 metre from the base plate and a tree 3 metres to the right of the base plate. Sgt Hills set up a pulling point behind this wall and he and the subaltern ran a line around the tree to the base plate. They both approached the base plate, Hills to the right and Stuart to the left. The mortar bomb was stuck at the muzzle by its fins and was suspended parallel to the ground.

Sgt Hills approached to affix a line to the bomb while the subaltern held a light for him. As Sgt Hills was attaching the line, the bomb fell from the muzzle and struck the ground nose first. Both men stepped back and the subaltern shone his light from the torch onto the bomb. The nose cone was pointing towards him. An AT WO2 who was at the scene, but not involved with the task, reported hearing a metallic ‘clunking’ sound and someone say “Phew, don’t do that to me again”. Hills and the
subaltern moved forward again until Hills was directly in front of the bomb. Sgt Hills
leant forward to examine the bomb and as his head was directly over it, it exploded,
approximately 5-7 seconds after falling. Sgt Hills was killed by a single
fragmentation wound to the head.\textsuperscript{40}

**IED and Perpetrator’s Intentions**

The Mk 2 mortar bomb’s fuzing arrangement incorporated a short length of safety
fuze between the percussion cap and the detonator, giving a short delay between
impact and detonation. This was so that the bomb could penetrate the roof of a
building before exploding. In this case, the impact fuze functioned when the bomb
struck the ground and the safety fuse burnt to the detonator just as Hills was leaning
over it. The Mk 1 mortar did not have this design feature. As this was the first use of
the Mk 2 mortar, Sgt Hills would have been unaware of the delay between impact
and detonation. Even so, a safe waiting period after an apparent ‘blind’ munition
impacts is always observed when dealing with conventional unexploded ordnance.
There is little reason not to apply the same basic safety precaution to an improvised
munition, especially one where the make-up is not known.

*Figure 7.17: Components of the PIRA Mk 2 improvised mortar bomb. The bottom
component is the detonator, attached to a short length of safety fuse.*
Analysis and Comments

It is disconcerting to observe once more the small safety distances, the presence of more than one person at the IED and the apparent lack of planning. As well as reinforcing these familiar lessons, this incident also demonstrated the need for a secondary soak – a safe waiting period after EOD action or other occurrences to allow ‘the dust to settle’ and the results to be observed before a further manual approach is made. Initially, these were of a fixed minimum duration, but later became variable to avoid setting patterns.

CAPT B S GRITTEN, 21 JUNE 1973, LONDONDERRY, CO LONDONDERY

Situation and Actions Before Arrival

Around 2300 hrs on 20 June 1973, a patrol from 22 LAD Regiment RA found two youths behaving suspiciously in a Nissen hut on Lecky Road, Londonderry. The patrol apprehended the two youths, but they later escaped during public disorder. The patrol members saw numerous bags and sausage shaped packages and, recognising these as explosives, tasked ATO.

Actions At The Scene

Capt Gritten arrived at 2345 hrs and the Bombardier leading the patrol briefed him on the explosives he had seen and on the ongoing public disorder. It is believed that Capt Gritten decided to deal with the incident straight away, rather than wait until first light due to the difficulty in securing the area from crowds of hostile civilians.

Capt Gritten entered the hut accompanied by the Bombardier and began searching. There were two types of explosives present (CO-OP and ANFO). Capt Gritten
emptied the contents of the smaller packages into larger ones and separated these into piles, retaining the smaller packages in a forensic bag. Capt Gritten told the Bombardier that this was “a good find” and he repeated this to the Bombardier’s Battery Sergeant Major when he entered the scene to request a Situation Report (SITREP).

Capt Gritten continued feeling his way through the pile of explosives. There was a larger bag at the base of the pile and it is possible that he may have been suspicious of this. Witnesses reported him picking an object from the bag, but their descriptions of the object differ. Both mentioned wire or wires trailing from the object. Shortly afterwards there was a massive explosion, killing Capt Gritten, seriously injuring the Bombardier and injuring another soldier.42

**IED and Perpetrator’s Intentions**

It would appear that the bag at the base of the pile contained a VOIED, possibly operated on pressure release or a pull switch. It was assessed that terrorist’s intention was to protect the hide against recovery by the SF.

**Analysis and Comments**

Under modern terminology, finds are classified as being occupied or unoccupied. Occupied finds refer to caches in houses that have people living in them or devices and components that are in transit. Therefore, they can be assumed to be safe to move as it is usually assessed that the terrorists will not have an armed VOIED in their presence. Unoccupied finds, however, must be treated as though there could be an armed IED present. Capt Gritten assessed that he had found a bomb making factory. He may have considered that the presence of the youths in the hut ruled out any form of booby trap being present. However, they may have been there simply to collect devices and/or to arm the VOIED.

The report into Capt Gritten’s death stated that:

> There are lessons to be relearned from this tragic incident:

a. ATOs must not assume a find is simply a collection of explosive. They must assume that any cache or find is booby trapped.
b. ATOs must never allow other members of the SF within the danger area when handling terrorist explosives until they are completely certain that no risk of initiation exists. BDR Toyer was no more than 5-7 metres from the seat of the explosion. GNR Mines was within 15 metres.

c. ATOs must insist that explosive finds are staked out or left until the time and facilities are available for a carefully mounted EOD investigation.

d. SF must not approach or request SITREPs from ATOs while they are working.43

SSGT R F BECKETT, 30 AUGUST 1973, PETTIGO, CO FERMANAGH

Figure 7.19: SSgt Ron Beckett (centre) in Northern Ireland shortly before he was killed.44

Situation and Actions Before Arrival

Around 1110 hours on 30 August 1973 a group of 6 – 8 PIRA terrorists raided the adjoining border villages of Tullyhomman and Pettigo. The terrorists left IEDs at the village garage, the Post Office and the HM Customs caravan. The permanent customs building had been destroyed in an earlier explosion. They also ordered all the civilians present to stand against a wall and questioned them at gunpoint as to their identities. The garage owner was a part time member of the Ulster Defence Regiment (UDR) and when he gave his name one of the terrorist pointed a pistol at
him. The garage owner fled and was fired on by the terrorists. He was not hit
but another civilian was struck on the arm. The garage owner ran to his house and
returned with a Sterling Sub Machine Gun which he had been issued as a personal
protection weapon. As he returned the terrorists were escaping in two cars. The
garage owner fired on them, claiming to have struck one vehicle.

The devices in the customs caravan and garage functioned around 1200 hrs but the
one in the Post Office did not. The security forces, including the ATO, were called.

**Actions At The Scene**

SSgt Beckett arrived at the scene at 1245 - 1300 hrs (witness statements and official
reports differ on the exact time) and set up an Incident Control Point (ICP) behind a
wall approximately 85 metres from the Post Office. He was briefed by an RUC
Inspector and the Postmistress, who had seen the IED being placed. It was
described as a white plastic bag with a clock inside. SSgt Beckett approached the
area of the Post Office to assess the best access routes. He questioned the
Postmistress again about the layout of the Post Office and the location of the IED.
He returned to his vehicle and told his team that the IED was inaccessible to
Wheelbarrow due to a high step at the Post Office entrance, the narrowness of the
door and being in an awkward position. Instead he decided to apply a 10 minute
soak time then make a manual approach carrying a Pigstick disrupter. It began to
rain, so he waited a further 20 minutes, finally making his approach 30 minutes after
first examining the area.

SSgt Beckett walked to the Post Office and was inside for approximately two minutes
as he located the IED and placed the Pigstick. He then returned to the ICP and fired
the Pigstick. Its report was audible in the ICP. SSgt Beckett confirmed that the IED
was approximately 30 lbs of explosives with a clock, contained in a plastic bag and
was sitting on the floor. He told his escort that the clock on the IED was ticking.
After firing the Pigstick he decided to apply a secondary soak of 15 minutes and then
make a further approach carrying wire cutters and hook and line equipment. His
plan appears to have been to confirm disruption and dismantle the remnants. If he
could not confirm disruption or the IED was not fully disrupted he would use the hook
and line to pull the components out. After his soak period expired SSgt Beckett
approached again. He was inside the Post Office for approximately two minutes when the IED functioned, killing him.\textsuperscript{45}

\textbf{Figure 7.20: The Post Office at Pettigoe, showing the car that prevented SSgt Beckett from using his Wheelbarrow.}\textsuperscript{46}

\textbf{IED and Perpetrator’s Intentions}

From the statements of the Postmistress and SSgt Beckett’s comments before he was killed, it appears that this IED was a standard anti-property type mechanical time IED. The first two IEDs functioned forty five to fifty minutes after being placed. This is typical of the time delays associated with the mechanical time IEDs incorporating modified clocks that were common at the time. SSgt Beckett said the clock was ticking when he made his first approach into the Post Office. This was approximately two hours and twenty minutes after the IED was laid. A clock could give either a one hour or twelve hour maximum delay, depending on which hand was used as an electrical contact. Most time IEDs at the time had a one hour maximum delay – usually less. Some IEDs incorporated two hour kitchen timers but both SSgt Beckett and the Postmistress reported seeing a clock. The IED may have had a similar delay period to the two that functioned but had stopped at some point and then restarted. Conversely, the IED may have had a delay set for anything between
one hour and twelve hours in order to cause maximum disruption and difficulty to the security forces. It is possible that the terrorist may have hoped that the IED would function while the SF were present – or while the ATO was dealing with it. However, it would be impossible to accurately predict when the ATO would make his approach.

Regardless of the intended delay the chances of the IED winding down while SSgt Beckett had the misfortune to be at the scene are slim. It is more likely that some action of his caused the device to function.

A more complex and cunning attack, specifically targeting the ATO, cannot be completely ruled out but is considered unlikely. For example an RC IED may have been fired from across the border, but why did the terrorist not initiate the IED when SSgt Beckett made his first approach? Similarly the IED may have incorporated a collapsing circuit activated by the action of the IED being disrupted and starting a secondary timer. Again it would have been difficult to accurately predict when the ATO would make his second approach, unless he did it at exactly the same time on every task. There is no evidence to suggest this is what SSgt Beckett did. Finally there may have been a VO element concealed within the main charge that was activated by some action he took on his second approach. If there was something else to this IED other than a timer, this was probably it.

**Analysis and Comments**

Because SSgt Beckett was out of sight when the explosion occurred the exact cause of his death remains a mystery. As far as his actions could be observed, his conduct of the task appears to have been almost ‘textbook’ for the time (as much as any IEDD operation can be) right up until the moment he was killed. We will never know what he did inside the Post Office though. It seems most likely that his shot with Pigstick did not completely disrupt the IED and on his second approach he touched or moved something that completed a circuit. This may have been stray wires or possibly a VO element that was separate from the time element and so was not targeted with the Pigstick.
Despite the tragedy and the mystery, this task does throw much light on how IEDD tasks were conducted just over a year after the deaths of Capt Young and WO2 Clark. A number of points stand out.

SSgt Beckett first carried out Explosive Ordnance Reconnaissance (EOR) to assess his approach routes. He then carried out his planning at the ICP, not the target. A Wheelbarrow Remotely Operated Vehicle (ROV) was available. Had there been suitable access for it SSgt Beckett would have used it. A Pigstick disrupter was available and SSgt Beckett used it as his first option. He applied both primary and secondary soak times. He did not take a second Pigstick with him on his second approach but did take hand tools and hook and line.

It is clear from the foregoing that much had been learnt and the conduct of this task would be recognisable to any modern IEDD operator. However, there was still a long way to go.

The author has not visited the scene but photographs show the Post office door to be of a standard size through which a Wheelbarrow would fit. There was a car in front of the door so the size of the step could not be seen. The car itself may have presented an obstacle to Wheelbarrow. We do not know the location of the IED inside the building. The Post Office had large windows though. A modern Mk 8b Wheelbarrow may have been able to gain access through these or another route, but the Mk 3 or Mk 4 that SSgt Beckett had would have been considerably less capable. The point being made is that had SSgt Beckett been able to effect entry with the Wheelbarrow he may have been able to disrupt the IED with a remotely deployed Pigstick. He could then have recovered the Wheelbarrow, reloaded the Pigstick and sent it back to confirm disruption via CCTV cameras. If the IED was not fully disrupted he could have fired Pigstick again. However he felt at the time that this option was not open to him.

It is probable that he only had one Pigstick available to him. It was still a new – and very secret – piece of equipment at the time. Had he carried a second one on his second approach he may have been able to place it without touching anything and again disrupt the IED from a safe distance.
The foregoing two paragraphs show that while the doctrine had moved on, assisted by the developing technology, the availability and performance of equipment was struggling to keep pace.

SSGT A N BRAMMAH, 18 FEBRUARY 1974, MOYBANE, CO ARMAGH

Situation and Actions Before Arrival

On 17 Feb 74 a series of explosions occurred in a rural area outside Moybane, Co Armagh. The EOD Team based at Bessbrook Mill, led by SSgt Brammah, and accompanied by the CATO, were tasked to investigate the explosions. They were escorted by a party from Prince of Wales Company, 1 Welsh Guards. The clearance operation began the day after the explosions. An aerial reconnaissance was conducted by helicopter before the troops landed in two helicopters.

Actions At The Scene

The CATO cleared the area around the craters while SSgt Brammah cleared a Command Wire (CW) that had been found. The CW was initially pulled using Hook and Line, then SSgt Brammah, accompanied by his escort, traced the route of the wire. It had been shallowly buried and ran in a northerly direction across a number of walls and a field for a distance of approximately 200 metres. SSgt Brammah was seen to manually pull the wire and at one point to snap it.

The CW terminated over a fence near a roadway and SSgt Brammah assessed this to be the Firing Point for the original explosions. Near the roadway he saw a suspicious area of ground, approximately 12” x 7”. This stood out as it was different colour from the surrounding vegetation and was slightly raised. SSgt Brammah approached, knelt down and lifted the right hand corner of the sod. His escort reported seeing a neat square white package underneath. SSgt Brammah moved away to a distance of approximately 6 metres and gave his rifle to Gdmn Miller. He told his escort that he thought this was a Radio Controlled IED (RCIED) and became very excited, saying that it was the first one that they had found. SSgt Brammah then returned to the sod. He knelt down and lifted the opposite corner. Two or three seconds later there was a large explosion and SSgt Brammah was killed instantly.
After the explosion, The CATO requested a helicopter to evacuate casualties and a RE Search Team (REST) then cleared the immediate scene.48

**IED and Perpetrator’s Intentions**

As well as pieces of flesh and fragments of clothing, the CATO found pieces of a beer keg, a Calor gas bottle and a small piece of an ‘Ever Ready’ battery. Stuck to the interior face of the Calor gas bottle fragment was a substance assessed to be ANFO Home Made Explosive (HME). The crater was 8’ in diameter and 4’ deep. The CATO assessed the device to have contained 100 – 200lbs of explosive.

The first series of explosions took place in a rural area away from the road when there was no target present and were initiated by CW. This suggest that the terrorists were probably test firings of batches of HME. However PIRA would have known that all explosions were investigated by SF, and that CWs were followed to their FPs. It is likely that they concealed a further device at the FP to catch out such an operation. The contemporary reports make no mention of a CW coming away from the seat of the explosion. It is likely that the IED was an RCIED or a VOIED. SSgt Brammah himself suggested that the device he found could have been an RCIED, although we do not know what this was based on, as no antenna or receiver was identified. The device functioned the second time SSgt Brammah approached it. It is often assumed that the terrorist will initiate a command device as soon as a target presents itself, but this is not always the case, as the murders of WO2 Garside, Cpl Brown and two others in 1975 demonstrates. All we can say for certain is that if it was an RCIED, the terrorist waited until SSgt Brammah approached again – maybe he wasn’t ready at the time of the first approach or maybe he was waiting for more personnel to gather around the target. The act of SSgt Brammah giving his rifle to Gdmn Miller and kneeling down next to the device may have signalled to the terrorist that he (Brammah) was about to manually render the device safe and that this was the last chance to initiate the device.

Alternatively, if it was a VOIED SSgt Brammah may have initiated it by moving it on his second approach. However Gdmn Miller said that SSgt Brammah only lifted the sod - he did not mention him touching the IED. Moreover, the IED functioned several seconds after the sod was lifted. Had the firing switch been connected to
the sod, it is likely that it would have functioned immediately. On balance, it seems likely that the device was an RCIED as Sgt Brammah suspected and it was placed to kill SF – possibly the ATO specifically – who were tasked to investigate the earlier explosions. As such, SSgt Brammah may have the dubious distinction of being the only ATO to be killed by an RCIED.

Analysis And Comments

There are a number of interesting points about this case. The first is the way the operation was conducted. The attack took place in a rural area with a population largely sympathetic to PIRA. As such the terrorist would have had the time and space to prepare an elaborate trap. The SF were well aware of this and the presence of the CATO suggests how seriously the EOD community took the threat in these areas. Sixteen months had passed since the deaths of Capt Young and WO2 Clark in the summer of 1972 and some of the lessons had clearly been learnt. Rather than rush in, the scene of the first explosions was left overnight and an aerial reconnaissance was carried out before the SF deployed. There is no record remaining but it is safe to assume that a degree of planning took place in the intervening period. This more cautious method of approaching IEDs in rural areas had been in place since at least the end of 1972 and was clearly having some effect. PIRA were unable to lure the SF onto an IED with the simple expedient of a suspicious milk churn or drum left by the side of the road as they had in 1972. Instead they had to stage an incident – or link this attack into their ongoing research and development programme – in order to get troops into the killing zone.

However, there was clearly some way to go as far as planned operations in rural areas was concerned. A helicopter reconnaissance was conducted but there was no mention of aerial photography. Had aviation imagery been available and properly analysed, the disturbed area of earth that concealed the IED would probably have been seen. This, one hopes, would have changed the whole plan.

The amount of detailed planning that took place before deployment must be questioned. Once on the ground, the operation unfolded in an almost haphazard fashion with little co-ordination between the CATO and SSgt Brammah. Later it
came to be recognized that only one person must be the EOD operator. In this case it could either be the CATO, with support from SSgt Brammah and his team, or SSgt Brammah, with advice and supervision from CATO. Instead, both cleared separate areas at the same time.

Early on in the task SSgt Brammah pulled the CW with Hook and Line, but later on he pulled and snapped another section of CW by hand. On finding the IED, SSgt Brammah did not notify the CATO or other troops in the area. Nor did he retire to a safe area to plan his Render Safe Procedure (RSP). The reports and witness statements make no mention of SSgt Brammah having any EOD equipment – weapons, explosives or Hook and Line – with him, so we can only assume that he intended to carry out a manual RSP with his escort stood six metres away. The escort did state that SSgt Brammah was very excited about finding the device, so it is possible that this excitement caused him to forget the correct actions.

There was no REST present with the EOD team. Indeed, CATO had to task a REST after the fatal explosion. By the time of WO2 Garside and Cpl Brown’s death sixteen months later, it had become standard procedure for a REST to accompany planned EOD operations in rural areas and this remains in place to this day.

Finally there is no mention of ECM equipment being used. The first RCIED was encountered on 19 January 1972, nearly two years before this incident. Electronic Counter Measures (ECM) equipment in the shape of Lilliput Mk 1 and C45 had been available since the Spring of 1972 and was mentioned in the reports on the deaths of SSgt Cracknell and Sgt Butcher, Capt Young and WO2 Clark. One would assume that ECM equipment was available for this task, but no mention was made of its use in the contemporary documents. Although crude by today’s standards and limited in its capability, ECM equipment may well have saved SSgt Brammah had it been available and/or used correctly.
SSGT V ROSE, 07 NOVEMBER 1974, STEWARTSTOWN, CO TYRONE

Situation and Actions Before Arrival

On 06 November 1974 an explosion occurred at the electricity sub-station near Stewartstown. The sub-station was surrounded by two fences. The inner fence was six feet high, made of metal railings and had Dannert wire, a form of barbed wire, on both sides. The outer perimeter fence was a four strand wire fence about four feet high. Both fences had been cut to gain access to the sub-station, but the damage to the sub-station itself was slight.

Actions At The Scene

Around 1300 hrs the next day the explosion was investigated by an EOD team, led by SSgt Rose, supported by a mobile patrol of A Squadron, The Royal Hussars, commanded by SSgt J C Simpson. Also at the scene was an RUC constable and two members of 3rd Royal Tank Regiment who were in civilian clothes and had been tasked to photograph any evidence.

SSgt Simpson split his patrol into two sections. One section, commanded by himself, stayed at the sub-station, while the other, commanded by a LCpl, moved to a location further away to provide cover and control traffic.

SSgts Rose and Simpson entered the sub-station to assess the damage and emerged a short time later, stating that the station was clear. SSgts Rose and
Simpson, accompanied by four other soldiers and the RUC constable then moved to the area of the cut in the inner fence. They stood there in a group for a short time. Following this SSgt Rose organised the party into extended line and they began searching the grassed area between the two fences in a clockwise direction. At 1425 hrs, as they moved off, a large explosion occurred, killing SSgt Rose and SSgt Simpson and injuring the remaining members of the group.

**IED and Perpetrator’s Intentions**

The CATO conducted an immediate investigation and examined the scene. He found that the crater was 10 feet in diameter and four feet deep. He assessed that device had contained 100-200 lbs of home made explosive and was probably initiated by a pressure mat.

This was a well planned and executed attack by PIRA, who were able to correctly predict the ATO’s actions at the scene of the first explosion. The first explosion was staged as a ‘come on’, intended to draw the security forces onto the second device, which was probably initiated by one of the group stepping on it. No trace of any command wire was found and the area was well covered by troops, making the use of an RCIED unlikely.49
Analysis and Comments

This incident occurred nearly nine months after the death of SSgt Brammah, but it seems that not much had changed in the way that planned operations in rural areas were conducted. As with the case of SSgt Brammah’s death, the SF did not rush into the scene immediately. Instead it was left to ‘soak’ overnight. However, the
RMP report does not make any mention of an aerial reconnaissance or photography overflight so it is not known if any took place. Even if an overflight did take place, it is doubtful if photography was used and analysed. As with SSgt Brammah’s death, had photography been analysed, the location of the buried device would probably have been seen.

Again, the amount of detailed planning, both before deployment and at the scene, must be questioned. Finally there was no support from a Royal Engineer Search Team (REST), whose task it should have been to search an area for further IEDs. Pressure mats and switches had been in use by PIRA since 1972, albeit infrequently, so SSgt Rose should have been aware of them. An almost identical attempted attack took place two months earlier at Armaghilkin. In that case an explosion had occurred at an old school building. ATO and REST were tasked to investigate. REST found a duffle bag in a hedge adjacent to the school building. The ATO rendered safe a 100 lb IED designed to be initiated by a pressure mat placed just in front of the bag.51

WO2 J A MADDOCKS, 02 DECEMBER 1974, GORTMULLAN, CO FERMANAGH

Situation and Actions Before Arrival

Around 0830 hrs on 28 November 1974, a woman found a suspicious milk churn in a ditch adjacent to a road near her house. She saw a two red coloured leads and one white wire coming from the churn and disappearing into the earth about five feet away. The woman reported the churn to the RUC at 1500 hrs the following day. After she reported it, her son and another man used an improvised hook and line to pull the churn away from the house and into the middle of the field.

An air reconnaissance of the farm and surrounding area was carried out and a clearance operation was mounted on 02 December 1974. A cordon was inserted and the area was searched by a Royal Engineers Search Team (REST) from 9 Independent Parachute Squadron RE. During the search they found severed command wires at the churn’s original location. The REST also cleared a path up to and around the churn.
**Actions At The Scene**

WO2 Maddocks and his team arrived at 0925 hrs the same day. Around 1230 hrs, WO2 Maddocks approached the churn and took photographs of it. He decided to attempt to disrupt the churn with shotgun fire, so he and his No 2 armed themselves with shotguns and took up a firing position 40 metres from the churn. Before firing any shots WO2 Maddocks changed his mind and made another approach to the churn. Before he left he talked to his No 2 about “cutting off a length of the cordtex”. He approached the churn and stooped over it. One eyewitness, observing through binoculars, reported seeing him reach down and touch a wire with his right hand. As he did so the milk churn exploded and WO2 Maddocks was killed instantly.

The CATO was called to the scene and he carried out an immediate investigation. He found small pieces of white co-axial cable and the remnants of a No 6 electric detonator at the seat of the explosion.

The REST traced the reminder of the original CW to the firing point. No batteries were present. As a final action, the CW was pulled with hook and line. As it was pulled, a second explosion occurred where the CW met the road. CATO assessed this device to have contained 50 -100 lbs of Home Made Explosive. He found a plastic lunch box which contained an alarm clock, intended to act as a safe to arm switch, batteries, a toggle switch with a length of very fine fishing line attached. This line was then attached to the CW.52

**IED and Perpetrator’s Intentions**

It is assessed that this incident was originally intended to be a straightforward CWIED attack on a SF patrol. When the churn was discovered and moved, PIRA, knowing that the SF would respond after a delay, took the opportunity to modify it into a VOIED, using co-axial cable in place of cordtex, as they look very similar. There are two possibilities as to how this may have been done.

The co-axial cable ‘cordtex’ may have been connected to a pull switch. Alternatively, the co-axial cable itself may have formed part of the IED circuitry. Again, there are two methods that could have been used. The co-axial may have formed part of a collapsing circuit, so that when the cable was cut another part of the IED was
activated, or the co-axial was a ‘make’ circuit. When cut with a metallic tool, or crushed together, current was able to flow between the inner and outer parts of the cable. It is assessed that the last method is the most likely. The Department of Industrial and Forensic Science (DIFS) carried out test on remnants of the co-axial cable, using the snips that WO2 Maddocks used. Their report said

The results showed that the snips produced a short circuit between the inner core and the sheath every time the cable was cut.53

PIRA attempted to use this technique again on 04 November 1976 in Belleek, Co Fermanagh. An IED was rendered safe that had a visible decoy circuit. Attached to this was white twin core lighting cable, intended to simulate detonating cord. This formed part of a second, concealed, functioning circuit. Any attempt to cut the ‘detcord’ would have caused the device to function.54 A similarly constructed device was encountered as late as 1991 in South Armagh.55 It is not known if the VOIED attached to the CW was part of PIRA’s original plan or was included at the same time as the VO circuit that killed WO2 Maddocks.

Figure 7.23: Diagram of the scene of WO2 Maddocks’ death.56
Figure 7.24: Diagram of the milk churn and secondary device on CW.57

Analysis and Comments

We can see in this incident a clear progression in the way planned operations in rural areas were undertaken, yet we also see the old lessons of minimum manual approaches, maximum use of remote means and the danger of operators changing their plans.

Three days passed between the churn being discovered and the SF deploying, allowing plenty of time to plan the operation. An aerial reconnaissance was carried out, although we don’t know if photography and image analysis was used. A REST was an integral part of the operation and performed valuable service on this task. The practice of searching right up to the IED was used at the time (it is mentioned in several subsequent reports) but was later dropped in favour of the ATO clearing the immediate target area.

WO2 Maddocks was initially shown the churn by the REST. He retired and obtained a camera before approaching and taking photographs. In effect he placed himself in danger by making two manual approaches to a viable IED without taking any positive action against it to make it safe. He then decided to disrupt the churn using shotgun fire. Shotguns were often used to disrupt IEDs at this time, with varying degrees of success, but one wonders what he hoped to achieve with a shotgun against a metal cased main charge. It did at least it had the merit of being a remote action, if only by 40 metres.
Eventually he decided against disruption and apparently chose to cut the cordtex. This was a common procedure in the early 1970s and is mentioned in both RSP code lists that were published in 1972. WO2 Maddocks must have believed that the ‘cordtex’ was genuine. Even so, it would have been better to simply remove the detonator from the ‘cordtex’ than cut the ‘cordtex’ itself. This, of course, would not have dealt with the IED that was actually concealed within the churn, but would have rendered safe the IED that WO2 Maddocks thought he had.

In any case, TAB 21/1725 dated December 1972 stated that all IEDs in country areas were to be destroyed by demolition in situ.\(^{58}\) This runs the risk of losing forensic evidence, but does protect life. If WO2 Maddocks adopted this course, or a remote means of gaining entry to the churn, such as using an explosive disruption charge, he would have lived.

**WO2 E GARSIDE AND CPL C BROWN, 17 JULY 1975, CORTREASLA BRIDGE CROSSROADS, CO ARMAGH**

![Figure 7.25: WO2 Gus Garside.\(^{59}\)](image)

**Situation and Actions Before Arrival**

On 10 July 1975 a foot patrol noticed a suspicious oil can wrapped in plastic lying 25 metres south of the Cortreasla Bridge crossroads near Crossmaglen in South Armagh. A Reconnaissance Intelligence Centre (RIC) flight was tasked to take aerial photography of the item. The flight took place at 1135 hrs on 11 July. RIC reported that the photography was inadequate so another flight was tasked, taking place at 1530 hrs the same day. On 12 July a further foot patrol was sent out to
confirm the location and description of the item as there had initially been some confusion. This was done under the pretext of carrying out snap Vehicle Check Points (VCPs) in the area. This patrol moved through a gap in the hedge near a signpost in order to join the road. The patrol then moved to a nearby garage and questioned some members of the local population, one of whom was a PIRA member later convicted of the murder of WO2 Garside, Cpl Brown and two others.

Two operations were planned for the area. The first was an EOD clearance of the suspect oil can on 17 July and the second was a series of ambushes intend to catch PIRA illegal VCPs on 18 to 20 July. The OC of A Coy 1 GREEN HOWARDS, Maj PJ Willis, carried out a helicopter reconnaissance and helicopter pilots were asked to keep an eye on the area over the next few days. Another RIC flight was planned before the EOD clearance commenced, but this was cancelled.

The EOD clearance operation consisted of five groups. Four groups came from Crossmaglen SF base. These were three groups of four soldiers to provide the cordon – known as ‘stake outs’ at the time – and the command group, consisting of Maj Willis, the platoon commander and two other officers. The ATO’s party came from Bessbrook Mill SF base and consisted of the ATO, WO2 Garside, his No 2, Cpl Brown, a RESA, Sgt McCarter and an RMP sergeant from the Bomb Intelligence Team (BIT), later to be known as the Weapons Intelligence Section (WIS).

The four groups from Crossmaglen deployed at 0900 hrs on 17 July, arriving by helicopter and landing at a site some distance away from Cortreasla crossroads so as not to alert the locals as to the group’s destination. They then moved on foot to the crossroads and the stake outs took up their positions. At the crossroads, one stake out group and the command group, in extended single file, moved through the same gap in the hedge, near a signpost, that the patrol on 12 July had used. Nothing suspicious was seen. This gap in the hedge was approximately 25 – 30 metres from the suspect oil can.

The command post was established in the adjacent field. The ATO’s party arrived by helicopter between 0935 and 0940 hrs. Before landing, the helicopter circled the field twice to allow WO2 Garside to view the area. Shortly afterwards, the NCO in command of the first stake out group saw a man running southwards along the road
away from the garage. He attempted to pass this information to his Platoon commander, but the Platoon commander’s radio experienced a fault.

**Actions At The Scene**

The ATO’s party assembled in the field and, after a short briefing, Sgt McCarter moved towards the gap in the hedge and carried out a Vetch sweep. The sweep proved negative. Maj Willis and WO2 Garside followed a short distance behind, walking side by side, discussing the suspect IED and the possibility of there being any other devices. Cpl Brown, accompanied by the BIT sergeant, extracted hook and line equipment from his Bergen and the two then followed on. Sgt McCarter completed the Vetch sweep and placed the instrument down 10 m from the gap in the hedge.

Maj Willis, WO2 Garside and Sgt McCarter paused at the gap in the hedge, which allowed Cpl Brown and the BIT sergeant to catch up. It appears that Maj Willis and WO2 Garside then moved through the gap and on to the road. Sgt McCarter and Cpl Brown were stood in the gap and the BIT sergeant was a metre or two behind. The whole group was spread over a distance of six metres. The time was 0950 hrs. At this point a large explosion occurred in the gap in the hedge. Maj Willis, WO2 Garside, Sgt McCarter and Cpl Brown were all killed. The BIT sergeant was injured.

Within a very short space of time a very effective reaction operation was mounted. The medical officer, the acting CO of 1 GREEN HOWARDS, a REST and another ATO team from Lurgan with another BIT sergeant were all tasked and arrived in a short space of time. The CATO, Lt Col Underhill, arrived shortly afterwards. Another RIC sortie was flown and pictures, although uninterpreted, became available at 1430 hrs. At 1110 hrs a man was arrested by one of the stake out groups as he drove away from the area.

As part of the clearance operation Lilliput ECM equipment detected two radio signals. CATO asked for all electric power to the surrounding area to be shut off. This was done and one of the signals dropped away, but the other remained detected. This led to the belief that the device had been an RCIED and that there may have been a secondary device in the area. After some hours, CATO cleared the suspect oil can, declaring it to be innocuous, and cleared the seat of the
explosion. Bared ends of a command wire were found and these were traced to a firing point some 300 metres south of the junction.\textsuperscript{61}

**IED and Perpetrator’s Intentions**

The device was a CWIED with a firing point some 300 metres to the south on a track leading to a farm. It is assessed that the IED was not specifically targeting the EOD team. It is more likely to have been aimed at foot patrols carrying out VCPs at the Corteasla crossroads and this group simply offered a target of opportunity.

In his report into the attack, the deputy commander of 3 Infantry Brigade assessed that the location of the main charge in the gap in the hedge was coincidental. He believed the IED to have a directional affect and was aimed directly at the crossroads. He wrote:

> There is absolutely no evidence to suggest that the suspected IED and the bomb were connected. The blast effect of the bomb was directional and aimed at the crossroads, presumably to destroy a VCP. The fact that the bomb was laid beside a gap in the hedge was probably coincidence. (If the gap had been elsewhere the bomb would still have been placed where it was).\textsuperscript{62}

The deputy brigade Commander appears to be describing a ‘claymore’ type device. Photographs do show debris thrown onto the road, but it is entirely possible that a similar amount of debris was thrown in the opposite direction, into the field. The CATO’s report does not describe the device as directional. He assessed the main charge to be 50 – 75 lbs of commercial explosives, contained in a steel container, buried into the bank at the gap in the hedge.

The deputy brigade commander is probably correct in his assessment that the original suspicious oil can was not placed as a ‘come on.’ More likely is that it was innocently discarded, but once seen it was treated as suspicious by SF. He assessed that PIRA then noticed this SF interest in the area and, correctly deducing that an operation of some sort would soon be mounted in the area, they placed this CWIED at a point likely to be used by patrolling troops.\textsuperscript{63}
Analysis and Comments

Unlike most of the incidents previously recounted, this attack was not specifically targeted at the ATO. However, the way the operation was planned and conducted - by WO2 Garside, Maj Willis and the SF in general - contributed to the disaster which befell them. This incident does not tell us much about how IEDs were dealt with, but speaks volumes on how planned operations in rural areas were conducted. Specifically, how the EOD teams and supporting troops got into an area where an operation was to be conducted.

The SF activity in the area may have alerted PIRA to an imminent operation. In the immediate post incident reports it was stated that too much interest had been shown in the Corteasla crossroads between 10 – 16 July. The RIC flights and helicopter reconnaissances would have been of particular interest to PIRA and its sympathizers. A week passed between the discovery of the suspicious oil can, followed by RIC flights, and the clearance operation taking place. This, in itself, was not a bad thing. We have seen the results of rushing into a rural area where PIRA have time and space to lay an IED in the deaths of Capt Young and WO2 Clark. However, without constant over-watch – something that would not have been possible with the number of troops available – PIRA had plenty of time to lay and conceal an IED. The RIC flight that was flown after the explosion clearly showed the command wire. Had a sortie been flown on the day of the operation, but before the EOD team deployed there would have been a very different outcome. In fact, the CATO’s report stated that it is:

..essential that before any future operation a confirmatory flight is made and comparison of the SF original reconnaissance flight be made by the trained personnel at Aldergrove, to ensure that there are no discrepancies between the planning photographs and the actual photograph on the day.....CATO S.O.P.s have already been amended to this effect.64

After the operation, both the deputy brigade commander and the CATO considered that the operation had been conducted with too few stake out groups to be able to effectively dominate and search the area. When the troops arrived at the scene, Maj
Willis led them through the gap in the hedge, which was within 30 metres of the suspicious oil can. The Deputy brigade commander stated in his report that Willis evidently did not believe that there was an IED present. CATO commented in his report that WO2 Garside believed the same, but would not have crossed the road at the gap had he known he was so close to the suspect device.

The operation was mounted without the support of a REST. Therefore, there area was not subjected to an ‘isolation’ – a search of the outer areas intended to locate any command wire running into the target area. The RESA did deploy, but what he was expected to achieve without a search team is not known.

When WO2 Garside and his team arrived by helicopter, they flew straight into the field where the operation was to take place and began walking towards the crossroads. In future operations, EOD teams would land some distance away. The REST would search into a Filter Incident Control Point (ICP) and from there would search into the EOD ICP.

When the southern stake out groups moved into their positions, they passed within sight of the firing point and did not see anyone there. In his report, the deputy brigade commander opined that the arrival of the ATO’s helicopter may have been the signal for the terrorist to take up his position at the firing point. This would explain why the man was seen running from the garage, south towards the firing point shortly after the helicopter arrived. Had the stake out group commander’s radio message about this man got through to the platoon commander, it is possible that the outcome would have been different.

The command wire had been crossed several times by the deploying troops but they had not seen it as it had been very well concealed. Similarly, the command group and one stake out group had moved through the gap in the hedge and had not seen the main charge.

This is an interesting point for modern IEDD operators. When carrying out their threat assessment, one of the factors they are taught to consider is whether a viable target has presented itself. If it has, and no explosion has occurred, this usually
lowers the command threat in the operator’s mind. In this case, a target of eight soldiers did present itself at the gap and no explosion occurred. Although we have no way of knowing, it would be surprising if WO2 Garside had not considered this before moving through the gap in the hedge. He must have thought it was safe. So why did the terrorist not initiate the device when this first target presented itself? There are two possible explanations for this.

The troops were moving in extended single file, with large gaps between them. Had the device been initiated, it would probably have killed only one or two soldiers. Alternatively, the terrorist was not at the firing point at this time.

I assess the latter to be far more likely. As far as PIRA were concerned, one or two kills were still a worthwhile achievement. Moreover, the terrorist would have had no way of knowing that the gap would be re-used at all, let alone by a more bunched up group. The evidence of the man, who was later convicted of the four murders, being seen running towards the firing point after the ATO’s helicopter arrived strongly suggests that no one was watching the gap when it was first crossed. This is a very important point for IEDD operators. The fact that a target has presented itself does not necessarily reduce the command threat unless all of the facts about the situation are known.

SGT M E WALSH, 09 JANUARY 1977, DRUMULLY, NEWTOWNBUTLER, CO FERMANAGH

Figure 7.26: Sgt Martin Walsh.
Situation and Actions Before Arrival

Around 1750 hrs on 08 January 1977, four armed men entered a filling station shop at Drumully and left a milk churn there, stating that it contained a 100 lb bomb that was due to explode in twenty minutes. The shop owner called the RUC who evacuated the area and tasked ATO.66

The ATO, Sgt Martin Walsh, consulted with the Squadron Leader of A Squadron, 9/12th Lancers, which was the unit responsible for the area. Between them they decided that the milk churn was probably a ‘come on’ to lure SF onto an IED, possibly concealed on the route between Newtownbutler and Drumully. Because of this they decided to delay any deployment until the morning and devised a four phase planned operation to clear the scene.

Phase One would see a section of eight men sent to Drumully by helicopter to secure the area of the shop. On Phase Two, Unit Search teams would clear the first part of the route. For Phase Three, REST would take over the route clearance into Drumully and establish an Incident Control point (ICP) at the scene for the EOD team. Finally, Phase Four would see the ATO clear the milk churn, followed by a REST search of the area.

Normally the RESA would also be consulted on the planning of such an operation, but he was on leave at the time and only joined the operation on the morning it was mounted. On the morning he requested a second REST. Due to a problem with the availability of helicopters, it was expected that Phase Three would be delayed.

Sgt Walsh first carried out a helicopter reconnaissance on another task. He then agreed with the Squadron Leader to shorten the task by moving to Drumully by helicopter and clearing the scene concurrently with the route clearance taking place. Therefore Sgt Walsh, his escort and a search dog and its handler arrived at Drumully without the rest of their team or equipment at 1120 hrs on 09 January. 67

Actions At The Scene

On arrival Sgt Walsh spoke to the incident commander and the shop owner in order to ascertain the whereabouts of the suspect IED. The dog was then used to clear
the route between the ICP and the shop. At 1130 hrs Sgt Walsh and his escort moved to within 25 metres of the shop. Sgt Walsh then approached the shop. His escort’s witness statement says that he entered the shop and examined the churn for 10 – 15 seconds. The initial RMP report states that he viewed it through a side window. Sgt Walsh returned to his escort and told him that he could see a clock in the open neck of the churn and a length of what looked like safety fuse.

Sgt Walsh returned to the shop and attached a line to the churn. He returned to his escort and they slowly pulled the churn to the door of the shop. In his witness statement, Sgt Walsh’s escort says that it became stuck in the doorway, while the initial RMP report states that it fell over. Regardless of what happened, the churn stopped at the door and Sgt Walsh decided to apply a 30 minute soak.

At 1200 hrs Sgt Walsh made another approach and either reaffixed the line or attached a new one. Sgt Walsh returned to his escort, who was situated approximately 25 metres from the shop. Together they pulled the churn clear of the shop, across the filling station forecourt and onto the road. At this point the churn definitely did fall over, with its open neck facing across the road. Sgt Walsh applied another 30 minute soak and he and his escort returned to the ICP.

At 1230 hrs, Sgt Walsh and his escort made another approach, during which Sgt Walsh discussed using a primer to explosively extract the contents of the churn. They stopped 25 metres from the churn. At this point the escort could see into the neck of the churn and stated that he could clearly see a clock and battery hanging from the neck. Sgt Walsh then told his escort that he was going to dismantle the device by hand. Leaving his escort at the 25 metre point, he approached the churn. His escort was close enough for them to converse. Sgt Walsh told the escort that the clock had stopped. Sgt Walsh removed the clock and battery by hand. Sgt Walsh then knelt on the churn and put his arm inside. He then looked towards his escort. At that point the device functioned and Sgt Walsh was killed.68 One source states that as he looked towards his escort, he said “oh Christ what’ve I got here?”69

IED and Perpetrator’s Intentions

This device was a VOIED intended to catch out the ATO. It is likely that the clock and battery served no purpose other than to act as a decoy and that the real firing
switch was a pull switch, possibly attached to the wires coming away from the clock. This is supported by a supplementary report issued after the recovered evidence had been examined.\textsuperscript{70}

A similar device had been rendered safe in South Armagh a few weeks earlier. This consisted of two milk churns next to a car that had been damaged by an explosion. One milk churn was stood upright and contained only HME and a length of detonating cord. The other was laying on its side and was similarly filled, except that at the base was a time and power unit with a line running from the detonating cord to a pull switch. Pulling the cord or line would have caused the device to function. This device had been rendered safe using the primer technique that Sgt Walsh had discussed\textsuperscript{71} Another similar device had been dealt with by Sgt Walsh’s predecessor.\textsuperscript{72}

**Analysis and Comments**

There were a number of factors at play here that led to Sgt Walsh’s death. The CATO at the time, Lt Col Derrick Patrick, published a memoir which is unusual in that he was surprisingly candid in giving his views on the matter. It is instructive to look at what he said:

He was a self assured young man – confident and liked by his team. He was also impatient. Normally these are not traits that would kill an operator. Unfortunately circumstances were against him.

Firstly he had been back from rest and recreation leave only one full day before he went out on the clearance operation. So he had not had time to get himself back into the frame of mind necessary for the EOD operator’s task. Don’t forget he was a confident young man.

Second, he had made some very successful clearances. Unknown to us at the time this included one where he knocked the lid off a milk churn with a hammer.

Third, he did not go to bed early the night before the clearance.

Fourth, the inexplicable intervened. As someone said later ‘What the hell was he doing putting his hand inside the milk churn full of explosives?’ A drawing of the
booby-trapped milk churn I had neutralised beside the tanker on the border on Christmas Eve was actually on the wall in his office in Omagh!

Furthermore he had been asked by the RUC Special Branch to visit them before the clearance. They had some information on the bomb…which he did not call to receive.

Finally the owner of the shop, who had found it behind the counter, had advised him to blow it up in situ. It was good advice. But he did not take it.  

The incident Patrick refers to, where Walsh removed the lids of milk churns with a hammer, was a VBIED and is described by Walsh’s number two, Cpl Richard Peacocke:

He made a series of manual approaches…without his EOD suit on and used the hook and line to drag two milk churns from the boot. He then squatted on them and used a mallet to knock the churn lids off; and then emptied the explosives out. All this happened under the gaze of the locals and anyone else who wanted to watch and film it.

From the above passage, it was clear that Walsh had been observed manually entering an IED and it is highly likely that this incident was set in the expectation he would repeat the action. By 1977, IEDD doctrine had developed sufficiently to be recognisable to a modern operator. Remotely Operated Vehicles, in the form of Wheelbarrow, were available and their use was well developed and strongly encouraged. Neutralisation by disruption, using either explosive means such as the primers mentioned above, or disrupters like Pigsticke, had become the norm and had largely replaced manual dismantling as the primary Render Safe Procedure. The conduct of planned operations was also well developed, especially after the deaths of Garside and Brown in 1975.

While it could be said of most of the earlier deaths that the EOD teams were still finding their way, and the general practices of the time contributed to their deaths, this was not the case here. Sgt Walsh was not killed because of the inadequacies of the doctrine. He died because he cut corners and broke the rules. Or in other words
he ignored the *doctrine*. It must be asked what he did wrong and, perhaps more importantly, why?

Sgt Walsh, along with the Squadron Leader, assessed that this incident was staged as a ‘come-on’, to draw them onto another device, possibly *en route* to Drumully. This shows that he was aware that he may be targeted by PIRA. We do not know whether this assessment led him to believe that the device at Drumully was a hoax. If he did think this, and that the real threat was on somewhere at the roadside, it may have caused him to be more relaxed about the threat at the task location. In Patrick’s account, the RUC Special Branch had some information for him about the device. It is the author’s experience that police and other security agencies will seldom share sensitive information unless it is operationally vital. We do not, and probably never will, know the nature of this information, but it is tantalising to think that it might have changed the outcome. Any information to the effect that this bomb was real or that there was more to it than met the eye should have been enough for the whole operation to change. Sadly, we will never know.

The four phase plan was basically sound but should not have been finalised until the RESA had been consulted. The RESA, when apprised of the plan, evidently thought that the search assets were insufficient and asked for more. This led to a delay in the third phase of the operation that could have been avoided if it had been properly planned and resourced from the start.

This delay in Phase Three led Sgt Walsh to fly ahead with his escort and a small amount of equipment, leaving the remainder of his team to follow by road after Phase Three had been completed. Again, this suggests that he did not take the threat at Drumully seriously and considered the real threat to be on the road. Moving ahead with his escort denied him of most of his remote and disruptive equipment. One would hope that had his whole team and their equipment been present he would have used it. The temptation to carry out manual actions at the target may have been avoided altogether by the simple fact that Wheelbarrow could have done remotely what he did manually and semi-remotely - ie moved the churn from the shop. If he had not been at the target in the first place he could not have made a fatal snap decision. Having said that, the conduct of some of Sgt Walsh’s previous operations may suggest otherwise and it is entirely possible that, despite having all
of his equipment with him, he may have conducted this task in exactly the same way
that he eventually did.

Without his equipment, Sgt Walsh was forced to deal with the device as his
predecessors would have done in 1972 or 1974. He made several manual
approaches to assess the device and attach Hook and Line. In the early stages of
the task he was clearly still circumspect enough to carry out his actions semi-
remotely and to apply secondary soak times. Even so, there was no real reason to
move the churn from the shop. Sgt Walsh probably intended to remove any
explosive hazard from the area of the petrol pumps. However, he had no way of
knowing if there was a Victim Operated switch in the device, or how any such switch
might be activated. It was entirely possible that the action of pulling the churn could
have caused the device to function, thus negating any benefit gained from moving it
in the first place. This would not be a cause for criticism if Sgt Walsh only had Hook
and Line and hand tools with him, but he evidently also had explosives and intended
to use them later on in the task. It would have been better to attempt to explosively
open the churn where it stood and accept the risk of complete detonation, balanced
against the probability that the device would be disrupted in the process. This
thought process is still taught to operators: If a certain action is carried out, what is
the best case I can expect, what is the worst case and what is the most likely
outcome?

Having got the churn resting on its side at the side of the road, Sgt Walsh then
planned to use an explosive means to extract the contents of the churn. Had he
done this the task would have ended well for him. Instead he made a snap decision
to dismantle it by hand. After seeing the device in the shop, he had decided that it
was a real IED after all, but he seems to have been taken in by the time element that
could be seen. He seems to have taken no account of the possibility of a VOIED,
despite knowing about two recent cases of milk churns containing secondary circuits.
He put his hand inside the churn and, it would appear, found something he was not
expecting, just before the device functioned.

What the above paragraphs show is that although there were a number of
contributing factors, the two crucial ones were that Sgt Walsh failed to gather all of
the information available to him - and that which he did gather was not analysed
effectively; and that he changed his mind at the target. This led him to attempt to manually dismantle what turned out to be a VOIED.

There are many parallels with earlier EOD deaths, particularly those of Capt Young, WO2 Clark and WO2 Maddocks. This is all the more tragic because the lessons that emerged from those deaths had been learnt and incorporated into the doctrine. There were procedures and techniques available to Sgt Walsh that would have saved him, but he chose not to use them. Sgt Walsh had previously rendered safe an IED contained in a milk churn by hammering the lid off. There are definite echoes of Capt Young here and as well as matters of techniques and procedures, it would also appear that their personalities played a large part in their demises. This aspect was already well recognised at the time of Sgt Walsh’s death and had led to all ATs and ATOs having to undergo psychometric testing before being deployed on IEDD duties in Northern Ireland. This is discussed in Chapter Twelve.

SIG P J REECE AND GNR R A J FURMINGER, 02 AUGUST 1979, ARMAGH, CO ARMAGH

![Figure 7.27 (left) Sig Paul Reece. Fig 7.28 (right) Gnr Richard Furminger.](image)

**Situation And Actions Before Arrival**

On 02 August 1979, the Armagh team of 3 Section, 321 EOD Unit RAOC was tasked to a burnt out car. That car had been used in the murder of Constable George Walsh, who had been shot dead while sitting in a car outside Armagh courthouse. The murder was claimed by the INLA. The car was cleared and the team convoy, consisting of two Ford Transit Mk 2 vans, and their UDR escort in a Land Rover set
off back to Lurgan on the B115 Kilmaddy to Armagh road. The first vehicle contained the ATO and his No 2 operator. The second vehicle was driven by Signalman Reece, the ECM operator, with Gunner Furminger, the infantry escort, in the passenger seat.

**Actions At The Scene**

As the convoy passed over a culvert, a large explosion occurred, which severely damaged the second vehicle and killed Sig Reece and Gnr Furminger. Two men were seen running from the scene, one of whom had blood on his face.

**IED and Perpetrator’s Intentions**

This was a simple CWIED attack on a SF convoy. It is unlikely that the EOD team were specifically targeted – any military convoy would have served as a target. It was assessed that the main charge consisted of 400 – 500 lbs of HME. A command wire ran for approximately 60 metres away from the seat of the explosion. This was unusually short for such a large main charge and may go some way to explaining the bleeding man seen running from the scene.78

**Analysis and Comments**

This was a fairly standard CWIED attack on a SF convoy, unusual only in that the target was an EOD team. The post mortem revealed that both soldiers did as a direct result of internal blast injuries. However, it is clear from the photographs of the scene that the explosion took place not under the vehicle, as one might expect, but in front of it. The van can be seen at rest ‘nose down’ in the crater. Had the explosion occurred underneath then the vehicle it would have been propelled away from the seat of the explosion and, with such a large charge, would doubtless have disintegrated as well.

McCkittrick *et al*’s assertion that the abandoned car they were initially tasked to had been used in an INLA shooting is interesting. Given the type of device and its location, this IED was almost certainly the work of PIRA. This throws up a number of possibilities. INLA and PIRA were generally wary of one another, although it is known that individual members of both organizations did have informal links.
Members may have collaborated, if only to the extent of INLA informing PIRA that an operation was to take place that would result in an SF convoy using the chosen route, and PIRA using that information to place an IED. It is also possible that it was sheer coincidence. PIRA would probably have known that a SF convoy would use the route eventually and it just happened to be an EOD team responding to an INLA incident.

This incident, although tragic (both soldiers had only been in Northern for nine days), did not have any great effect on the conduct of IEDD operations. It did add some weight to the widely held belief that, when the command threat is high, the first vehicle in any convoy is the safest to be in. The logic behind this is that the perpetrator usually allows the first vehicle in a convoy to pass as it helps him time his moment of firing. In theatres where the VO threat was higher, such as the later stages of the Iraq and Afghanistan campaigns, the reverse is true and the first vehicle is usually seen as the most dangerous to travel in.

WO2 M O’ NEILL, 31 MAY 1981, NEWRY, CO DOWN

Situation and Actions Before Arrival

On 27 May 1981, Constable Mervyn Robinson was murdered by PIRA\textsuperscript{79} gunmen at Whitecross, South Armagh. The gunmen used a pale blue Ford Cortina estate car in the attack. On 30 May the RUC received an anonymous call, reporting that two armed men had abandoned a car at the junction of Hillhead Road and Drumalane Road, at the southern outskirts of Newry. An RUC patrol confirmed the presence of the car. Police enquiries found that such a car was registered to a man in Crossmaglen, but his car was currently parked outside his house, suggesting that the abandoned car had been ‘ringed’ or had acquired another car’s identity.

The Bessbrook ATO, WO2 O’ Neill, was tasked to clear the car. He decided to mount a planned operation in a few day’s time. He called his Officer Commanding and discussed the upcoming operation, stating that he intended to wait for the Reconnaissance Intelligence Centre (RIC) to carry out an overflight for aerial photography and that he intended to use RESA/REST assets to assist him. He did not mention that the car had been ‘ringed’. Rather than wait a few days as originally
planned, a planning conference took place that night. The cordon was inserted that night and the clearance operation was mounted the next day, 31 May 1981.

Sometime between the planning conference and the operation being mounted, the RUC discovered that the car had been hijacked on the concession road, along the border, on 06 May 1981. The RUC were keen to recover any forensic evidence from the car that could be used in the investigation into the murder of Constable Robinson.

**Actions At The Scene**

The clearance operation began at 0420 hrs. On arrival the REST searched the area and, once this was done, the clearance of the car started. WO2 O’ Neill decided to use his Wheelbarrow Remotely Operated Vehicle, which was fitted with Pigstick disrupters as standard, to clear the car remotely. On the first approach a Pigstick was fired at the lock on the car’s tailgate, with the intention of opening the tailgate. However, this simply jammed the lock. The Wheelbarrow boom was pushed through the rear window, in an attempt to open the tailgate but this also failed. However, using Closed Circuit Television (CCTV) fitted to the Wheelbarrow, WO2 O’ Neill was able to observe that was no large charge in the main load carrying area of the car. He then used the Wheelbarrow to rock the car from side to side. At this point the Wheelbarrow began to lose its CCTV picture, making its use very difficult. There was a reserve Wheelbarrow at Bessbrook, but WO2 O’ Neill did not ask for it to be brought forward. Instead he asked the RESA to clear a route to the car so he could begin making manual approaches.

After two members of the REST cleared the route and area around and underneath the car, WO2 O’ Neill made a series of manual approaches, wearing the full EOD protective suit. On his first approach to the car he attached a detonating cord charge and Hook and Line to the driver’s door. On returning to the incident Control Point (ICP) he fired the charge but it failed to open the door. He made a second approach to repeat the action and this time it successfully opened the door. On the third approach he carried out a visual check of the car then used Hook and Line to open the rear offside door. On the fourth approach he used Hook and Line to pull a cushion and carpet from the rear of the car. On the fifth approach WO2 O’Neill used
Hook and Line to operate the bonnet release catch. This opened the bonnet to the safety release catch. On the sixth approach WO2 O’ Neill opened the bonnet and checked the engine compartment. The report does not state whether he used Hook and Line to do this or if he opened the bonnet manually. At some point during this phase, WO2 O’Neill told his team that, having seen the damage to the rear lock caused by Pigstick, it was apparent that the car had recently had a poor respray.

WO2 O’ Neill then told his team that he was “90% sure that the vehicle is clear” and told his team to prepare their car tow rope, but to start packing away the remainder of their kit. He then made another approach to the car, still wearing the EOD suit, but without the helmet as it had prevented him from seeing clearly.

On this approach several witnesses stated that they saw WO2 O’ Neill kneeling on the left hand side of the car and that one or both doors on that side were open. These doors had not been opened with Hook and Line on the earlier approaches, so WO2 O’ Neill must have opened them manually. None of the witnesses had continual sight of him at this time, but one witness believed he saw WO2 O’ Neill leaning into the front passenger area of the car. At 0745 hrs there was a large explosion and WO2 O’ Neill was killed instantly.  

**IED and Perpetrator’s Intentions**

It is assessed that this device was VOIED of around 10 – 15 lbs of commercial explosives. The CATO at the time assessed that the intended target was probably RUC, following up the murder of Constable Robinson.

A series of explosive trials using similar cars were conducted to ascertain the size and location of the device. Its exact location could not be determined but it was assessed that it was placed somewhere in the front passenger area and most probably in the glove box.

It must have been very well concealed and was probably designed to pass very close scrutiny of the car. Unusually, no typical IED components, of even fragments of components, were found afterwards. This suggests that the car’s own electrical system may have been used. The Ford Cortina was fitted with a glove box courtesy
light that illuminated when the lid was opened. It would have been a simple matter to wire this into an IED. A similar method is believed to have been used in the murders of Constables Millar and Donald in 1970. In that case, which was the first fatal VOIED attack and one of the earliest IED incidents involving a vehicle, the device is believed to have been wired to the car door courtesy light, and functioned when the door was opened.\textsuperscript{81}

**Analysis and Comments**

By 1981, the IEDD *doctrine* was well matured and this can be seen in the way WO2 O’Neill approached the task. The operation was planned in advance, although it could have been left longer and planned in more detail. Remote means, in the form of Wheelbarrow fitted with a means of disruption, Pigstick, were used until this broke down. Then WO2 O’Neill used semi-remote means, in the form of detonating cord opening charges and Hook and Line equipment. In fact, apart from developments in equipment, this task should seem immediately familiar to a current operator. Had WO2 O’Neill continued in this vein he would have survived.

WO2 O’Neill was a competent, experienced AT who had served as an IEDD operator in Northern Ireland before. However, some of his decisions are open to question. The OC of 321 EOD Unit, as well as the remainder of the Bessbrook EOD team believed the car was to be left to soak. For some reason, it was decided not to wait a few days, but to mount the operation the day after the planning conference. The report does not state if the RIC photography flight had been flown before the deployment, or if it had, if the images had been received. If it had, then RIC’s efficiency must be praised. If not, then WO2 O’Neill ignored the lessons, enshrined in the CATO SOPs, of WO2 Garside’s death in 1975. Not that it would have made any difference to this task, but WO2 O’Neill did not know that at the time.

Although he spent most of the task following the procedure for such a scenario, he did not seem to be especially suspicious of the car. This is odd, as he knew that the car had been in the terrorists’ hands for three weeks, that it had been ‘ringed’ and, through his own observation, that it had been resprayed recently. In all recent cases
like this one, vehicles which had been so carefully disguised had always contained explosives.

It would appear that WO2 O’Neill opened the nearside doors and, finally, the glove box lid by hand. Considering that all of his actions on the offside of the car were conducted semi-remotely it would have been safe and logical to carry on like this throughout the car. His reasons for not doing this can only be guessed at, but he must have assumed it was safe to carry out manual actions. What any such assumption was based on is unknown. This may well be yet another example of an ATO intending to carry out a semi remote action, but changing his mind once in the target area.

WO2 J R HOWARD, 08 JULY 1988, BELFAST, CO ANTRIM

Figure 7.29: WO2 John Howard.

Situation and Actions Before Arrival

At 1715 hrs on 07 July 1988, three armed men and one woman took over the Falls Swim Centre, which is situated at the corner of North Howard Street and Falls Road. The terrorists held the staff hostage, telling them that there would be an explosion and then they would be released. They were also told not to re-enter the building under any circumstances. At 1910 hrs the explosion occurred, forcing a large part of the Swim centre wall out into the street and killing two civilians.
Actions At The Scene

WO2 Howard was one of the Belfast ATOs based at Girdwood park SF Base, and was tasked to the scene at 1930 hrs. He was joined there by the CATO at 2045 hrs. CATO left at 0015 hrs to attend another incident.

On his arrival, WO2 Howard questioned the Swim Centre staff about the incident. Then he deployed his Wheelbarrow. During this remote phase he had to make several manual approaches to use Hook and Line in order to open access doors for the Wheelbarrow. After his manual approaches he reverted to using his remote means. Using the Wheelbarrow’s CCTV, he found an end of the CW and the firing pack at the foot of the stairs in the lobby. He used Pigstick to disrupt the firing pack and then moved the CW remotely. His Wheelbarrow followed the CW and using CCTV he found and examined the seat of explosion. He then donned the EOD suit and made a manual approach to check the areas he had searched with his Wheelbarrow. Afterwards he tasked REST to search the areas around the seat of explosion and CW.

Having done all of the above, WO2 Howard briefed the Scenes Of Crimes Officer (SOCO) and a forensic scientist. He then took them both down to the seat of explosion area, where he handed the scene over to them and withdrew.

The area of the explosion was covered in rubble and several gymnast’s mats. The terrorist had damaged water pipes before the first explosion and this had flooded the area in about three inches of water. As the SOCO moved about the area he stepped on the rubble in an attempt to keep his feet dry. He saw a black gymnasium mat pushed up against a low wall. This low wall ran between the two walls that supported the stairs. Intending to use the mat to stand on, he pulled it down fully on to the floor. This revealed a white wire which ran from underneath the mat to over the wall, where there was a blue holdall. The holdall was open and the SOCO saw that the white wire was taped onto what he thought was Primacord detonating cord. The SOCO left, taking the scientist with him. The scientist had been examining the seat of the explosion, which was two metres away.

The SOCO and forensic scientist returned to the ICP and spoke to WO2 Howard. The No 2 Operator heard them talk about their discovery. WO2 Howard briefed his
No 2 on what had been found and asked him to prepare his EOD suit, an Improved Disrupter (ID) and its stand and a ‘Jack In The Box’ remote CCTV camera. He also decided to move the ICP 20 – 30 meters further away. The No 2 stated that WO2 Howard seemed annoyed that he had not found the holdall himself. He had expected there to be a secondary device but thought it would be at the firing pack end of the CW, not at the seat of the explosion. WO2 Howard told his No 2 that he intended to retrace the SOCO’s steps and gave the impression that he thought that the holdall was easily accessible. WO2 Howard then made his approach. He stopped outside the building and placed his equipment down, then ferried it inside, piece by piece. The OC arrived at 0158 hrs and was being briefed at the ICP and while this was going on an explosion occurred at 0200 hrs. The OC moved forward to the scene and once there could see that WO2 Howard was dead.\textsuperscript{83}

After a full clearance was conducted, a commercial pressure mat was found underneath the gymnasium mat. Evidence gained from examining the injuries suffered by WO2 Howard suggest that at the time of the explosion he was crouching down to one side of the gymnasium mat, possibly leaning against one of the stair supporting walls.

**IED and Perpetrator’s Intentions**

The initial device was a CWIED that was meant to target an army foot patrol. Instead, two local civilians, Eamon Gilroy, 24, and Elizabeth Hamill, 60, were killed. This was probably due to the system that PIRA adopted for laying out the device and choosing the moment to fire. The terrorist in command of the firing pack was inside the building and could not see what was happening on the street. Someone observed the target approach from outside and telephoned the Swim Centre reception. The female terrorist answered the phone and relayed the signal to fire the device to the terrorist with the firing pack. There was clearly some delay or misunderstanding about timings.\textsuperscript{84}

The device that killed WO2 Howard was a VOIED incorporating a commercial pressure mat as the firing switch. This was concealed under the gymnasium mat. The perpetrators probably smashed the pipes with the intention of forcing follow up personnel to stand on raised objects such as rubble and mats, including the one
concealing the device. The SOCO was extremely lucky that the action of pulling the mat onto the floor did not initiate the device. It was unusual for a secondary device to be so close to the seat of the explosion, as this runs the risk of the first device disrupting the second. In this case, the secondary device was protected on three sides by the concrete stairs and the two walls that supported them, and on the fourth side by the low wall that ran between the two walls.

Plate 7.30: Diagram of device that killed WO2 Howard, in position before the SOCO pulled the gymnasium mat down. 85

Analysis and Comments

As was the case with WO2 O’Neill, the IEDD doctrine was fully mature by this stage. In 1988, operations were conducted largely as they are now, with obvious adjustments for new equipment and from the conditions that arise from working in different theatres.

WO2 Howard gave the impression that the holdall was easy to get to. In reality, it could not be reached without leaning over the gymnasium mat, which was
concealing the pressure mat. As he was inside the building, no one saw WO2 Howard’s actions immediately before the explosion. As stated above, it was assessed that he was crouching at the side of the gymnasium mat. It is likely that he either moved forward onto the mat, either deliberately or accidentally, or he could have placed his weapon stand on the mat with the intention of disrupting the blue holdall. This latter choice would be surprising if true, as he had enough information to suggest that the gymnasium mat concealed a pressure mat. We cannot rule out the possibility that, whatever he did, he made a simple human error.

The possible reasons for such an error are interesting. WO2 Howard had not been in Northern Ireland for long – a few weeks. It had taken him several attempts to pass the pre deployment Special To Theatre course and it was suggested by some that he was not temperamentally suited to IEDD. Not everyone is. He was probably tired due to the late hour and he was described as being upset or angry about not having found the secondary device himself. This is not the best frame of mind with which to approach a live bomb. He should have referred up when the secondary device was discovered, as a second opinion is always advisable. As the OC was already en route, had he referred up he would probably have been told to wait before proceeding. If this had happened he would have had time to calm down and to discuss his plan with the OC. This may have drawn out the fact that the holdall was not as easily accessed as he first thought, leading him to devise a safer plan, possibly involving using Hook and Line to remove the gymnasium mat before going on to attack the white wires and/or disrupt the holdall.

CONCLUSION

It was stated in the introduction to this work that in learning the lessons that are inherent in these tragedies, both the original investigators and the author may have appeared somewhat critical of those who died. Sadly, the facts of these situations are rarely comfortable and if we are to find the truth and use that truth to prevent further tragedies then those facts must be critically examined. The author hopes he has never been disrespectful of those who died. The best way to preserve and honour the memory of these brave men is to remember not just that they died, but how and why they died so that no others die in the same way.
INTRODUCTION

Chapter Seven began with the contention that most of the lessons applied to IEDD doctrine were learnt when an operator was killed. However, it would be wrong to say that lessons were only ever learnt after a fatal explosion. However, it must be said that lessons were rarely learnt when things went well. It was usually an explosion, or the sometimes lucky prevention of one, that moved the doctrine forward.

In most military operations, the number of wounded exceeds the number killed. With EOD, and IEDD in particular, the situation is reversed. Surprisingly few operators were injured by IEDs during Operation BANNER. This can be explained quite simply. In general, the operator was either at the device when it functioned – and in most cases was killed – or he was at a safe distance and was therefore unharmed. There are exceptions to this and these will be discussed below.

It would be outside the scope of this thesis to list every instance, but this chapter illustrates a selection of incidents where lessons were learnt that did not cost an operator’s life. Some are still fatal explosions, but the victims were not from an EOD Team. Others are explosions where the operator was injured but not killed. There are also lessons that arose as the result of near misses, where skill and judgement or, all too frequently, luck intervened.

SECONDARY SOAKS AND SECONDARY TIMERS

Soak Times were discussed in Chapters Six and Seven. They were designed to protect operators from a time IED by imposing a safe waiting period before a manual approach could be made. This waiting period before a first approach later became known as the Primary Soak. As operators moved away from carrying out manual actions at the target and began using more remote and semi-remote techniques, the question arose of when to make any subsequent approaches. Initially most operators would immediately return to the device after a remote or semi-remote action had
been carried out, thinking that if the device had not functioned on being shot, pulled or what ever the operator had done to it, then it was not going to function. Experience showed that this was not always the case. We have already seen how Sgt Hills was killed after immediately returning to a hung up improvised mortar bomb that fell from the weapon’s muzzle.¹

The need for a further soak time was made clear even before Sgt Hill’s Death. On 02 March 1972 an ATO dealt with a complex device in a brown holdall at the General Post Office in Londonderry. The sides and zip of the holdall were lined with wires that formed part of a collapsing circuit, acting in both the time and VO role. The device would function if the zip was opened or the bag cut into. If no such action occurred, it would explode after thirty minutes had elapsed. It also had a microswitch at the base. Rather than initiating the device immediately, it triggered another collapsing circuit that would initiate the device seven minutes after the switch was operated. So if an operator pulled the device with hook and line, then immediately made a manual approach he would likely be at the device when it functioned.²

To counter this, a further soak time was applied to subsequent approaches, which became known as the Secondary Soak. At first this was set at a constant ten minutes.³ For example, an ATO applied a ten minute secondary soak after using hook and line when dealing with a CWIED near Newry on 12 September 1972.⁴

However, a standard ten minute secondary soak had its problems. Sometimes ten minutes was not enough. On 07 September 1972, an ATO was tasked to a VBIED at Carlish Road in Londonderry. The car had been in situ for four and a half hours, so it seemed likely that the device had failed. He made a manual approach with a Pigstick and placed it against a target in or on the car (the report does not say, but the TPU or battery would be the best target). After firing the weapon he applied a ten minute secondary soak and approached again. On reaching the car he heard ticking and retired to the Incident control point (ICP). Shortly afterwards the device functioned.⁵ It seems likely that the Pigstick did not disrupt the device, but did restart the timer, but we will never know for sure. It was just this sort of eventuality that the secondary soak was designed to protect against.
The other problem was that, if the operator always returned to the device ten minutes after carrying out a semi-remote action, it would be easy for the terrorist to exploit this pattern and predict when the operator would next be at the device. We have already seen how a secondary timer, using a collapsing circuit, had been used. It would be simple for the terrorists to set such a timer to function ten or fifteen minutes after the semi-remote action. In fact PIRA did use this tactic several times.

PIRA also developed the ability to use secondary timers. These lay dormant until started by some action. The most common methods used were to start a timer with a first explosion in order to catch out first responders, or after a remote or semi-remote EOD action to catch the ATO.

On 06 December 1973, one ATO dealt with several VBIEDs in Belfast. One was a Ford Transit van parked under a motorway bridge. He remotely opened the rear door of the van and, after waiting a 15 minute secondary soak, he approached. When he was 20 metres from the van it exploded, but he was not seriously hurt. He assessed that the van was booby trapped and was set up to function as the ATO approached after opening the door. If this was so, it could only be because PIRA believed they could predict when the operator would approach.6

Another example of a secondary timer was rendered safe much later in the campaign, on 31 August 1993. Two large IEDs, contained in ‘wheelie bins’ were discovered in a sheep pen that troops frequently used as a lie-up point. The first device was fitted with a pull switch and was originally intended to be used as a VOIED. For some reason the terrorist changed this to command, probably by the addition of a receiver pack at the end of a wire. The second device was fitted with an electronic timer that was not receiving power from its battery because of a built in looped wire that caused a short circuit. This wire was placed under the main charge of the first device. When that functioned the wire would be broken, removing the short and allowing power to flow to the timer, which would then start, causing the device to function twenty two minutes later.7

**IEDS CONCEALED WITHIN WEAPONS**

One of the peculiarities of Northern Ireland is that all weapons recovered by the police must first be cleared by an ATO. Elsewhere in the United Kingdom, police
firearms officers would clear weapons before recovering them. On the mainland the main risk is that an accidental shooting may occur if a firearm that is loaded with its normal ammunition is carelessly handled. In Northern Ireland that risk also exists, but is accompanied by the risk that the weapon may be a ‘come on’ for a command or VO IED, or may have an IED concealed inside it.

On 22 January 1976, RUC officers found a shotgun in a derelict building in a mixed area of Belfast. When the gun was broken open an explosion occurred and Inspector George Bell & DC Neville Cummings were killed. Examination of the recovered fragments showed that the gun had been booby trapped by fitting three batteries into the right hand barrel and an explosive charge with an improvised switch in the left hand barrel. The switch was made from two pieces of foil, separated by a hair roller. When the gun was broken open, the foil contacts slid over the roller and came together, completing the circuit.9

Another booby trapped weapon was discovered three years later on 26 February 1979. Children found a .303 P14 rifle in Strabane. When RUC officers cleared the weapon they found it to be cocked with one round in the chamber and another in the magazine. After the rounds were removed the magazine platform prevented the bolt from being closed, which also prevented the trigger from being pulled. The rifle was submitted to the Northern Ireland Forensic Science Laboratory (NIFSL) for examination. There it was stripped and a micro-switch was seen under the trigger mechanism. An ATO was tasked and he rendered safe a VOIED concealed in the butt of the rifle.10
IEDS CONCEALED WITHIN VEHICLES

In addition to the general threat posed by car bombs, motor vehicles offer the terrorist an excellent opportunity to conceal IEDs intended to catch out the unwary. The terrorist knows that SF must recover stolen and abandoned cars and that vehicles used in crime and terrorist activity can not be left in situ. As such they are perfect for use with the ‘come-on’ tactic. We have already seen how Constables Millar and Donaldson were killed by a VOIED in a car as early as 1970 and how WO2 O’Neill was caught out by a concealed VOIED in 1981.

Cars present a number of problems for the EOD operator. They are made of metal and have many cavities and receptacles, making them difficult and time consuming to search thoroughly. PIRA sometimes went to great lengths to conceal IEDs within vehicles, either to catch out the ATO or to get an IED into the forensic chain. Therefore, any vehicle that has been in terrorist’s hands must be treated with the utmost suspicion and painstakingly searched before it is handed over to other agencies.

Good examples of this are offered by vehicles that were used as mortar base plates. PIRA knew that such vehicles would be recovered in order to obtain forensic evidence and on several occasions they have had an IED secreted within them. On 22 January 1978, Forkhill SF Base was subjected to a two tube Mk 9 mortar attack, which injured seven soldiers. The base plate was mounted on a Ford D Series
flatbed lorry situated approximately 170 metres from the target. The ATO carried out a thorough search of the base plate vehicle and then returned to Forkhill SF base as he wanted to arrange a vehicle to tow the Ford lorry, before he could declare it clear. At 1510 an RUC officer got into the cab and turned on the ignition, at which point there was an explosion, seriously injuring three policemen. A VOIED, believed to have been wired into the lorry’s ignition system, had been concealed in the lorry, probably behind the fascia and, despite his best efforts, the ATO had not found it.\textsuperscript{12}

\textbf{WO1 R McClelland, 10 January 1994, Crossmaglen.}

A similar incident occurred sixteen years later. On 10 January 1994, Crossmaglen SF base was attacked with a single Mk 15 Mortar, fired from a Toyota Hiace van. The bomb caused serious damage but no casualties. The ATO, WO1 McClelland, carried out a full remote and manual clearance of the base plate vehicle and then decided to drive it back to Crossmaglen SF base for forensic examination. The short journey to the SF base passed without incident but as the WO1 McClelland braked firmly after reversing the van into a parking space inside a hangar, an explosion occurred seriously injuring him and another soldier who was guiding him. It was assessed the explosion was caused by a cleverly concealed VOIED, probably hidden in a void behind the dashboard, that was armed by an electronic timer and initiated by a mercury tilt switch.\textsuperscript{13}

\textbf{IEDS CONCEALED UNDER VEHICLES}

As well as concealing IEDs within vehicles, terrorists have buried devices underneath them. On 08 February 1976 a van that had been hijacked the night before was cleared by an ATO near Kilrea. He carried out a search of the vehicle, then left it in situ for the police to recover. As an attempt was made to move it a large explosion occurred, killing Constable McKay,\textsuperscript{14} and injuring five others. The device, assessed to have been contained in a milk churn containing 200 – 500 lb of HME, was triggered by an improvised pressure release switch that functioned when the vehicle was towed away.\textsuperscript{15}

As a result of this it became a mandatory action that all vehicles must be jolted and remotely moved their own lengths as part of the clearance procedure, before being handed over.\textsuperscript{16} This didn’t stop PIRA attempting the tactic again in the early 1990s.
On that occasion the car was towed remotely. Afterwards, the ATO noticed a pressure release switch where one of the wheels had been that had failed to reassert itself.\textsuperscript{17}

**RELIABILITY AND PERFORMANCE OF REMOTELY OPERATED VEHICLES**

The development and effects of Remotely Operated Vehicles (ROVs) such as Wheelbarrow, are discussed in Chapter Eleven. They, and disruptive weapons, have contributed enormously to EOD operations. Before they were available, operators had little choice but to deal with devices manually or, at best, semi-remotely. There have been many occasions when ROVs have been available but for various reasons – usually connected with access or reliability – they could not be used. We have already seen the example of SSgt Beckett who could not get his Wheelbarrow to gain access to the IED that eventually killed him. Below are some examples of incidents where injuries were caused for similar reasons.

**Explosion, 10 March 1973, Londonderry**

On 10 March an EOD team were tasked to a suspect package placed inside a shop on Carlisle Road in Londonderry. The ATO moved forward to carry out a reconnaissance from waste ground some distance away from the shop. From there he could see the device, which was in a brown paper bag, on the floor against the counter. He instructed the sergeant on his team to drive the robot (a Mk 4 Wheelbarrow) to the shop doorway. Wheelbarrow was not fitted with closed circuit television at the time, so the ATO relayed directions back to the sergeant from his vantage point. The Wheelbarrow attempted to push the shop door open but was unable to succeed. After a few attempts, the ATO ran over to the shop and opened the door. The door was fitted with a self closing device and, after unsuccessfully trying to stop the door open with a mat, he took the ‘disruptive equipment’ (a Pigstick disrupter) off the Wheelbarrow and placed it manually. He then walked out of the shop, but as he did so the device functioned. He was knocked over and suffered cuts, bruises and mild shock but was not seriously injured.\textsuperscript{18}

It seems that, like SSgt Beckett who was killed in the same year, he was attempting to execute a Render Safe Procedure (RSP) that would be recognisable to a modern operator, in that he wanted to disrupt the device with a remotely delivered pigstick,
but was hampered by the technical limitations of the equipment available to him. With better equipment, which was not long in coming, he could have conducted the whole task from the safety of his Incident control Point (ICP).

Figure 8.2: A Mk 4 Wheelbarrow after an explosion. This is believed to be the incident on 10 March 1973.19


On Christmas Eve of 1973, terrorists gained entry to 21 The Strand in Londonderry. They laid four IEDs over three floors of the building, three at the front and one at the rear. One device functioned and an ATO was tasked to investigate. While he was assessing the explosion scene a telephone warning was given, stating that there were six bombs in the building. The ATO found two devices. He rendered the second device safe. He had a Dictaphone with him and his tape record ran as follows:

Explosion at 21 The Strand at 2201 hrs…Tasked at 2207 hrs…Explosion seemed to be less than 5 lb and might have been an incendiary….Fire brigade doing an investigation upstairs have found a black rubbish type bag which they consider suspicious timed 0003 hrs….I entered the building and used 77320 at one bag exposing a charge; strong smell of co-op; clock and battery….Second bag found in
When he approached the third device it exploded, seriously injuring him. As he was being evacuated another ATO was tasked and he found and rendered safe a fourth IED, as well as two hoax bags. It was assessed that the terrorists had staggered their timings in order to catch out first responders and possibly the ATO.\textsuperscript{21}

The ATO couldn’t use Wheelbarrow in the circumstances so had to make a manual approach. He did not apply a primary soak when investigating the first explosion and the fire brigade were in the building at the same time as him during this part of the operation. It was they who found the second device near midnight – two hours after the first explosion. Ordinarily, any standard time device might be expected to have functioned by then. The ATO approached and deployed a disrupter against the second device, and found the third at the same time. After taking his shot he waited again and intended to disrupt the third device.

It is difficult to criticise the operator as this was an unusual tactic for PIRA and multiple time IEDs would usually be expected to function within a short space of time. In this case three hours passed between the first and second explosions. Only a very long assessed soak period could offer any protection and this was what was applied when the fourth device was dealt with. It was found at 0420 hrs but was soaked until 0900 hrs. Perhaps the strongest lesson that stands out here is the fact that the fire brigade were in the building soon after an explosion. In later years, other agencies would not be allowed access to the scene of an IED or explosion until an ATO had declared the area safe.

\textbf{Capt M C Wickham, 08 June 1980, Coalisland}

In the early hours of 08 June 1980, three blast incendiary IEDs functioned at the Cohannon Inn, near Coalisland. The ensuing fire destroyed the building, but was being tackled by the fire brigade when the EOD team arrived. Capt Mark Wickham was tasked to the scene and, on arrival, was informed that it was believed that there was a further suspect device in the service station shop which was adjacent to the Inn. Capt Wickham deployed his Wheelbarrow, but it was unable to mount a large
single step. Capt Wickham decided to make a manual approach wearing an EOD suit, but without his helmet. He first went to the front door of the shop but, after examining it, moved to a broken window. After clearing away broken glass he found his view and access route obscured by boxes of potato crisps. He began moving these one by one. When he had removed eight to ten boxes an explosion occurred, in which he was badly burned.  

Like the incident on 10 March 1973, Capt Wickham was forced into a manual approach by a failure, or a limitation in capability, of his remote equipment. At the time he did not know where the fourth device was. He was following sound principles in not using the shop’s front door as this was an obvious place to conceal a VOIED. With hindsight, Capt Wickham may have made better use of his wheelbarrow or hook and line by clearing the boxes from the window remotely. He may also have suffered less serious burns if he had worn his EOD helmet.

Capt Wickham was awarded the Queens’ Gallantry Medal for this and the thirty five preceding tasks he had completed. He went on to become one of a select few officers who served as ATO, SATO and CATO in Northern Ireland.  

LUCK AND JUDGEMENT

Explosion, 28 November 1972, Londonderry.

On 28 November 1972, an ATO was tasked to a suspect device placed inside the main entrance of Long’s Supermarket on Strand Road, Londonderry. Attached to the EOD team for the day was Gunner Paul Jackson, a photographer from 25 Light Regiment, Royal Artillery (25 Lt Regt RA) who had been tasked by the Regiment’s Intelligence Officer to photograph rockets and bombs that WO2 Kay could not make safe, before he destroyed them.

On arrival at the scene, the ATO and his team were met by a cordon provided by 25 Lt Regt RA. The ATO ascertained that a 20 minute warning had been given and that the expected time of explosion had passed. He ordered his driver to move the team’s Saracen armoured vehicle forward, so that he could observe and Gunner Jackson could photograph the scene. The Saracen halted just forward of the supermarket, then reversed about five metres before stopping level with the shop.
Almost immediately afterwards the device functioned. Gunner Jackson was killed, the ATO was seriously injured and his driver was slightly injured.

The ATO broke several of the rules that were already in place by late November 1972. He approached inside the accepted soak time of the day, he ignored the ‘one man risk’ rule and he approached, it seems, to do nothing more than observe. In his initial report on the incident, the CATO wrote:

WO2 XX [name redacted] has not explained his reasons for his actions which did conflict with SOPs. When medically appropriate it is probable that he can be asked.24

The documents available to the author never did definitively answer that question. However a reasoned assessment can be made. The ATO may have felt under pressure – real, implied or imagined - to obtain photographs of live devices. The IED was doubtless a standard time device fitted with either a parking timer or a modified alarm clock. As the warned time had expired he may have thought that the device had failed, and probably thought that if the device did function, the Saracen would provide sufficient protection. However, at least one hatch had to be open for Gnr Jackson to take photographs.


On 16 December 1988 a telephone warning was received that an explosion would take place on the railway line at the Kilnasaggart bridge. This bridge is 400 metres from the border with the Republic of Ireland and has been the scene of many IED attacks over the years. The explosion duly occurred but the SF chose not to react to it at that time. A clearance operation was planned and it was mounted on 26 December. The line was found to be cleanly cut and an undamaged Mk 15 TPU was found nearby. After a lengthy clearance operation, an RCIED was found concealed in a dry stone wall. The ATO, SSgt Mike Knox rendered it safe and it had a main charge of 200 Kg of ANFO, as well as a Semtex self destruct charge on the receiver.25

On 03 February 1989 another explosion was reported at the Kilnasaggart Railway bridge. Again the SF chose to apply a lengthy soak period before deploying. The
operation was mounted on 17 February 1989 and again the ATO was SSgt Knox. He assessed that the explosion was a ‘come-on’ intended to draw the SF into the area, as had been the case with the earlier task at the bridge. A member of the Royal Engineers Search Team (REST) spotted a white bag and a possible TPU. SSgt Knox went forward and using a series of Pigstick attacks and hook and line techniques, rendered safe a VOIED. As he approached after one of the hook and line pulls, a large explosion occurred. He was thrown some distance and suffered shock and minor injuries. An hour after the explosion he approached again to recover his helmet and ECM equipment.

The cordon remained in place overnight and the next day the operation continued in an extremely cautious manner. The remnants of the VOIED were recovered but the cause of the large explosion could not be found. There was no command wire or evidence of a radio control receiver. The operation continued into the day after that, 19 February, and eventually a fourth IED was discovered and rendered safe. This IED enabled the mystery of the previous day’s explosion to be solved. The device was connected by wires to the railway tracks and these were used as command wires. It took another full day before the area was handed over.

The railway track at Kilnasaggart bridge is situated high on an embankment and when working on them any member of the SF would be silhouetted. It is likely that PIRA observed the clearance operation in December and came to the conclusion that the EOD team’s procedures made the deployment of an RCIED or a conventional CWIED futile. To overcome this they came up with the idea of using the tracks themselves to pass the firing signal to the device. It was an ingenious solution to their problem but it only worked once. After that REST and EOD teams devised methods of isolating the tracks and thereby prevented a recurrence. SSgt Knox was later awarded the George Medal.


On 07 October 1989 a military patrol spotted and chased a suspicious van in Londonderry. The occupants of the vehicle abandoned it in Emerson Street. On examination it was seen to contain a mortar base plate with six tubes. WO1 Barry Johnson and his team were tasked to clear it. They used Wheelbarrow to examine
the vehicle and saw that it contained a mortar base plate consisting of two banks of three Mk 6 mortar tubes and a Mk 15 TPU. WO1 Johnson assessed that the base plate was in transit and was not ready to fire. Nevertheless, he disrupted the TPU using Pigstick mounted on Wheelbarrow. After applying a secondary soak and searching the rest of the vehicle, he made a manual approach, accompanied by his No 2. Together they removed the base plate from the vehicle. The No 2 then returned to the ICP, leaving WO1 Johnson alone at the vehicle. WO1 Johnson then manually removed five of the six mortar bombs from their tubes and made them safe. As he was removing the sixth, it exploded and he was seriously injured. He was later awarded the George Cross for the fortitude he showed in the face of his injuries.  

WO1 Johnson was correct in his assessment that the mortars were in transit and not ready to fire. It may seem that he broke the ‘one man risk’ rule in taking forward his No 2, but this was – and remains - allowed under certain circumstances when dealing with mortar base plates in vehicles. Where WO1 Johnson’s actions differ from current practice is in removing the bombs from the tubes by hand. Until this incident, this was considered a safe action. It does appear that in 1989 the lessons of Sgt Hill’s death in 1972 had been forgotten. After this incident all mortar bombs were removed using remote or semi-remote techniques. On 30 August 1994 a further reason to only remove mortar bombs by remote means was provided when a Mk 15 mortar was found to contain a VOIED designed to function when the bomb was removed from the tube.

SSgt C Whitworth, 30 March 1993, Antrim.

On 23 March 1993, two loyalist UVIEDs of a new design were encountered. One functioned when an EOD team attempted to disrupt it. The other fell off the intended victim’s car and exploded when it was picked up by a member of the public, causing serious injuries to his arm.

A third device was found under a car in Antrim on 30 March. Like the two previous devices, it consisted of a metal cylinder filled with low explosives. It was attached to the car using magnets. The firing switch was a pendulum with electrical contacts attached. Depending on its orientation it was designed to function by the car’s
acceleration or braking action, which would cause the pendulum to swing onto another contact on the bomb’s body.

SSgt Whitworth was tasked to the scene, but was told not to take any action until the SATO arrived with a specialist disrupter that was designed to penetrate metal cased IEDs. The SATO and SSgt Whitworth discussed the various options open to them and they agreed that any attempt to disrupt the device would cause it to function. SSgt Whitworth decided on a series of manual approaches. First he insulated the electrical contacts. While he was doing this he noticed a hole in the pendulum arm and on its shoulder plates, thereby adding an extra measure of safety. He assessed that he could fit a pin which would immobilise the arm. He returned to the ICP, discussed his plan with the SATO, then returned to the IED with a suitable piece of wire to use as a pin. He succeeded in immobilising the arm, although in a slightly different manner to the way he originally intended. He then attached a hook and line and then retired. When back at the ICP he pulled the device off the car, observing his actions through the Wheelbarrow’s CCTV system. The IED was thoroughly tumbled in this action and, using CCTV, SSgt Whitworth observed that the arm was still locked in place and the contacts were still insulated.

SSgt Whitworth’s next approach was to radiograph the device. On arrival at the device he saw for the first time a PP3 battery. He decided to remove this. The battery’s terminals were covered with tape, which he removed with a scalpel. Instead of finding a battery connector as he expected, he saw that the wires were soldered to the battery’s terminals. He decided to revert to his original plan of x-raying the device before using a remote technique to remove the battery. At that point the device functioned and he suffered a traumatic amputation of his hand.29

The technical investigation at the time concluded that SSgt Whitworth had conducted a thoroughly professional RSP and he was unfortunate to be injured. This was largely due to an IED that was poorly designed and constructed and was subject to short circuits through its body, even though the contacts had been insulated and immobilised. SSgt Whitworth was wearing a full EOD suit and had his visor down when the explosion occurred. He would have suffered far more serious, possibly life threatening, injuries if he had not worn it.
The only real lessons that can be drawn from this are to confirm that remote disruption is always preferable to manual actions. Unfortunately the design and position of this device prevented that. It must always be remembered that bomb makers \textit{may} be experts in their field, but in many cases they are enthusiastic amateurs and we cannot rely on their design and manufacture skills to offer us any safety. SSgt Whitworth went on to have a very successful EOD career who rose to the rank of Major (as at 2011) and was for many years the senior instructor at IEDD Branch of the Defence Explosives, Munitions and Search School (DEMSS), formerly the Army School of Ammunition.

\textbf{CONCLUSION}

This chapter has described a selection of EOD incidents that did not result in the death of an EOD operator. Some of the incidents discussed show how and why a piece of the \textit{doctrine} came into force. Other examples may not be the very incident that drove a \textit{doctrinal} change but they illustrate why some tenets are necessary and why they remain in force
INTRODUCTION

This chapter attempts to fit the casualties suffered by EOD teams in Northern Ireland into an analytical framework. We have already seen how the IED threat developed, how ATOs faced this threat at the start of Operation BANNER and how this approach led to casualties occurring. A great deal of ground has been covered and it is necessary to analyse and synthesise the data into something workable, before discussing how the EOD organisation reacted to these events and, in doing so, developed the current British approach to IEDD.

From the following analysis and synthesis a theory of IEDD risk emerges. To the trained EOD operator, or the intelligent layman, this theory may seem to state the obvious but the author contends that it is an ‘obvious’ based for the first time on empirical data. This theory, it is hoped, will be of utility in EOD operations at any time and in any theatre.

CORRELATION OF EOD ACTIVITY TO EOD FATALITY RATES

It was stated in Chapter Two that the early 1970s was the busiest time for EOD tasks and we have seen that this was when the majority of EOD casualties occurred. A glance at the casualty figures among ATOs shows that no ATOs died in the first two years of the troubles, and that most were killed between 1971 and 1975:
Table 9.1. **EOD Fatalities by year**

If this is compared with the level of EOD taskings during the same period, it can be seen that the incidence of fatalities roughly corresponds with the intensity of EOD activity:

Table 9.2: **EOD Tasks involving IEDs, Explosions and Finds by year**

However tempting it may be, it would be misleading to simply ascribe the number of casualties to the intensity of tasks. By this logic, casualties must be accepted as
inevitable and variable with the level of EOD activity. Indeed, if this were the case it should be possible to work out a ratio of IEDs to casualties and use it to predict the casualty level. For example, we could say that we expect an EOD fatality for every $x$ amount of IEDs that are encountered and that when the next $x$ approaches we need to prepare for a funeral. Aside from any principled objection to this, the statistics simply do not bear this out.

Tabulated below are the ATO fatality statistics for each year, compared with the number of tasks involving real deployed devices (IEDs/Explosions) and the total number of tasks. The first row of figures gives the number of EOD operators killed in each year. Below this are the numbers of IEDs deployed by terrorists in each year. These figures are used to create a ratio of IEDs deployed to ATO deaths. For example in 1972 there were 6 ATO deaths and 1537 IEDs deployed, giving an IED to ATO death ration of 256.1:1. Because the total number of tasks that EOD teams dealt with may be considered a factor, the next row gives the total number of EOD tasks of all types in each year and follows this with a ratio of total tasks to ATO deaths. In 1972 there were 4323 EOD tasks and 6 ATO deaths, giving a task to death ratio of 720.5:1

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<td></td>
<td>256.1:1</td>
<td></td>
<td>760:1</td>
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<td>720.5:1</td>
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*Table 9.4: ATO Fatalities/IEDs/EOD Tasks in NI by year 1970 – 1979.*
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</table>


The years 1971 to 1973 are interesting in that the total numbers of IEDs and explosions are remarkably constant. If the number of deaths was directly related to the number of bombs deployed then the ratio of IED and Explosion to ATO deaths should also be constant. 1530 IEDs were deployed in 1971 and 2 ATOs were killed giving an IED to ATO death ratio of 765:1. 1973 was very similar. 1520 IEDs were deployed and again 2 ATOs died, giving a ratio of 760:1. 1972 was the worst year of the troubles, for the province as a whole, for the Security Forces and for ATO deaths. 1537 IEDs were deployed and 6 ATOs were killed giving a ratio of 256:1.

In 1974, 3 ATOs were killed. There were less deployed devices as well as less tasks overall than the preceding 3 years. If the ‘number of bombs to death’ theory was valid then there should be a decrease in ATO deaths – and not a ratio of 371:1. 1975 was the year of the long PIRA ceasefire so the number of attacks was markedly down on previous years. However an ATO, as well as his No 2 and two other soldiers were killed in a single incident. 1976 saw a full resumption of violence with more IEDs and explosions than 1974 yet no ATOs were killed. An ATO was killed in 1977, when the number of IEDs and explosions was less than half of 1976. No more ATOs were killed until 1981, which saw less IEDs and explosions than the
three preceding years. A further seven years passed before another ATO was killed in 1988. This year had seen more IEDs and explosion than previous years but was still less than a third of those in the period 1971 – 1974.

If the number of EOD fatalities was a product of the number of IEDs deployed or overall EOD incidents dealt with, then the following chart would exhibit flat or near flat lines.

![Graph showing ratios of IEDs deployed and EOD tasks to ATO fatalities](image)

*Table 9.6: Ratios of IEDs deployed and EOD Tasks to ATO fatalities - 1980 – 1989.*

**SPATIAL DISTRIBUTION OF EOD FATALITIES**

It could be argued that the number of tasks that ATOs dealt with in these years led to exhaustion and then mistakes – an assertion that has reappeared with the rise in ATO casualties in Afghanistan in 2008 – 2011. However, the tasks were not all spread evenly across the province. The busiest places were, naturally enough, Belfast and Londonderry. It is instructive to look at where the casualties occurred.
<table>
<thead>
<tr>
<th></th>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td>1</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
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<td>Antrim</td>
<td>Rural</td>
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<td></td>
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<td></td>
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<td>1</td>
</tr>
<tr>
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<td>Rural</td>
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<td></td>
<td>1</td>
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<td></td>
<td>1</td>
</tr>
<tr>
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<td>Armagh</td>
<td>Rural</td>
<td></td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
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<td>Tyrone</td>
<td>Rural</td>
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<td></td>
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<td>Rural</td>
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<td></td>
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</tr>
<tr>
<td>Newtownbutler</td>
<td>Fermanagh</td>
<td>Rural</td>
<td>1</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td>Newry</td>
<td>Down</td>
<td>Rural</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
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<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>16</td>
</tr>
</tbody>
</table>

* Cracknell & Butcher considered as one incident.

Table 9.7 Fatal EOD incidents in NI by location and year.

<table>
<thead>
<tr>
<th>Urban</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Belfast City</th>
<th>L/Derry City</th>
<th>Lurgan</th>
<th>Antrim</th>
<th>Armagh</th>
<th>Down</th>
<th>Fermanagh</th>
<th>Co L/Derry</th>
<th>Tyrone</th>
</tr>
</thead>
<tbody>
<tr>
<td>3*</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 9.8 Fatal EOD incidents in NI by location – urban/rural. * Cracknell & Butcher considered as one incident.
If we consider each dead ATO by year and by whether they were killed in a rural or urban environment we can see a pattern emerge:
<table>
<thead>
<tr>
<th>Name</th>
<th>Year</th>
<th>Urban</th>
<th>Rural</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capt David Stewardson</td>
<td>1971</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>WO2 Colin JL Davies</td>
<td>1971</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SSgt Chris Cracknell and Sgt Tony Butcher</td>
<td>1972</td>
<td></td>
<td>X</td>
<td>Cracknell &amp; Butcher considered as one incident.</td>
</tr>
<tr>
<td>Maj Bernard Calladene</td>
<td>1972</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Capt JH Young</td>
<td>1972</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>WO2 WJ Clark</td>
<td>1972</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Sgt Ron Hills</td>
<td>1972</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Capt Barry Gritten</td>
<td>1973</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SSgt Ron Beckett</td>
<td>1973</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SSgt Alan Brammah</td>
<td>1973</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>SSgt Vernon Rose</td>
<td>1974</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>WO2 J A Maddocks</td>
<td>1974</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>WO2 E Garside</td>
<td>1975</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Sgt M Walsh</td>
<td>1977</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>WO2 Mick O’ Neill</td>
<td>1981</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>WO2 John Howard</td>
<td>1988</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td></td>
<td>6</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

Table 9.8:  EOD Fatalities in rural and urban environments.

Urban areas account for 7 ATO fatalities, whereas there were 10 in rural areas. Apart from the last ATO to be killed in Belfast in 1988, all of the urban deaths occurred between 1971 and 1974. So, in the early years urban areas proved to be the most dangerous but this danger shifted to rural areas as the campaign progressed. The majority of fatal incidents occurred in rural areas where the terrorists had time and space to set up an elaborate trap. The last fatality was in west Belfast, a strongly Republican urban area that also afforded the terrorist a considerable degree of time and space.
## TYPES OF IED RESPONSIBLE FOR FATALITIES

As was discussed in Chapter Five, IEDs can be classified according to the type of firing switch, be it time, victim operated (VO) or command (Comd). The following table organise the fatalities by device type:

<table>
<thead>
<tr>
<th>Name</th>
<th>Year</th>
<th>Time</th>
<th>VO</th>
<th>Comd</th>
<th>Other</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capt David Stewardson</td>
<td>1971</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WO2 Colin JL Davies</td>
<td>1971</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSgt Chris Cracknell and Sgt Tony Butcher</td>
<td>1972</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td>Cracknell &amp; Butcher considered as one incident.</td>
</tr>
<tr>
<td>Maj Bernard Calladene</td>
<td>1972</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td>Author’s assessment</td>
</tr>
<tr>
<td>Capt JH Young</td>
<td>1972</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WO2 WJ Clark</td>
<td>1972</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sgt Ron Hills</td>
<td>1972</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td>Dropped mortar bomb</td>
</tr>
<tr>
<td>Capt Barry Gritten</td>
<td>1973</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSgt Ron Beckett</td>
<td>1973</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td>After incomplete disruption. Author’s assessment</td>
</tr>
<tr>
<td>SSgt Alan Brammah</td>
<td>1973</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSgt Vernon Rose</td>
<td>1974</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WO2 J A Maddocks</td>
<td>1974</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WO2 E Garside</td>
<td>1975</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sgt M Walsh</td>
<td>1977</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WO2 Mick O’ Neill</td>
<td>1981</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WO2 John Howard</td>
<td>1988</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td></td>
<td>3</td>
<td>10</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

*Table 9.9: EOD Fatalities and types of IED.*

Only one ATO, WO2 Davies was definitely killed by being at a time IED when the timer ran down, although it is the author’s assessment that the same happened to Maj Calladene. The IED that killed SSgt Beckett was a time device that he had
disrupted, probably incompletely. The author assesses that a contact was made when he tried to confirm his disruption, so he is categorised as being killed by a time IED.\textsuperscript{18} These all occurred between 1971 and 1973. SSgt Brammah was killed by an RCIED in 1974\textsuperscript{19} and WO2 Garside and three others were killed by a CWIED as they moved into an ICP position in 1975.\textsuperscript{20} Sgt Hills was killed after dropping an improvised mortar bomb in 1972.\textsuperscript{21} The remaining eleven ATOs were killed by VOIEDs and they were spread over the whole period of 1971 to 1988. So it is clear that VOIEDs accounted for the majority of deaths among ATOs.

\textbf{PRIMARY AND SECONDARY DEVICES AND CIRCUITS}

While luck always has a part to play in IEDD, it is not something that can be relied upon. As it transpired, very few of the dead ATOs simply ran out of luck if, indeed, any of them did. Most were in some way deceived by the terrorists and were killed by something other than what they were originally tasked to, be that an extra circuit or switch inside the IED that they were not expecting or another IED at the scene. The following table lists those ATOs who were killed by the thing they were originally tasked to compared with those who were killed by an extra circuit or switch inside the IED or another IED concealed at the scene, known as a secondary device:
<table>
<thead>
<tr>
<th>Name</th>
<th>Year</th>
<th>Original IED as Reported</th>
<th>Secondary Circuit or Switch</th>
<th>Secondary IED</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capt David Stewardson</td>
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<td></td>
<td>X</td>
<td></td>
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</tr>
<tr>
<td>WO2 Colin JL Davies</td>
<td>1971</td>
<td></td>
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</tr>
<tr>
<td>SSgt Chris Cracknell and Sgt Tony Butcher</td>
<td>1972</td>
<td></td>
<td>X</td>
<td></td>
<td>Cracknell &amp; Butcher considered as one incident.</td>
</tr>
<tr>
<td>Maj Bernard Calladene</td>
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<td>Sgt Ron Hills</td>
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<td></td>
<td>X</td>
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<td>Dropped mortar bomb</td>
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<tr>
<td>Capt Barry Gritten</td>
<td>1973</td>
<td></td>
<td>X</td>
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</tr>
<tr>
<td>SSgt Ron Beckett</td>
<td>1973</td>
<td></td>
<td>X</td>
<td></td>
<td>After incomplete disruption. Author’s assessment</td>
</tr>
<tr>
<td>SSgt Alan Brammah</td>
<td>1973</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSgt Vernon Rose</td>
<td>1974</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WO2 J A Maddocks</td>
<td>1974</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WO2 E Garside</td>
<td>1975</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Sgt M Walsh</td>
<td>1977</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WO2 Mick O’ Neill</td>
<td>1981</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WO2 John Howard</td>
<td>1988</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td></td>
<td></td>
<td>4</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 9.10: EOD Fatalities and primary and secondary circuits and IEDs.

It can be seen that only four operators were killed by the device that they originally understood they were tasked to. These were the three that were killed by time IEDs plus Sgt Hills – all between 1971 and 1973. The remainder were killed by something extra. Six were killed by a secondary circuit or switch concealed inside the IED they were tasked to and five of these were killed between 1971 and 1974. The sixth was Sgt Walsh, who was killed at the start of 1977. Five were killed by a secondary IED and all of these occurred from 1973 onwards. Two of the secondary IEDs were
command operated. The rest were VOIEDs. It is clear that PIRA first used secondary circuits to catch out ATOs with some success, but when the current approach to IEDD began to be adopted, they shifted to other ways of killing EOD personnel. The exception is Sgt Walsh. Here PIRA observed a pattern of manual actions and in response reverted to an older technique which would work against an outdated EOD practice.

**EOD ACTIONS**

Having considered where and when EOD fatalities occurred and what kind of devices caused them it is necessary to scrutinise the actions of EOD operators in order to see if any commonalities emerge. In doing so, a series of questions present themselves:

- Were the deceased within the danger area of an IED?
- Were the deceased in the process of the rendering the IED safe when the explosion occurred, or were they doing something else?
- If they were carrying out EOD action, was it a manual action that could have influenced the IED while they were in the danger area?
- If they were carrying out manual actions, were those actions planned in advance in the safety of the ICP or were they unplanned and decided upon while the operator was at the target?
- Finally, if they were carrying out unplanned manual actions, was the device that killed them assessed to be a VOIED?

The answers to these questions are expressed diagrammatically below. The diagram consists of a solid line, above which are the questions discussed above. Between the line and the question are the names of all of the EOD operators killed by IEDs in Northern Ireland. Sig Reece and Gnr Furminger are not included in this as they were not EOD operators and they were en route back from dealing with a suspect car when they were contacted by a CWIED. Each name (or pair of names in two cases) is enclosed in a box which is coloured green. If the answer to the
question is yes, the box stays green and stays above the line. If the answer is no, the box drops below the line and the colour changes to white.

![Figure 9.2: IEDD Action model](image-url)

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At the first question all boxes stay green as it stands to reason that to be killed by an IED, one must be within its danger area.

In four incidents, the deceased were not actually dealing with the IED when it exploded. WO2 Davies was walking away from an IED, while Maj Calladene was approaching one. Both of these were time IEDs. SSgt Rose, or one of his party, stepped on a pressure mat initiated VOIED while searching for evidence. SSgt Rose, or one of his party, stepped on a pressure mat initiated VOIED while searching for evidence. WO2 Garside and Cpl Brown were killed by a CWIED as they moved into an ICP position. All of their boxes drop below the line, leaving twelve boxes green.

The next two questions reveal that the remaining twelve were all carrying out manual actions to the device when it functioned. Moreover these actions were all in some way unplanned. Finally, when asked if these unplanned action were on VOIEDs, three boxes drop below the line. These are Sgt Hills, who was dealing with a mortar bomb when he dropped it, SSgt Beckett, who was killed when he went to assess the effects of his disruptive shot, and SSgt Brammah who was killed by an RCIED he had just found.

This leaves ten operators in nine boxes – Capt Stewardson, SSgt Cracknell and Sgt Butcher, Capt Young, WO2 Clark, Capt Gritten, WO2 Maddocks, Sgt Walsh, WO2 O’Neill and WO2 Howard – who were carrying out some unplanned manual action at a VOIED.

**IEDD RISK THEORY**

From the above it is possible to deduce a theory that explains the hierarchy of risk in IEDD operations. The level of risk to an EOD operator starts low if he is far from the IED and increases as he is:

- Within the danger area of an IED.
- Dealing with an IED.
- Carrying out manual actions on an IED.
- Carrying out unplanned manual actions on an IED.
- Carrying out unplanned manual actions on a VOIED.
The only way to be totally safe from an IED is to be outside of its danger area. (Often there are multiple IEDs in one incident. This compounds the risk and makes the establishment of a truly safe area difficult. In this theory, for the sake of simplicity, it is taken that there is only one IED, or each IED in a multiple IED incident is treated separately). Much of any IEDD operation can be conducted outside the danger area and if the operator never left this safe area he would never be at any risk. The nature of the job, however, means that at some point the operator must enter the danger area in order to approach the device and in doing so he accepts that he puts himself at more risk than he would be if he simply stayed back. In stepping out from cover, he puts himself at risk not only from the device he is dealing with, but from any other secondary devices that may exist, unless the area has already been thoroughly searched or his threat assessment can negate the presence of a secondary device. The level of risk increases as he gets closer to the IED. Once at the device he must carry out some action. There are a number of options open to him, but whatever he does is at a greater risk from that device than when he was approaching it.

The risk increases dramatically if he decides to carry out a manual action against the device – that is any action that influences the state of the IED while he is next to it. It may be that he has given the matter considerable thought while back in his safe area and he has assessed that the manual action is safe to carry out. This may or may not be acceptable, depending on the circumstances. If, when he arrives at the IED, he decides to conduct a manual action that he has not thoroughly thought through the level of risk rises again. The case studies have shown that decisions made in the heat of the moment while at the IED are rarely good ones. The most dangerous thing he can do is carry out an unplanned manual action while dealing with a VOIED.

This is expressed diagrammatically below. The model shows the hierarchy of risk in the form of a layered pyramid. At the base are the actions of least risk. As the levels of the pyramid rise, so do the risks. In addition, the risk increases in areas where the enemy has the time and space to set up elaborate traps. Furthermore, the risk also increases when the enemy is able to observe EOD teams operating, especially if they are setting observable patterns that can be exploited. These factors are
represented by arrows on either side of the pyramid showing that the risks increase the more these circumstances pertain to any situation. They are shown outside of the pyramid as they are largely outside the control of the EOD operator whereas his own actions, which he can control, are inside the pyramid.

This theory is capable of generalisation. It can be applied to operations anywhere in the world, and at any time, albeit only within the EOD arena. It is of practical significance, both to the operators who served in the 1970s, who may find it helpful.
to understand why their colleagues died, and to current and future operators who will not only be able to apply the lessons learned but, equally importantly, will be able to understand why the lessons were learned at all.

CONCLUSION

This may seem obvious now, with hindsight, but things were not so clear cut at the time. EOD teams did not have the training and equipment that is now available. However, the way ATOs in the 1970s thought about IEDD and their attitude to the problems of IEDs needed to evolve before developments in training and equipment could be of any utility. How this happened in discussed in Chapter Ten.
INTRODUCTION

This chapter draws together the lessons and incidents discussed in Chapters Five to Nine and shows how the *doctrine* emerged and changed. It begins with a general discussion of the situation in mid 1972, before discussing the key documents published at the end of that year. A comparison is then made between the *doctrine* as it existed at the end of 1972 and the *doctrinal* documents that were published in 1978 and 1989. Finally, the tenets of the current *doctrine* are related to specific incidents which will show how it is grounded in operational experience – mainly the lessons learned following the deaths of ATOs.

THE SITUATION IN MID 1972

1972 was the year that IEDD began to change in Northern Ireland. The death rate was unexpected and clearly unsustainable. Each new death spurred on further changes and throughout the 1970s new ideas and equipments were tried. Some fell by the wayside, but others shaped the development of UK IEDD *doctrine* until the present day.

By May 1972, the list of Render Safe Procedure (RSP) codes had grown to reflect the changes that were beginning to take place in response to events. There was greater use of remote and semi-remote equipment, such as it was, but this was still a long way from the current *doctrine*:
Table 10.1: Render Safe Procedure Codes in force from May 1972.¹

By this stage, some remote equipment and disruptive weapons were in use, although not to the same extent that they are now.

DOCTRINAL INSTRUMENTS AND THEIR RELEVANCE TO OPERATIONS

As was shown in Chapter Six, the main doctrinal instruments were Ammunition and Explosives Regulations (A&ERs), Standing Operating procedures (SOPs) and Technical Bulletins. For this chapter we will add Precis produced by The Army School of Ammunition as these reflect how ATOs were taught to conduct EOD operations.
A&ERs provided the formal doctrine that regulated all else. Their main disadvantage was that they were published infrequently. There were editions of A&ER Vol 3 Pam 21 Part 5 published in 1970, 1978, 1989 (in draft) and finally in 1993. Given these large intervals, and the changes that occurred in those times, it is clear that A&ERs rarely reflected the actual practices of the day. They were amended in between complete re-writes and were also supplemented by Technical Ammunition Bulletins (TABs). TABs could be produced – and superseded - much more quickly and were therefore more relevant to the conduct of operations. The same applies to SOPs, which could be amended overnight if need be. Precis also closely followed actual practice, since they reflected the skills and techniques taught to operators just before they deployed to Northern Ireland.

**TECHNICAL AMMUNITION BULLETINS 21/1725 AND 1726**

In the same month that Sgt Hills was killed, new guidance was issued to EOD operators in the form of two TABs. The first, TAB 21/1725, amended the 1970 edition of A&ERs Vol 3 Pam 21 Part 5. The second TAB, 21/1726, was an Aide Memoire for EOD operations.

**TAB 21/1725 - Amendment to the 1970 Edition of A&ERs Vol 3 Pam 21 Part 5.**

It will be recalled from Chapter Six that the 1970 edition of A&ERs Vol 3 Part 21 Part 5 placed the responsibility for the conduct of EOD operations solely with the operator:

> The A.T.O. is solely responsible for determining the proper procedure to be used to accomplish disposal of any explosive ordnance. It is essential that sound judgement and common sense backed by technical knowledge and experience of ammunition and explosives is applied to all EOD tasks²

On 08 December 1972, TAB 21/1725 superseded that paragraph with the following key passages:

> 2. **SAFETY.** Any activity connected with explosives is inherently dangerous. The disposal of IED is the most dangerous task of all and therefore the strictest adherence to safety disciplines and practices is necessary to ensure the safety of the EOD
operator. For guidance EOD incidents are categorised at appendix 2 according to their potential threat and the steps to be taken during disposal operations are divided into phases. All actions must be cautious and methodical; if the outcome can not be predicted with certainty then the worst must be expected and allowed for. **EXCEPT WHEN FACED WITH A CATEGORY A INCIDENT THE SAFETY OF THE EOD OPERATOR IS THE FIRST CONSIDERATION AND IN ALL CATEGORIES OF INCIDENT THE AIM WILL BE “NEUTRALISATION BY REMOTE MEANS”**.

3. In EOD Standing Operating Procedures (SOP) covering counter insurgency operations and aid to the civil power, the NATO standard definition of a category A incident must be expanded to cover local conditions. For example, the following would be considered to warrant Category A treatment:

   a. An IED placed in or near a hospital in circumstances which make it impossible to evacuate the patients.

   b. The discovery of a second IED at the scene of an explosion where persons are known to be trapped in the debris and rescue attempts must continue.

4. The CATO/SATO of a theatre or command is responsible for ensuring that the safety principles in paras 2 and 3 are embodies in their SOP and that every EOD operator understands them and complies with them.

5. The EOD operator is responsible for determining the proper procedure to be used to accomplish disposal of any explosive ordnance. It is essential that sound judgement and common sense backed by technical knowledge and experience of ammunition and explosives, is applied to all EOD tasks. In cases of doubt he is to refer to his immediate supervisor for advice.³

This short document was produced by the Chief Inspector of Land Service Ammunition, (CILSA) in response to the events of the preceding 18 months – especially the spate of deaths in 1972. It was published three days after the death of Sgt Hills and must have been in preparation when that news was received. It was extremely important to the development of the current British approach to IEDD. In it there were several key tenets from which the current doctrine grew. Paragraph two
was absolutely crucial to this. It strongly stressed that the safety of the EOD operator is the first consideration. All else rests on this idea – that life is paramount, and that includes the lives of operators. Without this simple idea, there could be no advancement in the doctrine. Once again, it may seem to state the obvious, but it was clearly an ‘obvious’ that needed to be understood. This was the absolute bedrock of the current IEDD philosophy.

Also underlined was that the aim is neutralisation by remote means. There can be no firmer evidence that manual RSPs were now officially disapproved of. In many ways, this was more of an aspiration than a command, due to the availability and capability of Remotely Operated Vehicles (ROVs) at the time, but that was soon to change. The principle that an operator should not carry out any action that influences a possibly live device while he is still present in its danger area was first embodied in this TAB and it forms the foundation of the current principles of IEDD.

Paragraph four enshrined the need for SOPs in each theatre which would be read, understood and obeyed by all operators. This particular notion took some time to take root, for although SOPs were produced in Northern Ireland, few former ATOs who operated there in the 1970s can recall reading them.4

Finally the TAB introduced the concept of referring up the chain of command for advice when an operator was faced with a difficult task. Although this often happened anyway, before this document was issued it was never laid down on paper that it should occur.

**TAB 21/1726 – Aide Memoire for EOD Operators.**

On 19 December 1972, TAB 21/1725 was followed by a practical aide memoire for EOD operators. It was ‘to be carried by at all times by all EOD operators on duty’.5 The TAB introduced four new mnemonics covering different phases of an EOD task, entitled PIT, STOP, PLAN and FELIX:
TASKING

Place/location of IED? P
Intelligence. What is known about IED? I
Time bomb was laid/discovered. T

EVALUATION

Safety of public, security forces, area and self. S
Time laid. Cross check and confirm timings. T
Observe and question observers. O
Priority. Only take risk if category A. P
Protection. Shield, armoured suit, ear defenders etc. P
Establish exact location – Questions? CCTV? L
Accessibility. Which remote equipment can be used. A
Now or soak. N

ACTION

Fail safe. If in doubt or category A – refer up. F
Execute plan safely. E
Look again. Assess effects of action taken. If in doubt, go back to STOP L
Inform tasking HQ job completed. I
Xpedite feedback. X

The actual aide memoire card was colour coded, green corresponding to the tasking phase, red the evaluation phase and amber to the action phase.
PIT, STOP, PLAN and FELIX stayed in use until the mid 1980s. Although the mnemonics are no longer taught in this form, their contents can still be found within current teaching material. This was because they were good advice and, with a little consideration for changes in equipment, could be applied to current operations.

The aide memoire showed a great step forward from the purely technical ‘Phases in EOD operations’ in A&ERs of only two years earlier. Great importance was placed on evaluating and assessing the overall situation, and not just what the suspicious object is. In contemporary IEDD operations, much weight is placed on the skill of threat assessment – establishing exactly what it is that the operator is facing before he steps out of cover. In the early 1970s, most operators did this anyway, but the standard and quality of their assessments varied. Assessing the overall situation’s growth into a major part of an IEDD operator’s skill-set began at this time.
Safety was stressed several times and the term ‘fail safe’ was used. This again made the point that whatever the operator intends to do to the device, there is always the possibility that it may not work, or may not work out the way he intends. That being so, he should not be next to the IED when he does it.

**ARMY SCHOOL OF AMMUNITION PRECIS**

RAOC EOD operators were trained at the IEDD wing of the Army School of Ammunition, based at Bramley until 1974, then at Kineton thereafter. The school published (and still does publish) a series of précis to support the instruction given. The précis always carry the warning, printed in the front page, that they must not be quoted as an authority for action. However, they do serve as a valuable tool for illustrating how operators were trained to conduct operations.

**Precis AP4 – IED Appreciation Guide December 1972.**

Precis AP4 – IED Appreciation Guide was published at the same time as TABS 21/1725 and 21/1726. It is illuminating, as it lays down the recommended conduct of an IEDD task as at the end of 1972. Much of its content remains valid today. It introduced in writing for the first time important tenets of IEDD such as arrival procedures, including safety of the public and the EOD team, cordoning and evacuation, secondary hazards and the availability of emergency services. It also introduces the idea of exhausting remote means before a manual approach is considered and returning to remote means whenever possible, as well as the use of protective clothing, secondary soak times and the referral procedure.

One of the most important ideas, that of carrying out all planning at the ICP before making a manual approach, and returning to the ICP to re-plan if the original plan is not feasible, made its *doctrinal* debut. This was strongly stressed at paragraph 4, which dealt with actions at the device:

a. Does the plan still seem feasible (if not retire at once and replan).

b. Am I spending too long a time at the device? (if so retire at once and replan).
c. Is any action going to disturb or move the device? (if so retire at once and replan).

d. Is the equipment being placed in the best position?

e. Is any action being dictated by the equipment I have to hand? (if so retire at once and replan).\textsuperscript{10}

IEDD doctrine was developing quickly, but still had some way to go. In many cases, the doctrine was limited by the available technology, which was also in its infancy. For example, the remote means mentioned were:

a. WHEELBARROW/JACKAROO/LITTLE WILLY fitted with PIGSTICK/PLATTER/CANDLE.

b. CARL GUSTAV practice rounds.

c. Shotgun on stand or SAA.

NOTE: Remote attack and demolition in situ by any means is mandatory in country areas.\textsuperscript{11}

Where remote attack was not possible, the course of action was to wait the mandatory soak time, establish if a route had been cleared to the IED then use one of the following RSPs:

(1) Place ‘Pigstick’.

(2) Place demolition charge and dispose of IED in situ.

(3) Use of cordtex opening charge.

(4) Use Hook and Line from a safe area to remove IED from target or to activate anti handling switches (once the IED is removed from the target to a prepared sangar or open area – destroy in situ).

(5) Radiography.\textsuperscript{12}
The last page of the precis had a list of ‘Important Considerations’, which offers an insight into the origin of today’s Mandatory Actions and accepted conventions:

1. Always observe a secondary soak time after any positive action. (Remember collapsing circuits!)

2. Pulling or disruptive techniques do not always render an IED safe.

3. Never cut into IED until you see and identify everything (Use hook and line to expose contents).

4. Keep approaches to a minimum and spend only the minimum time at the device.

5. Wear ear defenders and other protective clothing.

6. Switch off radios when exposing electric dets and carts.

7. Expect the worst to happen at every stage of the RSP and plan accordingly.

8. Beware of a secondary hidden IED time/s at interval/s to hazard EOD personnel and other SF.

9. Remember that if you can see the IED, it can see you.

10. If you do anything without a thought out, logical reason, you are wrong.

11. If you approach an IED empty handed, you are wrong.

12. An IED operator does not take chances, only calculated risks.

13. DO NOT BE OVER-CONFIDENT (THIS IED MAY BE YOUR LAST)!13

Precis AP4 – Access and Render Safe Procedures in an IED Incident - May 1975.

Precis AP4 was revised and enlarged in May 1975, reflecting the lessons learned in the preceding few years. It was a much more detailed document than its 1972 iteration. While much had been added, little that appeared in the original document
had been replaced. It included, for the first time, an EOD philosophy, which repeated the statement made in December 1972 in TAB 21/1725:

**EOD Philosophy**

Life is irreplaceable. When planning the Render Safe Procedure (RSP) there is one over-riding consideration to be made:

“EXCEPT WHEN DEALING WITH A CATEGORY A INCIDENT THE SAFETY OF THE OPERATOR IS THE FIRST CONSIDERATION AND IN ALL CATEGORIES OF INCIDENT THE AIM WILL BE NEUTRALISATION BY REMOTE MEANS”.

The precis included the PIT STOP PLAN FELIX aide memoire, as well as detailed information on the sequence of events at an IED incident and the EOD operator’s question technique. There was also an annex that reproduced an extract from the CATO SOPs in use in Northern Ireland at the time. It is clear from this précis that the thinking behind the changes in doctrine that occurred towards the end of 1972 was sound and still very much in force in 1975. What had changed was the capability and availability of equipment which meant that much more could be accomplished remotely.

**THE 1978 EDITION OF AMMUNITON AND EXPLOSIVES REGULATIONS VOLUME 3 PAMPHLET 21 PART 5**

The 1978 edition of A&ERs Vol 3 Pam 21 Part 5 superseded the 1970 edition and its amendments. A great deal of change had occurred in the preceding eight years. By the time the 1978 edition was published its contents were already firmly established in operational practice and instruction. This edition was not an ambitious publication, given the events that had occurred, and in many ways it lagged behind the accepted thinking of the day.

Although an EOD Philosophy had been mentioned in Precis AP4 of 1975, it did not appear in the 1978 edition of A&ERs. However, one important change that did occur was a shift of the burden of responsibility for the conduct of operations. The 1970 edition placed the whole responsibility on the shoulders of the operator, which effectively allowed him to conduct any EOD operation as he saw fit. The 1978
The ATO dealing with the IED is personally responsible for determining the correct EOD procedure to be used within the framework outlined by this pamphlet.\textsuperscript{15}

Section 3, ‘Sequence of Events in EOD Operations’, began by reiterating the point made earlier about preparing for the worst when carrying out EOD action:

All actions taken must be cautious and methodical. If the outcome of any action cannot be predicted with certainty then the operator must expect and prepare for the worst.\textsuperscript{16}

The idea that an operator, when faced with a difficult or unusual situation should refer to his chain of command was first appeared in writing in TAB 21/1725 and Precis AP4 of 1972. Section 3 of the 1978 edition of A&ERs enshrined the referrals process in a formal regulatory document for the first time:

EOD operators must consider all options open to them before making their disposal plan. If they have any doubts concerning the action to be taken at any stage of the operation, they are to seek advice from their immediate superior.\textsuperscript{17}

Section 3 divided EOD Operations into four phases:

a. Tasking to incident.
b. Evaluation of Incident.
c. Action.
d. Feedback.

The pamphlet did not specifically make the point that IEDs should be disrupted or that manual neutralisation techniques should be avoided. However, while discussing the ‘Evaluation of Incident’ phase, the following point about remote attack and soak times was made:
The IED must be attacked remotely if at all possible. If a personal approach has to be made it will follow a safe waiting period (soak time).\textsuperscript{18}

In the annexes, there were detailed descriptions of remotely operated equipment, such as hook and line and Wheelbarrow Mk 7, and disruptive weapons such as Pigstick, Shotgun, Beguine and Flatsword. This does imply that remote and disruptive methods were in use, if not mandatory.

Section 4 was entitled ‘Evidence, Intelligence and Information’. It discussed the need to obtain and preserve information from recovered IEDs so that forensic evidence could be used to gain convictions against terrorists and intelligence could be exploited to formulate counter-measures. This remains a central pillar of the current IEDD philosophy. However, the following warning was made:

On no account is life to be put at risk to preserve forensic evidence.\textsuperscript{19}

The 1978 edition was a curious publication. It was clearly based on the developments that emerged from Northern Ireland in the preceding eight years and much of what it contains can be found in the current doctrine, albeit in a modified form. Yet the sections that governed the conduct of an EOD task were scarcely more weighty than the 1970 edition and it did not mention the specific measures that appeared at the end of 1972.


This pamphlet, entitled ‘Regulations and Instructions for IEDD’ was first issued as a TAB\textsuperscript{20} in 1989 and was published as regulations in 1993. The TAB was significant as it was the first time that the doctrine was expressed in its current form in a regulatory document. That is to say that the Aim, Principles and Philosophy of IEDD that we are familiar with now appeared there first. They were published in Section 1 as:
Aim of IEDD

4. The aim of IEDD is to deny terrorists and criminals their objectives.

IEDD Philosophy

5. The following philosophy is followed to safely achieve the aim;

   a. The safeguarding of human life takes precedence over all else. Where there is any conflict between this constraint, the public comes first, then the operator.

   b. All RSPs must cause the minimum of damage and restore the situation to normality as soon as possible conversant with safety.

   c. Forensic evidence is to be preserved and collected as much as possible where consistent with a and b.

IEDD Philosophy

6. Following on from this philosophy, the following principles have been evolved and are to be followed in any area of IEDD to successfully achieve the aim:

   a. Remote equipment is to be used wherever possible.

   b. Mandatory soak times are to be observed.

   c. Operations are to be pre-planned where time allows.

   d. Tasks are to be categorised by commands according to importance.

   e. The operator is to spend the minimum amount of time at risk from the device.

   f. Disruption of the device is the preferred option.\textsuperscript{21}
Section 3 ‘Sequence of Events in an IEDD Incident’ went into much more detail than any previous iteration. In the sub-section entitled ‘Planning a Render Safe Procedure (RSP)’ the point was made that RSPs were based on the philosophy and principles and that any RSP would fall into one or more of the following categories:

- Neutralisation.
- Destruction In Situ.
- Removal.
- Containment.  

Removal and containment were essentially dismissed as viable options in most cases. Destruction in situ was available at the SATO’s discretion. This could be achieved using ECM in the deliberate initiation role or by conventional munitions disposal techniques. The use of the terrorist's own means of initiation was expressly forbidden.

Discussing neutralisation, two possible options were offered. These were disruption and dismantling. Disruption was declared to be the safest option and one that did not result in a significant loss of forensic evidence. Of dismantling, the following warning and comments were given:

**WARNING – ACCIDENTAL INITIATION**

CUTTING INTO A SUSPECTED DEVICE WITHOUT KNOWING IT’S COMPLETE MAKE-UP MAY RESULT IN ACCIDENTAL INITIATION.
THE OPERATOR IS NOT TO CUT INTO A SUSPECTED DEVICE UNLESS HE CAN POSITIVELY 100% IDENTIFY THE COMPLETE CIRCUIT VISUALLY OR BY USING RADIOGRAPHY.

Dismantling. Manually, this technique carries a high risk and is only to be used where the assessed risk from disruption is too great to allow disruption to be used, or where it is known that the IED is not armed. The use of this technique is to be defined by CATO/SATO SOPs. Semi-Remote dismantling is only used where disruption cannot be used e.g. hook and line used in a culvert.
The Sub-section went on to discuss disruption techniques as follows:

a. Where an object is suspected to be an IED then disruption is to be used first unless the operator believes that this will achieve the terrorist’s or criminal’s aim.

b. Where an object is suspected to be inert, but connected to a hidden anti-handling device, then disruption in the likely area of the device is to be adopted.

The 1993 edition remained extant until it was superseded by JSP 364. In fact it was absorbed, largely unchanged, into the new publication.\textsuperscript{25} The above paragraphs reflect IEDD thinking from the late 1970s to the present day.

By the end of the 1970s, IEDD operations in Northern Ireland had matured to a point where they were broadly similar to how they are now. There were still differences from the current approach. Some of these were dictated by the equipment that was available, while others stemmed from minor differences in thinking. On the whole, however, a operator trained in 2011 would recognise the conduct of a task from this period.

The lower levels of IEDD doctrine were capable of evolving very rapidly. The publications that appeared at the end of 1972 are evidence of this, while SOPs could be – and often were – amended overnight. It is interesting to note that the doctrine as expressed in the formal regulatory documents was much slower in reflecting operational practice.

One former long serving ATO and Senior Instructor at the IEDD Branch of The Army School of Ammunition made the point that the publication of A&ERs always lagged actual operational practice and what was being taught on courses.\textsuperscript{26} They formally enshrined those doctrinal developments that had occurred and had been accepted by the RAOC establishment. In effect they reflected doctrinal change, after a delay, rather than led it.

CORRELATION OF THE CURRENT DOCTRINE TO EVENTS IN NORTHERN IRELAND

This section of the Chapter discusses the correlation of events in Northern Ireland to current doctrinal tenets. In some cases it is possible to say that event $x$ led to the
introduction of tenet y. Where this is the case the example is given. In other cases the doctrine is grounded in an accumulation of events. Where this is so, examples are discussed. Most of the examples have been discussed already, so this section aims to draw together all of the strands of that have appeared in this work so far.

PHILOSOPHY.

The Philosophy is more difficult to pin down to specific incidents than the other elements of the doctrine, but it is firmly grounded in experience in Northern Ireland.

Save Life.

The ‘EOD Philosophy’ first appeared in print in Precis AP4 of 1975, although the idea that life, including that of the operator, is paramount emerged at the end of 1972 in TAB 21/1725. This was based on the deaths of Capt Stewardson and WO2 Davies in 1971 and those of SSgt Cracknell, Sgt Butcher, Maj Calladene, Capt Young and WO2 Clark in 1972.

The following three tenets first appeared in their current form in the 1989 draft of A&ERs although the thinking behind them had been extant for many years.

Preserve Property

It was discussed in Chapter Six that the preservation of property was ranked very highly at the start of Operation BANNER – to the detriment of life in some cases. A very early document, SATO Bulletin No 7, published in August 1971, instructed ATOs that they should not use semi remote techniques on suspected VOIEDS in case they functioned, damaging property and achieving the terrorist’s aim.27 It was clear that this approach was flawed, at least at the tactical level and as far as the operators were concerned. At the strategic level limited casualties may have been acceptable as long as the economy was able to operate effectively. This may have only changed when fatalities increased to such a level that it appeared that PIRA was achieving one of its aims, that of killing soldiers with the political consequences that carries. It was soon acknowledged that damage to property may occur in EOD operations and that this was acceptable if it helped to save lives, or returned the
situation to normality quickly. By the middle of 1972 violent and sometimes destructive RSPs were in use.

However, the original point that simply allowing devices to function or causing excessive damage achieved the terrorist’s aim for him remains valid as long as it does not over-ride the need to preserve life.

Return to Normality.

One of PIRA’s aims was to disrupt the economy and civil life in general. The longer an incident went on, the more disruption and economic damage they caused, even if there was not an explosion. Another aim was to kill members of the security forces and the longer they were stood on cordons, the greater was the opportunity to attack them. It follows then that EOD operations should be completed as quickly as possible, commensurate with safety.

Figure 10.1: A suspect car is blown open using a disruptive charge in December 1974. This car turned out to be innocuous, but such damage was accepted for reasons of safety and speed of returning the situation to normality.28
Collect and Preserve Forensic Evidence.

The idea of recovering evidence and intelligence from IEDs that had been rendered safe pre-dated Operation BANNER. In fact it was one of the reasons that RAOC took the lead in IEDD. This was first systematically applied in 1955 when RAOC ammunition technical personnel were seconded to the Cyprus Police to deal with EOKA IEDs. By early 1972, due to the high operational tempo, the recovery of forensic evidence had lost some its importance. However, the idea was soon to re-establish itself as it became clear that terrorism could be fought by capturing and prosecuting terrorists - and for that high quality forensic evidence was required.

PRINCIPLES.

The Principles of IEDD operations are more prescriptive than the Philosophy

Remote Equipment Is To Be Employed Where Possible.

Most of the deaths that occurred among EOD operators could have been avoided if the device had been dealt with remotely before a manual approach was made. Until the second half of 1972 no practical remote equipment was available. After that Wheelbarrow became available and it use could have saved the lives of nearly all of those who died thereafter. By December 1972, a remote attack was to be carried out whenever possible and was mandatory for rural devices.

Mandatory Soak Times.

Soak times have been a feature of IEDD operations since the start of Operation BANNER, but initially they were not mandatory and it was up to the operator to decide if a soak was needed and what that soak would be. The deaths of WO2 Davies in 1971 and Maj Calladene in 1972 led to the use of soak times being made mandatory. These will be discussed in more detail under mandatory Actions below.

Operations Are To Be Pre-Planned When Time Allows.

The pre-planning of operations can be considered on two levels. Firstly there is planning of whole operations before they are mounted, normally in rural areas. These Planned Operations will be discussed under Mandatory Actions below.
Secondly there is the planning of any action while in the safety of the ICP. We have seen that the deaths of Capt Stewardson, WO2 Davies, Maj Calladene, Capt Young, Capt Gritten and SSgt Brammah were the direct result of not pre-planning their RSP.

Equally important to planning is sticking to the plan. Changing the plan at the target was a major factor in the deaths of SSgt Cracknell, Sgt Butcher, WO2 Clark, Sgt Hills, SSgt Beckett, WO2 Maddocks, Sgt Walsh and WO2 O’Neill. This problem was well known and was commented on by DLSA after Sgt Walsh’s death:

This is the second occasion to my certain knowledge (the first was WO2 Maddocks) that we have lost an operator, who having declared an intention to destroy an IED in situ changed his mind on approaching the device and started to dismantle it.

Such instantaneous decisions are dangerous as they cannot have been thought out thoroughly and reached on a basis of logic. I know that you already quite correctly teach that an operator who changes his mind in the middle of a clearance operation must retire and think out his actions afresh. Would you please ensure that this is emphasised during training and is brought out in practical training wherever possible.31

However, it was clear that this well understood by the end of 1972:

Has the complete Render Safe Procedure been planned including contingency plans?

If you do anything without a thought out, logical reason, you are wrong.

If you approach an IED empty handed, you are wrong.32

**Commands Are To Categorise Tasks By Their Level Of Importance.**

This is more of an issue for tasking authorities than EOD operators, but remains important. If there are more than one concurrent task, the one that presents the most danger should take priority for clearance. This can be applied by EOD teams as well, though. If an operator is faced with, say, two IEDs on one task, one of which is at a petrol station while the other is in a nearby field, then common sense should dictate that the one at the petrol station should be dealt with first.
Minimum Amount Of Time At Risk From The Device.

This first appeared in the *doctrine* at the end of 1972. Clearly, the less time an operator spends at an IED, the less risk he is at. There is the danger that a time device might function while the operator is at the target, but time spent at the target also increases the danger when the IED is not a time device. The longer an operator spends at a command device the greater opportunity he gives the terrorist to initiate the device. Excessive time spent at an IED is also dangerous when dealing with VOIEDs. Being close to a live IED is a stressful activity and this is not conducive to rational decision making. This was a factor in Capt Stewardson’s death in 1971. He was at the device for a long time before the explosion occurred. The same could be said for Capt Gritten in 1973. WO2 Davies approached an IED but carried out no action against it. SSgt Beckett was in the building for several minutes before the explosion occurred, as was WO2 Howard. SSgt Brammah was at the device for the second time when his device functioned.

Neutralisation By Disruption.

It was clear from the fatalities that had occurred that dismantling IEDs by hand carried a grave risk. Although the practice persisted for some time afterwards, the need for neutralisation by disruption was embodied in the *doctrine* at the end of 1972. This was prompted by the deaths of Capt Stewardson, SSgt Cracknell, Sgt Butcher and WO2 Clark. In all of these cases, the use of a disruptive weapon – had one had been available – would have saved their lives.
An early example of remote disruption of a suspect VBIED, Belfast 1973. Figure 10.2 (top): The ATO fires a shotgun to break the car’s windows. Figure 10.3 (centre): The EOD Team fit a ‘Torpex Candle’ disruptive charge to a Mk 3 Wheelbarrow. Figure 10.4: The Wheelbarrow boom enters the car via the broken window and drops the Candle before retiring. The charge would then be fired, disrupting the car and any IED it contained.35

This follows on from the need for remote means where possible and neutralisation by disruption. It is believed that WO2 Clark did not have a Wheelbarrow so began his final task semi-remotely. Had he continued in this manner he would have survived, but on the spur of the moment he decided on an unplanned and unnecessary manual action. The same could be said for Sgt Walsh. Although he had a Wheelbarrow he did not wait for it to arrive. SSgt Beckett wanted to use his Wheelbarrow but decided that he couldn’t so he used a semi-remotely deployed Pigstick. After that he decided to use another semi-remote method – hook and line. However, he must have done something to the device manually. WO2 O’ Neill did start off with a Wheelbarrow, but had some problems with it. He then moved onto using hook and line and, like WO2 Clark, if he had continued with this he would have survived. Instead he decided to carry out manual actions.

MANDATORY ACTIONS.


The death of WO2 Davies in 1971 was a direct result of not observing a primary soak. After that incident, the SATO, Maj Calladene, wrote:

Soak based, not upon timings given by the terrorist, but by past experience of timing devices (eg Parkway timer, Jock Clock etc) and the time at which the ATO/AT arrives at the target. The terrorist may aim to trigger the device at the time the ATO/AT can reasonably be expected to be nearby.36

It is tragically ironic that Maj Calladene was himself killed in 1972, probably as a result of not observing a primary soak.


The need for a secondary soak was recognised as early as 1971, when IEDs with collapsing circuits that started secondary timers were encountered. This was reflected in Precis AP4 in 1972:
Always observe a secondary soak time after any positive action. (Remember collapsing circuits!)\(^3^7\)

**Manual Approaches As A One-Man Risk.**

This phrase did not appear in the formal *doctrine* until 1989. In earlier documents it is clearly implied and a one man approach was the standard practice in most cases.

The phrase did appear in writing in 1971. WO2 Davies entered a building with his driver to search for an IED and they were both retreating from it when the device functioned. The SATO, Maj Calladene, wrote a report on the incident which absolved him of any blame, but said his only mistake was to take his driver with him into the building, saying:

> Reconnaissance of all IEDs is a one man risk.\(^3^8\)

SSgt Cracknell and Sgt Butcher were killed while dealing with an IED in a car – they were both at the device when it functioned. There are no copies of CATO SOPs surviving from this period, but interviewees have stated that the one man risk was made mandatory in SOPs after this incident.\(^3^9\)

**EOD Suit Worn On Manual Approaches.**

Most IEDs used in Northern Ireland were small and it became apparent that an armoured suit could offer protection against them should one explode during an operator’s manual approach. An EOD suit was developed in response to the Hong Kong campaign of 1967-68 but was never used there. This Mk 1 suit was in service from the start of Operation BANNER but it seems that few operators wore it. The Mk 2 suit was introduced in 1974 and was a great improvement, but any EOD suit is heavy, cumbersome and tiring to wear. The use of the suit was ‘strongly encouraged’ at first but operators frequently sought reasons to dispense with it. As a result, its use was made mandatory later in 1974.\(^4^0\)

An EOD suit can only protect against so much explosives at point blank range and there is a balance to be struck between protection on one hand and mobility and visibility on the other. WO2 O’Neill and WO2 Howard were wearing an EOD suit at the time of their deaths. WO2 O’Neill had removed his helmet but it was assessed
that he would not have survived had he been wearing it. Capt Wickham was also in an EOD suit without a helmet but he survived. Had he been wearing a helmet it is likely that he would not have suffered internal burns. SSgt Whitworth was wearing a suit and survived. There is every chance that he would have been killed if he had not been wearing one.

Of the others who died, Capt Stewardson, WO2 Davies, Maj Calladene, Sgt Hills and SSgt Beckett would probably have survived had they been wearing an EOD suit.

**Manual Approaches Are To Be Made Under Full ECM Active Cover.**

As was stated at the start of this work, the subject of ECM will not be discussed in detail. However it sufficiently well known that ECM can inhibit radio signals thus preventing an RCIED being initiated by the terrorist.

SSgt Brammah was the only ATO to have been killed by an RCIED and he approached it twice without any ECM. Some early RCIEDs were rendered safe without ECM cover. In these cases the operators benefited from a degree of luck.

**Planned Operations For Suspected Command And Victim Operated IEDs In Rural Areas.**

In urban environments, time is frequently a factor but this is much less so in rural areas. There is also the time and space for the terrorist to deploy a cunning trap, usually involving a VOIED or a command IED, in order to catch out first responders and EOD teams. On the other hand this also gave the SF the time and space to pre-plan IED clearance operations. It was recognised early on that rushing to an incident in a rural area could be foolhardy. A more considered, multi-agency, response was required, as is illustrated by these comments from Brig (Retd) Frank Steer who was a Captain conducting rural operations in 1971:

> We were the first RAOC EOD Section to undertake joint operations with the Royal Engineers in the country on the approach to a device. We didn’t have a Royal Engineers Search Advisor and all the good bits of kit that exist today. I went out with a Sapper section, commanded by a corporal, using old fashioned mine search techniques – looking for trip wires, pressure pads and the like, on the
way up a mountain track to a radio mast that had been blown up. It was an incident that occurred shortly after the Brougher Mountain murders. We were of the view that the explosion on the radio mast that I went to could have been a ‘come on’. So we took the precaution of searching the road on the way up so that we could get the vehicle to it. I meanwhile took an unorthodox approach across the fields to get to the scene of the incident. This type of operation was carried out on a number of occasions after that, but much more informally than is now the case.  

This approach was not always taken. Capt Young and WO2 Clarke were both killed in 1972 after responding immediately to incidents in rural areas when there was no real need to.

Lt Col Mackenzie-Orr was CATO in 1973-74. He strongly believed that the operations should pre-planned in rural areas so that the SF could ‘take away the initiative from the terrorist’.  He encouraged his operators to:

\[ \text{Think like a terrorist. Do not use obvious positions or drills and never repeat the operation mounted against a particular bomb on a previous occasion.} \]

This is good advice in all IEDD operations, not just rural ones and shows that by this time ATOs were thinking about the tactical aspects of an EOD task as well as the technical details.

**Planned Operations To Have At Least One Aviation Imagery Sortie Flown After The Cordon Is Firm.**

The delay between discovering a suspect IED in a rural area and deploying meant that there was time not only to plan but to carry out reconnaissance. This might simply be an overflight in a helicopter but a better option was to obtain aerial photography. The trained image analysts at the Reconnaissance Intelligence Centre (RIC) at RAF Aldergrove could then examine the photography for signs of concealed IEDs. This technique was very effective at discovering command wires.

However, if there was a delay between the RIC flight and the operation being mounted this gave the terrorist an opportunity to position an IED in the knowledge that the SF were showing interest in a particular area. This is what happened at
Cortreasla Bridge in 1975 when WO2 Garside & Cpl Brown were killed along with
Maj Willis and Sgt McCarter. After that incident it became mandatory for a further
RIC flight to be flown after the area had been secured by the cordon but before the
EOD team deployed.

**Vehicles Are To Be Remotely Or Semi-Remotely Moved Their Own Length And
Jolted.**

In Chapter Eight we saw how Constable McKay was killed in 1976 when he drove a
vehicle off an improvised release switch and PIRA attempted to use a similar device
in 1992. These incidents, along with the incident in which WO1 McClelland was
injured, explain why vehicles must be remotely moved and jolted before they can be
handed over.

**Referrals**

There are a number of occasions when an operator must refer to his chain of
command before carrying out certain actions. This process was first formalised in
1972:

The EOD operator is responsible for determining the proper procedures to used to
accomplish disposal of any explosive ordnance. It is essential that sound judgement
and common sense backed by technical knowledge and experience of ammunition and
explosives is applied to all EOD tasks. In cases of doubt he is to refer to his
immediate superior.

The referral process is important because it provided EOD operators with a second
opinion from someone who is usually more experienced than they are. One ATO
described the process as a ‘sanity check’. Maj Styles wrote that when he tasked
Capt Stewardson to the IED that killed him, he gave instructions that Stewardson
was to telephone him if there was anything out of the ordinary about the task. He
never did. It is difficult to believe that any OC would have allowed SSgt Cracknell,
Capt Young, WO2 Clarke or Capt Gritten to carry out the actions they did had they
discussed it with them first.
Cases exist where operators referred up but then went on to be killed. WO2 Rose discussed his plan with the Senior Ammunition Technician (SAT) before he deployed and WO2 O’Neill did the same with the SATO. In Rose’s case he deviated from the plan he agreed with the SAT. O’Neill did not apprise the SATO of all of the information. These instances illustrate the need for frankness and openness on the part of the operator when referring up and of sticking to any plans agreed.

CONCLUSION

This chapter has shown when the *doctrinal* documents that guide the conduct of IEDD operations were introduced. The key tenets of the contemporary *doctrine* - that life is paramount, that operations should be pre-planned, that IEDs should be neutralised by disruption preferably delivered remotely, and that manual actions should be a last resort - first appeared in these documents. At first glance the documents produced in the 1970s bear little relation to the contemporary *doctrine*. The formats of the documents appear archaic and much of the terminology has changed. Closer study reveals that many of the principles first espoused at the end of 1972 are still relevant and can still be found in the contemporary *doctrine*, albeit in a re-worded or modified form. Therefore it can be legitimately argued that the thinking behind the conduct of current operations has its roots in the lessons learnt in Northern Ireland in the 1970s.
THE DEVELOPMENT OF THE BRITISH APPROACH TO
IMPROVISED EXPLOSIVE DEVICE DISPOSAL
IN NORTHERN IRELAND

CHAPTER ELEVEN

EQUIPMENT – ENABLER OR DRIVER OF DEVELOPMENT?

INTRODUCTION

Operation BANNER saw the development and introduction of a host of new equipment, for counter-insurgency and internal security duties in general and for IEDD in particular. Some of the equipments – and the ideas behind them – fell by the wayside, while others have endured and gained acceptance world-wide. Most of the enduring equipment ideas emerged at roughly the same time that the IEDD doctrine began to change. This chapter describes the most important developments in IEDD equipment and discusses the extent to which they shaped the conduct of operations. Or in other words, did new equipment drive changes in IEDD thinking, or did new ideas about IEDD demand new equipment and did the availability of that equipment enable aspirations about IEDD to be translated into reality?

Military equipment constantly evolves and, while some venerable survivors exist, there are few items of equipment that have stayed in service unchanged since 1972. However most modern equipments are directly descended from equipments introduced in the early 1970s and most are used in much the same way. To describe every equipment development would fill a book in its own right, and would fall outside the scope of this work. Therefore, rather than discuss every single development in the IEDD armoury, equipment will be discussed as equipment concepts and there are five such concepts to be considered. **Hook and Line** enables operators to move objects semi-remotely. **Radiography** gives the operator an opportunity to see inside an IED before taking action against it. **Disruptive Weapons** negate the need for a manual entry into IEDs by violently (usually with the aid of explosives) entering and breaking up IEDs before they can function. **Remotely Operated Vehicles** allow the operator to observe the IED and deploy a disruptive weapon, as well as carrying out other actions, from a safe distance. **Personal Protective Equipment** offers the operator a degree of protection from blast and fragments when he makes a manual approach to the IED. There were
many other developments, but these five equipment concepts — in their various forms — were and remain prominent features of the British approach to IEDD. A sixth equipment concept, Electronic Counter Measures was also crucial to the development of IEDD doctrine but falls outside the scope of this work so will not be discussed here. It will be seen that although the equipment concepts came to fruition in Northern Ireland, few of the ideas were wholly new. Some predate Operation BANNER in British service. Some were borrowed from other countries and some had been already developed independently and unbeknown to the British.

THE EQUIPMENT CONCEPTS

The equipment available to an EOD operator engaged on IEDD duties at the start of Operation BANNER was limited:

In the early days, bomb disposal was very much with crossed fingers. We were all feeling our way. The kit we had was exactly the same kit as we had in Hong Kong and consisted more or less of a Stanley knife and a pair of wire cutters. I remember I carried all my kit in the left hand flak jacket pocket. Fortunately they were feeling their way too.¹

Speaking of the situation in 1969-70, ATO 1 said:

We made our own kits up for the team. Most items were gathered by scrounging. I liked medical items due to their quality, scalpels, and other knives.

Simple REME type tools were also gathered, pliers of various sizes, cutters.²

This was at a time when hand entry was the most common RSP and we have seen in Chapter Seven the fatal results of relying on these methods.

HOOK AND LINE

Hook and Line is the earliest and most basic of specialised EOD equipment, consisting of a length of rope or cord and a means of attaching it to an object. It enables an operator to move an object semi-remotely. He must put himself at risk by first making a manual approach to attach his line but he can then retire to a safe distance to pull it, thus fulfilling the criterion of not being in the danger area of an IED when taking any positive action against it. Should the device function the operator
will still be safe. It has been used to simply move an object from one place to
another, to disturb an object to negate the presence of a VOIED, to open car doors
and as a means of disrupting an IED.

As an EOD technique it has a long history. In the First World War, when the
Germans were proficient in the use of booby-traps, Sappers – who called it a ‘life
line’ - used it extensively for tasks such as opening doors on captured dugouts and
moving abandoned attractive items. In the Second World War, similar techniques
were used to remove fuzes from aircraft bombs and to remove butterfly bombs to a
safe place where they could be destroyed. It found further use against IEDs in
Palestine and Hong Kong.

Although issued Hook and Line kits existed and were used in the Hong Kong
campaign it seems that at the start of Operation BANNER most operators made up
their own kits using string, fishing line and car tow ropes. In 1969 and 1970, ATO 1
used:

> Various strength cords, especially parachute and tie down cords. These were wound
onto empty cordtex drums.

Things had not moved on a great deal by early 1972:

> Used large fish hook, rope & lightweight garden hose reel. This needed to reel out
well as we usually ran in on approach. Good kit to drag things into open & away
from target.

As operators attempted to move away from manual RSPs, but before ROVs and
disrupters were widely available, great use was made of Hook and Line as a means
of moving and disrupting IEDs.
Even after ROVs and disrupters came into use, Hook and Line remained popular with operators. ATO 4 was typical when he said of Hook and Line:

The most valuable tool of all. Once considered defused or unsure of anything, give it a good shaking from round a corner.\textsuperscript{11}

This was echoed by ATO 7:

Great! Used it a lot. Mainly with aim of repositioning device for wheelbarrow accessibility or pulling apart device after disruptive action.\textsuperscript{12}

Despite the great advances that have been made in ROV technology, Hook and Line remains a vital piece of IEDD equipment with many applications.

**RADIOGRAPHY**

Radiography gives the operator an opportunity to see inside an IED before taking action against it. Like Hook and Line its use in EOD predated Operation BANNER, although its history is rather more chequered. In the Second World War ‘Field Photography’ was used as a synonym for X-Ray equipment used to radiograph German air dropped bombs. Radiographic equipment was relatively primitive then and it could take twelve hours to obtain a good image of a bomb fuze.\textsuperscript{13} X-Ray
machines were used to radiograph suspect items of mail and baggage being loaded onto aircraft in Cyprus in the 1950s. These were used in a stationary role and were not mobile systems that were used by EOD Teams.\textsuperscript{14}

The first purpose designed IEDD radiography equipments were issued in the mid 1960s. There were two X-ray systems and a gamma ray system. In Northern Ireland it was the Andrex Model 3001 X-Ray system (usually referred to as the 300 kV) that was available to EOD teams.\textsuperscript{15} This was a complex, heavy and cumbersome system that was mounted on a trailer and employed wet chemicals to develop the films. It was centrally located and EOD teams had to call it forward if it was needed.

\begin{figure}[h]
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\includegraphics[width=0.4\textwidth]{andrexit.png} \hspace{0.1\textwidth} \includegraphics[width=0.4\textwidth]{andrextube.png}
\caption{The control unit and tube head for the Andrex Model 3001 X-Ray system (300 kV).}
\end{figure}

X-Ray came into its own when the Castlerobin and Midlander series of complex VOIEDs appeared in late 1971. Capt Stewardson was killed when he attempted to cut into the first one of these.\textsuperscript{16} Attempts to use Hook and Line and explosive opening techniques on later devices all resulted in the IEDs functioning.\textsuperscript{17} It was only when the IEDs were radiographed and the circuits fully diagnosed that a semi-remote and manual RSP that would not initiate the device could be devised and implemented.\textsuperscript{18}
However, these tasks were exceptional. Most IEDs remained simple and most were
dealt with by manual or explosive techniques without the aid of X-ray. Throughout
the 1970s, X-Ray equipment was never popular among operators. ATO 3 was
typical when he said:

Waste of time. 300kva too heavy to use in normal circumstances. 19

By early 1972 PIRA had largely moved away from complex VOIEDs and onto timed
VBIEDs. Consequently the use of X-Ray diminished further. ATO 4 operated in
1972 and said:

Rarely used in my time. The day of the complicated anti-handling device (Europa
type bomb) was over. PIRA had lost too many people with complicated devices. 20

The 300 kV was replaced by the Scanray x-ray system in the mid 1970s. This was
not as large and heavy as the 300 kV, so could be carried on the EOD vehicles, but
was still a substantial and complex piece of equipment. Operators’ opinions of x-ray
equipment had changed little. ATO 11 used it in 1975 and said of it:

The Scanray, which preceded the inspector, weighed a ton, was difficult to deploy and
the plates were difficult to develop successfully in the field. Limited value. 21

ATO 12 had it on his team kit in 1978:

We had it – crude in the extreme and I never used it, partly because there was never a
real need, partly because it was so crude and unresponsive and partly because I never
really grasped (from the too brief pre-ops course) how to use it! 22

It was only when the lightweight Inspector X-ray system, which used Polaroid type
films was introduced in 1979 that the use of X-ray increased:

Inspector was introduced during this tour with in theatre training. Provided increased
scope and enhanced abilities. 23

A truly lightweight and portable system, Inspector allowed EOD teams to employ
radiography as they saw fit. This did not mean a return to the days of radiographing
a suspect package before cutting into it, as the doctrine had moved on by then. In
most cases the advent of disruptive weapons and ROVs had made this unnecessary
and, indeed, undesirable as it meant that the operator had to put himself at risk to gain the image. It was much safer and quicker to deploy a disrupter, either manually or remotely. Radiography still has its uses, the most common being to examine suspect items of mail and to confirm an operator’s assessment that an object does not contain a concealed IED. In most cases, if the operator believed or even suspected that it might contain an IED, he should take disruptive action against it.

DISRUPTIVE WEAPONS

It became clear very early on that cutting into suspect IEDs by hand was an inherently dangerous activity. Radiography could reduce the risk by informing the operator of the suspect IED’s make up but it did not remove the risk that an inadvertent action could initiate a VOIED or that a timer could wind down while the radiography or the RSP was being carried out. A method of entering and disabling an IED that could be carried out from a safe distance was required.

Disruptive weapons use explosives to defeat explosives. They negate the need for a manual entry into IEDs by violently entering and breaking up IEDs before they can function. They can be divided into four classes: Explosive Effect weapons use one or more of the explosive phenomenon of High Explosives, usually blast overpressure, brisance (shattering effect) or a shaped charge effect to damage an IED and/or its container. Thermal Effect weapons use fire to destroy an IED or its container before it can function, or fully function. Projected Mass weapons use the power of explosives to propel a single large solid object – or a matrix of smaller solid objects - into an IED. Injectors use the propellant gases from a Low Explosive charge to propel solids or liquids down a barrel and into an IED. Some disruptive weapons can be considered as a combination of two or more of these four classes.

An Explosive Effect method already existed in the form of standard demolition explosives. The most common was ‘Cordtex’, or detonating cord. Cordtex had been used as a means of opening suspect packages in the Cyprus and Hong Kong campaigns. In Northern Ireland it was often found that the opening charge would also have the effect of breaking the IED’s circuitry, thus rendering it safer to be dismantled by hand.
Capt Young and WO2 Clark were both killed attempting to deal with IEDs in metal containers (a milk churn and an oil drum respectively). Thereafter, small explosive charges were found to be very effective at semi-remotely opening such containers:

A 1 ounce CE Primer taped to the bottom of a milk churn would pop the lid off quite nicely.\(^{28}\)

Two specialised disruptive charges to counter the VBIED threat was introduced in 1972. The first, called Clam, was developed from a naval limpet mine and was intended to be fired from outside of the vehicle. It was not a great success.

The second was called Candle or Torpex Candle. It was originally taken from an explosive charge used in the service Rapid Cratering Kit. A window on the target vehicle had first to be broken, usually with a shotgun, and then the charge was dropped inside the car, either manually or remotely, then detonated. The aim of this was to simultaneously break up the circuitry and disperse the explosive material.\(^{29}\)

This proved very effective and a remote delivery of Candle became the standard procedure for dealing with VBIEDs.\(^{30}\) In later years Candle was developed into the Mini and the Maxi Candle, with only the latter remaining in service in 2011. Although now superseded by another system, a remote system for delivering a cluster of Maxi-Candles was the primary means of attacking a VBIED until the late 2000s, and is still available should it be needed.

![Figure 11.4 (left): A suspect car is blown open using a Torpex Candle that has been delivered by Wheelbarrow. Figure 11.5 (right): The results are investigated by a Mk 7 Wheelbarrow.\(^{31}\)
Figure 11.6: Twenty years later and a similar technique is used on a Transit van.\textsuperscript{32}

**Thermal effect** weapons had a place because, until the introduction of successful explosive effect and projected mass weapons, the only remote or semi-remote method of dealing with a VBIED was to burn it out. Initially EOD teams made their own incendiary or blast incendiary weapons – often referred to as PE bombs – and these could prove effective.\textsuperscript{33} Later, a manufactured store called a Destructor Incendiary was issued to replace the extemporised incendiaries. The danger with any thermal effect weapon is that the IED’s main charge may burn to detonation. In fact this happened on several occasions, but usually only after a large part of the main charge was already consumed, thus greatly reducing the explosive effect.\textsuperscript{34}

Throughout the 1970s, cars suspected of containing a concealed VOIED were often burnt out – especially if they were in rural areas. This saved the operator the trouble and risk of manually searching the vehicle but also lost forensic evidence. It is still a technique an operator could use if need be.\textsuperscript{35}
Projected Mass weapons use the power of explosives to propel a single large solid object – or a matrix of smaller solid objects - into an IED. This concept was developed to counter VBIEDs but also found other applications. Its earliest incarnation was simply firing the inert practice round from the standard infantry 84 mm Carl Gustav recoilless anti tank weapon. The first purpose designed system was called Plate, which was just that – a single steel plate projected by the blast of an explosive charge into a suspect vehicle, with the intention of disrupting any IED inside. It was replaced by Beguine, which differed in that the plate was prefragmented and on the detonation of the explosive charge it broke up into a mass of smaller fragments. The action of breaking the plate up also absorbed some of the energy of the explosion and prevented the fragments from reaching too high a velocity. The user pamphlet described it thus:

Beguine is a flying plate system designed for car bomb disposal. It is a relatively massive steel plate, explosively propelled at fairly low velocity which, on impact with the car bomb assembly, disrupts it before the initiation system of the bomb can function.
Mike Barker MBE, who developed the system said:

I had invented a car bomb explosive driven disruptor called Beguine that again took every car bomb out, with a 99.9% success rate. In 1986 I increased the size of the explosive disruptors, as the bombs got larger, now containing steel shot cast in araldite resin instead of the one inch thick eight inch square steel plate of Beguine.39

Later developments used the same idea to extract main charges from vehicle boots by firing from underneath, or from the load areas of vans by firing one or two charges from the side, much as Beguine did. These weapons could also be used to in the rural environment to blow holes in dry stone wall in order to allow an operator to use a route of his own choosing.

Injectors were – and remain – the most important and widely used of the disruptive weapons. When most operators use the term ‘disrupter’ they are referring to an injector and the terms have become almost synonymous, although ‘disrupter’ could refer to any of the disruptive weapons. Injectors use the propellant gases from a Low Explosive charge, usually contained within a cartridge, to propel a solid or liquid medium down a barrel and into an IED. Once into the IED, the medium breaks up the container and the internal circuitry before the device can function.

The earliest injectors were conventional infantry small arms. This method could be effective but had drawbacks. One was that the firer may miss. Styles wrote of an incident in early 1972 where he had a sniper fire four shots into a suspect package. Deeming the device to be disrupted he approached it, only to find a group of four bullet holes in the wall above the package – and the package completely intact.40 Another drawback was the risk that the impact energies of high velocity bullets may cause a device to function. In August 1973, PIRA hijacked a Dublin to Belfast train and, having rigged it with explosives, abandoned it at Meigh in South Armagh. Wheelbarrow could not gain access up the steep railway bank and, fearing a VOIED or RCIED, the CATO forbade the ATO to approach before some disruptive action could be taken. Therefore it was decided that snipers would fire at a length of geoflex detonating cord that could be seen running from the locomotive’s cab to its front buffers. On the 8th shot the detonating cord was seen to move and the 9th shot
severed it. This was immediately followed by a large explosion which destroyed the locomotive.\textsuperscript{41}

A more effective type of small arms fire was offered by the use of shotguns:

Speaking of events in 1971 and 1972, Mike Coldrick said:

At the time there was a lot of talk about finding some remote way to get at the bombs more safely and one day, when I saw some of the RUC guys carrying Browning shotguns, I came up with the idea of using a 12 bore as a remote attack method for many of the devices were in our line of sight. This worked very well for a time and I never had one device go off after it had been hit with a shotgun. The shot usually stopped the timer or severed the circuitry and after leaving it to soak for a time, I could usually cut it with the secateurs and make it completely safe.\textsuperscript{42}

However, the idea was not a new one. The use of a remotely fired shotgun, using hook and line to operate the trigger, was described and illustrated by Lenz in his 1965 book, \textit{Explosives and Bomb Disposal Guide}:

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\end{center}

\textit{Figure 11.7:} Semi-remote shotgun used as a disrupter by Lenz in 1965.\textsuperscript{43}

Initially, British operators in Northern Ireland simply fired shotguns from the shoulder at the IED. This was usually done from behind hard cover, but the operator had to get fairly close for the shot to be effective. The American idea of using shotguns as
disrupters (or de-armers, as they referred to them) semi-remotely was more advanced than early British practice, even though it pre-dated it. Shotguns were also adapted so they could be mounted on ROVs and they stayed in service long after the introduction of purpose designed injectors.\textsuperscript{44}

The first purpose designed injector that could be fired remotely or semi-remotely was introduced in 1971. This was initially code named Jack Horner, but this was changed to Pigstick. This was an extremely heavy three part weapon. Its main innovation was that it fired a charge of water at very high velocity. It could be deployed manually and fired semi-remotely or could be mounted on an early ROV.

![Figure 11.8: Jack Horner/Pigstick I, mounted on a Dalek ROV during trials. This was the first purpose designed IEDD injector.\textsuperscript{45}]

The earliest successful use of an injector was in November 1971. Mike Barker, who developed the weapon, described its first use:

I changed the whole way the Army Teams made bombs safe. There was no longer the need to take X-Rays so reducing time close to the bomb. On the 12th November 1971 I went with Capt Clouter into an electrical Warehouse EAB in College Square North. There was a bomb in a wooden box with a gallon can of cleaning fluid placed against it. I advised we needed two of my propellant driven water guns then called Circuit Breaker and later Pigstick. We set them both two inches from the box and Alan insisted I fired them when the RUC gave us the clearance to proceed. I waited
anxiously, wanting to fire the guns before we lost the bomb. I fired and heard just the propellant sound and fortunately did not bring the building down. It was its first operational success and continued after with a 99.99% success rate. It is now used all over the World.\(^{46}\)

The success of the injector meant the operator did not need to make a hazardous manual entry, as had been necessary with the ‘Catlerobin’ series of VOIEDs and later complex VOIEDs, such as the ‘Midlander’ which incorporated a collapsing circuit, were disrupted.

![Figure 11.9: The ‘Midlander’ complex VOIED, after being disrupted with an early injector.\(^ {47}\)](image)

There were problems with Pigstick in the early days. One was its weight:

Received first pigstick - weighed a ton- had to carry sandbags to position it - never used it.\(^ {48}\)

Although lightened considerably by 1975 it was still a heavy piece of equipment:

The 1975 Pigstick was very heavy compared with the lightweight version I used during my second and third tours.\(^ {49}\)
Another problem was the need to maintain secrecy about its existence and method of operation which sometimes constrained how it could be used. Despite this, most operators valued Pigstick highly. ATO 4, who operated in mid 1972, said:

On ATO course, we were training in hand clearance. Only on the final day of the IEDD section were we shown a PIGSTICK. We thought it a Godsend.50

ATO 12 said:

Pigstick – the most widely used IEDD weapon – I would have been lost without it!!51

In the early days there too few Pigsticks and there were only used on special tasks. By 1973 there were enough for one to be issued to each team, but we have seen how the absence of a second Pigstick was a contributory factor in SSgt Beckett’s death.52 Later on all teams would carry a range of injectors.

![Figure 11.10: A modern Pigstick mounted on a Wheelbarrow Mk 8b ROV disrupting a wooden ammunition box containing a mocked up IED.53](image)

**REMTOTELY OPERATED VEHICLES**

With all of the equipment described above, the operator still had to put himself at risk by making a manual approach to deploy the equipment. It was soon realised that was what was needed was a remote means of achieving the same effect.
Again the basic idea was not wholly new, but it had to be re-invented for Northern Ireland. In the Second World War, the Germans developed a remotely controlled tracked vehicle that was used to deliver a demolition charge to protected targets. This vehicle, called Goliath, resembled a miniature tank or – in hindsight – a Wheelbarrow hull. Most were driven by a petrol engine, but some were driven by electric motors, as later ROVs were.

Figures 11.11: Captured Goliath ROVs. The technology behind this vehicle dating from the 1940s could have been used as a basis for an EOD ROV that would have been more advanced than the equipments that did enter service in the early 1970s.54

The first ROV to be used in Northern Ireland was initially developed by Queens’ University Belfast. It incorporated parts from an electric wheelchair and was nicknamed ‘Little Willie’. The design was later taken over by the Atomic Weapons Research Establishment and renamed ‘Dalek’. The concept behind these earliest ROVs was that they should be made up of readily available components. Little Willie/Dalek was specifically designed to deliver a Jack Horner or Pigstick disrupter to a suspect IED target. This worked well enough on tasks and in user trails, but it was felt that a purpose designed machine would better serve the needs of EOD teams than one extemporised from available components.55 Ironically, the ROV that eventually found success was also initially made up from parts taken from a machine meant for completely different purpose.
There were other developments, such as a system called Skate, which was designed to deliver a disruptive explosive charge. These early ROVs proved that the concept was viable, but the system that spawned the modern generation of ROVs was Wheelbarrow.

The Mk 1 Wheelbarrow was invented by Lt Col Peter Miller of the Fighting Vehicles Research and Design Establishment at Chertsey. It was a rudimentary vehicle designed for just one role – to attach a tow rope to a suspect car so it could be removed from its target. It consisted of the chassis, motors and running gear of a three wheeled battery operated garden truck or wheelbarrow called ‘Packhorse’ and was fitted with a spring loaded hook on the front of the chassis. There were three controls: A stop-go switch and two lengths of rope that were used to steer it. It was
first used to tow a booby trapped car away from a garage in Belfast on 26 June 1972. An attempt was made to burn the car out but the device burnt to detonation.\textsuperscript{57}

\textit{Figure 11.13: Wheelbarrows Mk 1 to 4 from left to right.}\textsuperscript{58}

The Mk 1 Wheelbarrow was not popular with everyone. ATO 3 said:

\begin{quotation}
Was given a two cord controlled useless piece of kit, tried it once & binned it.\textsuperscript{59}
\end{quotation}

From these humble beginnings grew a versatile family of vehicles. Improvements came thick and fast and ATOs came to appreciate their mechanical charges, even when they could be unruly. ATO 7’s opinion was much more positive than ATO 3’s:

\begin{quotation}
Great – even though we had early versions. Hats off to REME who were brilliant at keeping them on the road.\textsuperscript{60}
\end{quotation}
ATO 11 said:

The early version of Wheelbarrow as provided in 1975 was useful. However it tended to be unpredictable during rainy weather. On two occasions my machine discharged the shotgun without any command from the ICP. Investigations later revealed that there was an internal problem with the circuitry.\textsuperscript{61}

ATO 12 used them three years later and echoed this:

Generally a good piece of kit but of limited range and endurance and very prone to electrical faults. Often held together and kept running by liberal amounts of ‘black nasty’.\textsuperscript{62}

 Appearing in August 1972, the Mk 2 Wheelbarrow incorporated many improvements, including forward and reverse gears, electrically operated steering replacing the cumbersome tiller ropes, a firing circuit and finally a jib that allowed charges to be dropped into a car. In November came the Mk 3 which had four wheels and was much more mobile. It was fitted with CCTV, a window breaking gun and, most importantly, Pigstick. This was the first of the ROVs capable of changing the way IEDD tasks were conducted.\textsuperscript{63}

The Mk 4 of early 1973 was the first to be fitted with tracks, while the MK 5 improved mobility again and the Wheelbarrow began to take on the form that is familiar today. By November 1973 the Mk 5 had undertaken over 600 operational tasks. The Mk 6 had a number of detailed improvements over the Mk 5. The MK 7 entered service in 1975. This was improved throughout its life and by the time of its replacement by the Mk 8 in 1986 it was capable of most tasks that any ROV would be called upon to do. The MK 8 was a major leap forward, and its mid life improvement, the Mk 8b which was introduced in the mid 1990s, is still in service in 2011.\textsuperscript{64}
Figure 11.14: A Mk 7 Wheelbarrow is prepared with a Pigstick and a Candle disruptive charge before being deployed to a suspect vehicle, Belfast 1979.65

Figure 11.15: In the same incident, the Wheelbarrow extends its boom into the cab of the vehicle.66
Figure 11.16: The charge is fired and the vehicle cab is burst open. This turned out to be a hoax but that was not known at this stage. Had it been a real device it could have been rendered safe without the operator putting himself at undue risk.67

PERSONAL PROTECTIVE EQUIPMENT

Occasions arise when an ROV can not be used. The most common of these are when the environment does not permit access for remote equipment. For example, the target may be across exceptionally rough ground or may be upstairs in a building with stairs too steep for an ROV to climb. On other occasions the operator may deem it inappropriate to use an ROV. For instance, he may suspect the ground to conceal a VOIED, but he may not know where the switch is. In this case ploughing ahead with an ROV would normally be undesirable and a manual search would offer a better chance of finding the device. Even when an ROV has been successfully used and the device has been rendered safe remotely, the operator must always make a manual approach to confirm what he has done remotely, to carry out final render safe actions and to search for further devices. When doing so, he usually wears personal protective equipment, in the form of an EOD suit, which offers him a
degree of protection from blast and fragments when he makes a manual approach to the IED.

Again, the idea was not new to Northern Ireland. The American magazine *Popular Science* ran a piece showing a German police officer wearing a protective suit while opening suspicious items of mail in 1933. Lenz describes and shows a bomb suit developed in the USA by the Federal Laboratories in the early 1960s.

In British service an EOD suit was issued in Hong Kong and this formed the basis of the Mk 1 Ensemble. This suit was heavy, restrictive and uncomfortable to wear. Although photographs exist showing operators wearing it in Northern Ireland, most never did, preferring to wear the normal infantry fragmentation vest, or ‘flak jacket’. Lt Col John Gaff, who was CATO in 1973 and 1974, explained why:
It was a cumbersome suit and, quite rightly, operators were reluctant to don the motley collection of bits and pieces from which it was made up. The introduction of the Mk 2 suit, with the new helmet and the communication system linking them to the incident control point, helped the operator gain confidence through not having to be truly alone at a device. None the less, it was a trying task to ensure that operators wore the new suit when required for they had little or no confidence in its predecessor.\footnote{71}

The Mk 2 suit was introduced in 1974 and shared many features with the American suit shown by Lenz. While still heavy and restrictive – all EOD suits are – it was a great improvement. At first its use was strongly encouraged but before long it was made compulsory, unless the operator had very good reasons for not wearing it.\footnote{72} This suit set the standard for all others and its replacement, the MK 4, which was not markedly different, stayed in service until the mid 2000s.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figures/Mk1.jpg}
\caption{Mk 1 EOD Suit being worn in Northern Ireland in 1974.\footnote{73}}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figures/Mk2.jpg}
\caption{Mk 2 EOD Suit.\footnote{74}}
\end{figure}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figures/Mk4.jpg}
\caption{Mk 4 EOD Suit being worn in Belfast in the summer of 2001.\footnote{75}}
\end{figure}

No EOD suit can offer complete protection against all devices, if any degree of mobility is to be retained and all EOD suits restrict mobility and vision to a greater or lesser degree, according to the amount of protection they offer. In this respect they
are similar to armoured fighting vehicles. There is always a trade off between mobility and protection and, with current technology, one can not improve one without compromising the other. Most operators understood this, but the suit was never popular. ATO 8 said:

Always used if a manual approach was necessary, certainly saved me on two occasions. The only problem was the visor fogging up: the first time I tripped over the kerb as I approached a suspect beer keg and ended up clutching the IED.\textsuperscript{76}

Not all operators found its weight to be a problem. ATO 10, who served in 1974 the same year as ATO 8, said he wore it:

On most tasks – especially if it was cold. Being a big lad the suit was not a problem for me and it did keep you warm. I can only remember one task when I took it off because I needed to remove its weight and be more manoeuvrable.\textsuperscript{77}

ATO 12 probably spoke for many operators when he said:

Mandated for use on all manual approaches, whatever the perceived threat. Very cumbersome and a real pain to wear. Very much hampered manual dexterity and very tiring to wear, to the extent that it probably caused fatigue leading to loss of judgment. I only wore it as and when I thought SATO/CATO might turn up!\textsuperscript{78}

**CONCLUSION**

Most of the equipment concepts that have been discussed appeared in British service in the early 1970s – the same time that the doctrine was rapidly evolving. To what degree did the equipment shape the emerging doctrine and how did the new doctrine influence the developing equipment capability?

All of the five equipment concepts existed in one form or another before the start of Operation BANNER, but only Hook and Line and explosive entry techniques that may result in disruption were widely used at the start. Because of its technical limitations, radiography was not able to greatly influence the conduct of operations until the lightweight Inspector system was introduced in 1979. By that time the doctrine had crystallised into a form that is recognisable today. The EOD suit also
had little effect on the shape of doctrine, simply because it did not affect the way operations were conducted. If the doctrine persisted with manual neutralisation as the preferred option, but insisted that a suit be worn while this took place, as is the practice in some countries, the doctrine would hardly have moved on from where it was in 1970. Moreover, by the time the Mk 2 suit was introduced, and it use made mandatory, the doctrine had already drastically changed.

Ultimately, the two equipment concepts that had a profound effect on British IEDD doctrine were neutralisation by disruption – particularly with the use of injectors – and the development of a remote means of delivering the disruptive weapon. In fact, these concepts could quite comfortably be considered together as one concept – remote disruption.

The importance of remote disruption can not be overstated. Not only did it bring safety and success for EOD teams, it also had an effect on how the terrorists operated. This manifested itself in a number of ways. One was the length of warning times given for bombs. Lt Col Gaff, speaking about VBIEDs in 1974, said:

> The IRA watched all our operations and calculated we had a “bogey” time to attack any suspected car bomb and began shortening fuses and warning times. This meant that the operator had a maximum of ten minutes to set up Wheelbarrow, do his appreciation, place and fire a disrupter.\(^79\)

This, in turn, meant that operators had to learn to extract information, analyse it, devise a plan and then put the plan into effect very quickly. The days of carefully diagnosing a circuit before cutting into it had largely passed because equipment developments forced PIRA into not allowing it.

On the other hand, the days of complex VOIEDs targeted at the ATO also passed, because PIRA soon realised that there was little point in setting out intricate internal traps if the ATO was simply going to send a robot to remotely disrupt the device. There is no need for an anti-handling device if the intended target will not handle the device until it has been disrupted. This should not be taken to mean that the threat
from this type of device vanishes as soon as remote disruptive equipment is introduced. The equipment – and the *doctrine* behind its use – is only effective in deterring the terrorist from deploying these types of devices if they are assiduously used. The deaths of WO2 Maddocks and Sgt Walsh show that if operators deviate from the accepted *doctrine* and get into the habit of not employing a remote/and or disruptive RSP, then the terrorists will observe and exploit this.

Although PIRA generally desisted from employing complex anti-handling devices against ATOs, they never lost the will to target them. Instead they moved on to other ways of attacking EOD teams and we can see that after 1974, most EOD casualties were as a result of secondary devices at or near the scene of a ‘come on’, rather than secondary circuits and switches within the original device. This in turn led to developments in not only EOD but SF *doctrine* with the adoption of search drills on arrival at an ICP, for example.

It does not appear possible to give a clear cut answer as to whether equipment drove *doctrine* or vice versa. In the case of Wheelbarrow and Pigstick, the equipments arrived not in response to a statement of requirement by the user units, as is normally the case, but as a result of work independently undertaken at research establishments. They allowed new operational techniques to be attempted and, therefore, they drove the development of the *doctrine*. Once the users saw the potential of the new equipments, they began to suggest and to devise improvements to them. They also began to envisage new ways of employing remote equipment. Once the ideas of remote disruption took hold the user units demanded improvements to equipment in order to fulfil their aspirations of applying the new *doctrine* ever more widely. Here, the *doctrine* began to drive equipment development.

Given that so much occurred at more or less the same time, the most accurate explanation is that *doctrine* and equipment development fed one another, with ideas intertwining and separating as tactics and equipment came and went. ATO 15, who was CATO when many of these changes took place, summed it up nicely when the question was put to him:

> I’d say that it was a bit of both, really.⁸₀
INTRODUCTION
The existence of a mature and relevant doctrine is little more than an intellectual indulgence if operators do not understand or are unable to apply the doctrine. Equally, the possession of expensive equipment is of little use if EOD teams can not effectively use the equipment in order to put the doctrine into practice. Therefore, effective training is vital. Unlike many military subjects, IEDD can not be taught purely by the repetition of drills or the remembering of facts by rote. There are drills and facts to learn but they form a small part of the overall subject matter. It is the author’s contention that successful IEDD can be broken down so that something in the order of 75% of all activity is thinking and only 25% is doing.

The current system of preparing EOD operators for high threat IEDD tours is one of selection, training, then selection again. On the whole this works well, but it took many years for this system to evolve. Like the matter of equipment, a detailed treatment of this subject could fill several volumes and would be outside the scope of this work. This chapter gives a brief overview of how operators were prepared for tours in Northern Ireland. It begins with a discussion on personnel selection, including psychometric testing, before going on to review the training and testing regimes that operators were subjected to before they deployed.

PERSONNEL SELECTION
At the very start of Operation BANNER, there was no special selection at all. The ATs and ATOs who happened to be posted to the strength of Headquarters Northern Ireland (HQNI), as well as those as the Ammunition Sub Depot at Ballykinler, were tasked on a more or less ad hoc basis to incidents as and when they occurred. Although they were fully trained in the principles and technology of munitions design, most had little or no EOD experience.
Captain Sidney Brazier, an officer who had served on EOD duties in Cyprus during the EOKA campaign and had risen from the ranks, gave his opinions of the ATOs working in Northern Ireland in 1969-70:

Captain R. Willcox had arrived in Northern Ireland direct from the ATO course. He had no knowledge or experience in EOD organisation and administration. He had worked long hours for some considerable time but had, on his own admission, stumbled from bomb to bomb. Captain K. Goad had been sent to Northern Ireland at a time of political upheaval and direct from an ATO course. He lacked confidence and frankly admitted that the task frightened him. He was completely overawed by the situation. WO2 Glover appeared competent and had worked hard and unstintingly on EOD duties. Staff Sergeant Barry had arrived from Southern Command Ammunition Inspectorate as a member of 321 EOD Unit and was being used as a general factotum, to his disgruntlement. He felt his main task should have been EOD.¹

Before long the permanent HQNI staff were augmented and then replaced by personnel posted or detached specifically to conduct EOD duties. ATO 1 was one of the earliest of these. He was a captain working at Southern Command Ammunition Inspectorate² where, among his other tasks, he undertook EOD duties which included dealing with a live device at Salisbury Cathedral. He was notified by letter from his Officer Commanding that he was to deploy to Northern Ireland in 1969. He received no special pre deployment training, nor was there any in-theatre briefing on his arrival in Northern Ireland. He was operating on the streets the very next day.³

He was not content with this situation:

I was not happy with the way the team was constituted. We met the day before we drove to Omagh from Kineton. There was a total lack of joint training. Briefing on the security situation and the threats did not occur. I knew little about the situation other than what appeared in newspapers and in the media.⁴

The situation did not change markedly when 321 EOD Unit deployed and was established. Most operators were selected from their parent units whether that unit had an EOD role or not. In the case of Senior NCOs, most had been in the army and working with ammunition and explosives for several years before they were
selected. Most officers had several years general military experience but usually a lot less experience of ammunition and explosives. Some were deployed immediately or very soon after passing their ATO course. Under the current system most operators are required to demonstrate an understanding of IEDD by being qualified at the ‘Joint Service’ level\textsuperscript{5} and having a solid licensing record\textsuperscript{6} in a low threat theatre. In the early 1970s, operators were selected by rank and availability.\textsuperscript{7}

Normally this was worked out with a rota or list, but not always as ATO 4 found out:

Butcher, Cracknell and Calladene had been killed in a 10 day period in Belfast in Mar 72. I received a telephone call on 30 Mar telling me to report to Lisburn the following day.\textsuperscript{8}

**PSYCHOMETRIC TESTING**

It was assumed that any trained AT or ATO would be able to undertake EOD duties and in purely technical terms that was the case. What was not initially considered was whether all operators were of the right temperament and personality type to undertake EOD duties in an environment where the enemy was actively targeting them. WO2 Bob Harvey had replaced WO2 Davies after his death at Lurgan in December 1971 and was later transferred to Londonderry in early 1972. He describes the attitude of his new colleagues:

I got the distinct impression that the Captain was a bit ‘bomb happy’ – he showed a misguided bravado – deliberately exposing himself to danger when the resident troops tended to keep their heads down, especially near the Rossville flats. It seemed to me that he and Keith had psyched themselves up to believe that this was a personal war, and that the clearance of bombs was a sacred trust.\textsuperscript{9}

As was seen in Chapter Seven, by the end of 1972 eight EOD operators had been killed in Northern Ireland and some of the actions carried out by those who were killed defied explanation. Other acts could be explained by the general mindset or personality of the operators. The RAOC ammunition organisation consulted with service psychiatrists and psychologists to determine if adverse personality traits could be identified by a series of tests. If they could, the test results could be used to exclude those assessed as being likely to put themselves or others at unnecessary risk while employed on EOD duties.\textsuperscript{10}
Psychometric testing was introduced in December 1972 at first for only ‘doubtful’ operators but, from early 1974, for all. Its aim was to identify those personality characteristics that would suggest that an operator could, or could not, cope with an intense series of stressful and dangerous incidents, over a period of time. The tests consisted of three or four papers, each made up of questions, the answers to which would allow a profile of the operator’s personality to be built up. This could then be followed by an interview with a psychologist. Operators were graded 1 to 5:

1 were those perfectly suited to EOD work.

2 were well suited but had one or two adverse characteristics.

3 were suitable but fallible, as most humans are.

4 should not be employed in EOD work if possible

5 were definitely unsuitable.\(^1\)

It was found after many tests had been conducted that there were few 1s, more 2s, that the majority were 3s, there were less 4s and very few 5s. In fact, when plotted on a graph the results formed a classic Gaussian curve.\(^2\)

Initially, tests were undertaken by ATs and ATOs when they were selected for deployment for Northern Ireland. It was policy that those who were deemed unsuitable would be removed from the ammunition technical trade and re-mustered into another trade. This caused some problems as by the time most soldiers sat the tests they were SNCOs of ten years or more loyal service. To lose these men at this stage of their careers was not only a waste of trained manpower and training resources, it could have a very severe affect on the soldier’s career and sense of self worth. Within a few years, it was decided to administer psychometric testing before officers and soldiers began their technical training.\(^3\) The system was run like this for many years but recently has reverted to testing operators before they attend the high threat course.\(^4\)

ATO 1 was posted to the Army School of Ammunition after his tour, and had this interesting comment to make:
Not long after the psychological testing tests were introduced. To start with, we the team were the only voting members who decided on pass, deferred or failed. We normally agreed with the Psychological results but on one occasion they said no and we were divided. I cast my vote in favour of a pass. The ATO went and was killed about two weeks into his tour. After that we took great heed of the psychological tests and they became a benchmark shortly afterwards.¹⁵

Psychometric testing can not be said to be infallible. For example, Sgt Walsh’s personality probably had as large a part to play in his death as any other factor. Similarly, it is the author’s opinion that the personality of some operators who were killed in Afghanistan played an equally large part in their deaths. However, it has certainly played a significant role in the increasing safety and success of EOD teams by ensuring that, on the whole, those who undertake this work are temperamentally suited to it.

So what, in psychological terms, makes a good operator? Cary L Cooper attempted to answer this in his 1982 article, Personality Characteristics of Successful Bomb Disposal Experts.¹⁶ Using a series of psychometric tests, Cooper investigated forty operators who had served in Northern Ireland. Twenty of these were considered to be particularly successful by a set of criteria that included a high rating of quality work under stress, the successful completion of complex and dangerous tasks, the successful completion of a large number of tasks, all without injury or adverse reporting. The remaining twenty did not fulfil all of the same criteria and were used as a control group. Cooper found that there were no significant differences between the ‘successful’ group and the control group as far as clinical/pathological and individual personality traits were concerned. Where there was a difference was in their interpersonal/social behaviours and orientations. The more successful operators tended to be less social and found it harder to form close bonds. They also tended to be more non-conformist, relying less on conventional values and judgements. Cooper said:

This low level need to rely on conventional judgements and to do things in traditional ways may enable the successful bomb disposal operator to treat each bomb disposal job with the degree of flexibility required by the differing situations – which is
obviously important with the proliferation of new priming devices and modes of
detonation.\textsuperscript{17}

This is interesting as the ammunition technical trade is unusual in the army in that
not only does it train its officers \textit{and soldiers} to think for themselves, it actively
encourages them to develop the habit of asking ‘why?’ This habit is not always
welcomed in more regimented military environments. In the author’s experience, the
trade is full of individuals who have had successful careers but, perhaps, would not
have found such a happy home in more conventional units. ‘A collection of misfits’ is
how an infantry Regimental Sergeant Major once summed up the AT trade to the
author. In chapter 1 it was stated that safety and success for the EOD teams came
not from out-braving the bombs, but from out-thinking the bombers. It was in depth
technical training coupled with this unconventionality that allowed this to take place.

\textbf{TRAINING}

ATs and ATOs have always had an EOD role and for a long time their technical
training, which included an element of EOD, was deemed to be sufficient for them to
carry out this role. Indeed, the experience of Cyprus, Hong Kong and other
campaigns bore this out. In later years, when a system of progressive IEDD training
was implemented it was only trained and experienced operators who had operated
successfully in lower risk environments who were selected to go to Northern Ireland.
Therefore, none of the operators, even in the very early days, were \textit{completely}
untrained. However, it was found that their general technical training alone was not
sufficient for the demands of this campaign.

The ATOs posted to HQNI establishment at the start of Operation BANNER received
no extra training for operating in Northern Ireland and nor did the first
reinforcements.\textsuperscript{18} One of these reinforcements was ATO 1, who had this to say:

\begin{quote}
Having done my tour I wrote a very critical report on the way the team had been
assembled, they lack of pre Ops training and the poor equipment.
\end{quote}

I had my posting to Blackdown changed at ten days notice and was sent to AS of A
Bramley to take over The EOD Demolitions wing and set up a pre Ops course. It took
WO1 XX [name redacted] and the team some four weeks to agree the course with the
Chief Instructor. He was against the idea and said he normally agreed to his instructors and did not have them forced upon him!

Over the two years I was in post we developed the course as things changed in NI and as new equipment was developed. I was involved in the development of Little Willie and Wheelbarrow. I also had a major part in developing pigstick, and needle.

We developed RSPs and wrote the précis for the students. As the theatre objectives changed the RSPs and subjects taught changed. One area I developed was forensic collection and this has now become an excellent way for criminal data to be retained for the Police specialists to analyse.¹⁹

A two week long 'pre-operations' or 'pre-ops course' began in 1971 and the training system developed by ATO 1 and his WO1 formed the basis for the current training and selection regime. The content changed over the years and the course grew in length (as of 2011 it is seven weeks long and is usually preceded by a three week preparatory course) to match the developing threat and the introduction of new equipment, but the format remained largely constant. This consisted of briefings on current threats and the appropriate responses to them, training on individual pieces of equipment, supervised simulated EOD incidents - referred to as training tasks, and finally assessed simulated EOD incidents. Coldrick attended one of the earliest courses and said:

We studied and constructed terrorist type devices to be familiar with them and practised the evaluation of suspect bomb situations and devices, questioning witnesses and the like.²⁰

BB attended the course in early 1972 and described the content as:

Evacuation, Current devices, x ray using radioactive source & 300kva, use of cordtex, principles of soaking.²¹

ATO 6 passed the course a year later and listed the training matter as:

Equipment, Types of Devices, Basic Procedure, Equipment Practice, Simulated Tasks, Assessment.
Homemade Explosives

SATO NI gave a presentation

Useful “war stories” by instructors.\(^{22}\)

The point about ‘war stories’ is vital. With IEDD, it is important for operators to understand context and this can be provided by experienced operators sharing their experiences. Furthermore, it is vital that training stays relevant and up to date. This can be achieved by modifying the course content in the light of recent operational experience, as provided by recently returned operators. In the very early 1970s this was not always easy to achieve as ATO 5 noted:

[The instructors were] ATOs and ATs. Some (most) had no NI or IEDD experience.\(^{23}\)

However, as more operators passed through Northern Ireland and then on to the training establishment, this slowly improved. ATO 9 said of his instructors in 1974:

ATOs and ATs instructed, all with NI experience I think, but experience then was quite limited.\(^{24}\)

By 1978 the situation was such that ATO 13 was able to say of his instructional staff:

Most instructors had recently returned from operational NI tours and were probably the most experienced in the IEDD situation at the time.\(^{25}\)

ATO 10 attended courses in 1974, 1981 and 1983, and then went on to have a long career as an instructor and testing officer at The Army School of Ammunition. He is well placed to observe the development of training. Speaking of the 1974 course, he said the content was:

Theory – 1st principles, HMEs, device types, Terrorist tactics, RSPs, evidence collection, do’s and don’ts, EOD weapons and a little ECM. Not unlike the current course in makeup – just less of it … Funny though the 81 and 83 notes only differ in the types of device and ECM.\(^{26}\)

Operators had to pass three out of the four assessed tasks to be considered suitable for deployment and, as ATO 1 stated, failure rates were high from the beginning.
The failure rate was normally 75%. This led to our being told to improve the pass rate and for ATOs and ATs sanction were put in place; ATs who failed twice had their promotion limited to WO2 and ATOs who failed twice were then taken off ATO duties. This did not last long. Probably due to CATO EOD from DLSA attending a one to one course with me. Shortly after the restrictions were withdrawn.27

This high failure rate never really changed and is all the more striking when it is considered that most attendees, certainly in the later years, were already qualified EOD operators with experience of operating, albeit in environments with lower levels of threat. ATO 12 alluded to this point:

It was very relevant and useful, but was really insufficient to make me in any way proficient given that I had done absolutely no real EOD work beforehand. It was clearly structured for the majority who, coming from No1 AIDU (the forerunner of 11 Regt), had much more EOD experience than I did.28

Throughout the history of the course, there have been attempts to improve the pass rate. Some of these have been the result of internal reviews, while others have arisen from pressure applied to the training establishment by external headquarters. So far, the only successful way of improving pass rates has been more training time, especially when it is devoted to training tasks, as this allows operators to gain more experience before being tested.29

The rigour, validity and, sometimes, impartiality of the testing regime has come under scrutiny in recent years. It is the general feeling throughout the EOD community that the standard of testing has become harder over the years, although this may largely be a matter of perception. However, experience has shown that when the standard of testing is lowered, the standard of operator drops and therefore people are put into positions for which they are neither fully prepared or fully suited. The death of WO2 Howard is a case in point. He had attended two courses, one directly after the other and, according to contemporary operators, did not do well on either. He deployed to Northern Ireland regardless and was dead within two weeks of his arrival.30
AUTHOR’S COMMENT

Not everyone can be a successful IEDD operator. It is the author’s view that there are a number of criteria that must be met. These are aptitude, technical knowledge and application. Some people seem to have a natural flair for the subject and are almost instinctively good IEDD operators. These are rare individuals, however (the author is not one of them) and when they do appear they stand out from the crowd. However, raw talent is not enough on its own. Operators need sufficient background knowledge of munitions, explosives and associated subjects. This can all be taught on the course, but the amount if time available for training is limited, so those operators who already have this knowledge by virtue of their trade training stand a better chance of succeeding in the time frame made available by the training system. Finally every potential operator must fully apply himself to the subject, as even the most naturally talented will not pass without wholehearted dedication. The nature of the British approach to IEDD, whereby there is a framework of fairly complex low level doctrine and an infinite variety of situations in which to apply it, means that few find IEDD easy. Most have to work at it.

In the army, Ammunition Technicians and Ammunition Technical Officers best meet these requirements, especially that of background knowledge. In 2009, the restriction that only RLC operators conduct high threat IEDD was lifted. So far (2012) two RAF operators and two RE operators have passed. At the same time a scheme was introduced that allowed applicants from all arms and services to apply to become EOD operators. Hundreds have applied but at the time of writing (2012) less than a dozen have qualified at the lower threat level and none have succeeded at the High Threat level. Most of those that have passed have proved to be proficient, but lacking in detailed technical knowledge. The author would argue that they are mostly people with natural aptitude for the subject who have applied themselves fully. ATs and ATOs still make up the overwhelming majority of Defence EOD Operators and High Threat IEDD operators and this is unlikely to change in the near future.
CONCLUSION

At the start of Operation BANNER there was no special selection and training for EOD operators serving in Northern Ireland. A regime of selection, training then testing was implemented in 1971 and this has continually developed to match emerging threats and evolving equipment, as well as the developing doctrine. Although the content has changed over the years, a key feature – that of selection, training and testing has remained constant.

It is important that only those who are temperamentally suited to IEDD are selected to undertake such duties. Once selected they must be given the best possible training. Finally they must be tested rigorously to ensure that they are capable of applying the doctrine in a way that achieves their aim and is safe. If this is compromised upon, we run the risk of putting people into positions they are ill suited to deal with. On balance, it is better to have fewer operators of the right calibre than more of the wrong. Producing more operators of a lower standard for EOD operations in a High Threat can only lead to more casualties, which is the antithesis of the British approach to IEDD.
INTRODUCTION

This final chapter summarises and offers conclusions to the foregoing twelve chapters.

SUMMARY

At the start of Operation BANNER, the army in general, and the RAOC ammunition organisation in particular, was unprepared for the intensive, destructive and cunning IED campaign that was to follow. EOD personnel were taken from wherever they could be found and, with little or no special training other than their ammunition and explosives technical backgrounds, were expected to proceed with the task at hand in the manner that they saw fit.

There was little in the way of official guidance on how EOD tasks should be conducted, and what guidance did exist approached IEDD as a purely technical problem, rather than a joint technical and tactical one. Initially, operators were expected to take grave personal risks to save property. Most RSPs were conducted manually or, sometimes, semi remotely. In each case, the operator had to put himself at risk to effect an RSP and more often than not stayed at risk, ie at the IED, throughout the RSP.

At first IEDs were small and crude – both in terms of their make-up and their deployment. However, terrorists, PIRA in particular, quickly developed often as fast as the readily available technology of the day would allowed. IEDs became larger and more complex, while the perpetrators became more tactically astute and deployed them in ever more sophisticated ways. A battle of wits and nerves was played out between the PIRA bombers and the EOD teams and, before long, PIRA began actively targeting the EOD personnel.
Between 1971 and 1988 seventeen ATOs and three other team members were killed by PIRA IEDs in Northern Ireland and, in most cases, the deceased were carrying out a manual RSP when they were killed. Of these, most were carrying out an unplanned manual action on what transpired to be a VOIED.

Thirteen of the deaths occurred in the short space of time between September 1971 and December 1974. This level of attrition was both unexpected and unsustainable and it is no coincidence that the current British Approach to IEDD began to emerge during this period.

After every casualty occurred, and after every near miss, a detailed investigation was carried out. Where there were lessons to be learnt, and there often were, these were incorporated into the emerging doctrine. The same happened with every new development in IED technology and tactics.

Around the same time that new ideas about the conduct of EOD tasks were gaining support, new equipments were being developed, the most important of which were disruptive weapons and Remotely Operated Vehicles. Initially they were crude and limited in their capabilities, but they offered EOD teams a way of defeating IEDs without the need for a manual hand entry and as their capabilities evolved they allowed the whole RSPs to be conducted from a safe distance. New equipment capabilities influenced new ideas about the conduct of operations, which in turn informed the further development of equipment.

By the mid 1970s a doctrine was firmly established that placed the preservation of life, including that of the EOD operator, above all other considerations. This was followed by the importance of preserving property, returning the situation to normality and the preservation of forensic evidence. This formed the Philosophy of IEDD and it was to be put into practice using the principles of IEDD which encouraged, among other things, the use of soak times, neutralisation by disruption and the use of ROVs. This doctrine continued to develop and mature as the campaign progressed but the fundamental principles of the preservation of life and the preferred use of remote disruption remained central.

A regime of selection, training and testing has developed alongside the maturing doctrine and the ever growing equipment capability. This has, on the whole, ensured
that the right people, who are capable of understanding and applying the *doctrine* in a variety of situations, are thoroughly prepared before being deployed on High Threat IEDD operations.

**CONCLUSION**

The majority of EOD casualties occurred between 1971 and 1975. In later years, PIRA was to achieve a level of technical and tactical excellence that has rarely been equalled, and they never lost the will to target EOD teams. Yet they had little success in this respect and in later years EOD teams were able to successfully deal with most IEDs they were tasked to, as long as they arrived in time. This experience of EOD operations in Northern Ireland and elsewhere has shown that the British approach to IEDD, as developed in response to events in Northern Ireland is sound, adaptable and durable. It can be taken and applied to IEDD operations anywhere in the world, with suitable modification to suit local conditions.

If we take the examples of Iraq and Afghanistan, the *doctrine* developed in Northern Ireland holds good there but had to be adapted because of constraints imposed by the ground. When heavy team kits could be deployed, and when the ground could be held long enough, the *doctrine* could be applied exactly as it would be in Northern Ireland. In Iraq, it was often said that an EOD cordon could not be held in Basra City for more than twenty minutes before the cordon came under fire. This forced EOD operations to be conducted very quickly. By the time the author deployed there in 2007, British forces had withdrawn from the city and most IEDs were encountered on the main supply routes that crossed open deserts. Here, cordons could be held for as long as was needed and enemy fire could be dealt with by heavy assets without fear of collateral damage and civilian casualties. This meant that the *doctrine* could be applied almost exactly as it would be in Northern Ireland. However, it took some teams a while before they readjusted to this slower, more methodical and safer way of operating.

When, as was and is still often is the case in Afghanistan, EOD operations were mounted on foot over rough terrain and long distances, the amount of equipment available was limited to what could be man-packed in addition to each team member’s own personal equipment. This imposed constraints on what could be
done remotely so operators tended to use semi remote and sometimes manual techniques. In many ways they were forced to adopt the IEDD tactics and techniques of the early to mid 1970s and it is perhaps little coincidence that EOD casualty figures have been similar to the 1973 – 74 period. The same does not hold true in reverse. While Northern Ireland style tactics can be used in Afghanistan when circumstances permit, Afghanistan style tactics would not be appropriate in Northern Ireland or, perhaps, anywhere except Afghanistan. We would set a dangerous trend if what passed for normal there became the accepted norm elsewhere.

**IEDD RISK THEORY**

A number of minor substantive theories were developed in this thesis. Examples include explaining the events that led up to the deaths of ATOs and explaining the development of certain *doctrinal* tenets. One formal theory was also produced. This is the theory of IEDD Risk that is developed in Chapter Nine.

The author argued that this theory is capable of generalisation. It can be applied to EOD operations anywhere in the world, and at any time. It has practical significance, to the operators who served in the 1970s, who may find it helpful to understand why their colleagues died, and to current and future operators who will not only be able to apply the lessons learned but, equally importantly, will be able to understand why the lessons were learned in the first place. The IEDD Risk theory will hopefully find a place in the training of current and future operators.

The level of risk to an EOD operator starts low if he is far from the IED and increases as he is:

- Within the danger area of an IED.
- Dealing with an IED.
- Carrying out manual actions on an IED.
- Carrying out unplanned manual actions on an IED.
- Carrying out unplanned manual actions on a VOIED.
When the *doctrine* embodied in the British approach to IEDD as developed in Northern Ireland in the 1970s is adhered to, EOD casualties are rare. It is only when operators deviate from it, either voluntarily or when forced to by circumstances, that casualties occur.

**RECOMMENDED AREAS FOR FUTURE RESEARCH**

This thesis examined EOD activity in Northern Ireland during Operation BANNER, and concentrated on events from 1971 to 1975 to explain how the British approach to IEDD developed. It would be of great use to examine how that approach has developed and been used in subsequent campaigns, and to compare the British approach to that taken by other nations. In particular, the following questions would be worthy of further research:

How has the British approach to IEDD as developed on Operation BANNER been applied to operation in Iraq and Afghanistan? Has the approach developed or been deviated from? Could it have been applied more rigourously and if so would that have saved lives? What can be learned from recent deployed operations and incorporated into the existing *doctrine*? Is the current approach appropriate to operations in theatres like Afghanistan or Iraq or should new *doctrine* emerge for military operations that are closer to war fighting than Military Aid to The Civil Power?

How does the British approach to IEDD compare with that taken by other nations? Do countries that have had substantial IEDD experience differ in their approach to those that have not? Have they developed approaches similar to the British one or taken a different path? Why have they chosen their respective approaches? In particular, the IEDD experiences of Israel, Russia, the United States of America and possibly Sri Lanka, juxtaposed with the British approach, would form the basis for a useful comparative study. The American experience in Iraq would be of particular interest. The US IEDD capability and doctrine grew and changed a great deal in the early years of that campaign and it would be useful to examine how and why this occurred and to compare it to the British development in Northern Ireland.
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APPENDIX A

THE DEVELOPMENT OF ARMY
EXPLOSIVE ORDNANCE DISPOSAL CAPABILITY
1896 - 1966

INTRODUCTION

Explosive Ordnance Disposal (EOD) is an activity that predates its given name and even its former name, Bomb Disposal (BD). It is a widely held, but erroneous, belief that EOD was born in 1939 with the formation of BD Parties, Royal Engineers (RE). Much of the available literature on the subject begins with a brief discussion of the introduction of air dropped bombs in the years preceding the First World War, before going on to describe the establishment of the RE BD organisation nearly 30 years later.¹ This concentration on air dropped munitions ignores the EOD work devoted to naval munitions, land service ammunition and terrorist devices, all of which predate the use of air dropped bombs and continue to form the vast bulk of EOD activity to this day.² It also pays scant attention to the disposal of air dropped bombs in the early years of their use. A comment made in several histories of the subject is that there was no bomb disposal organisation before 1939 and that none was needed.³ While it is true that no units were solely dedicated to EOD, or were named as such, an EOD capability certainly existed. However, that capability was embedded in units with other roles and less glamorous titles.

This Appendix traces the development of EOD in the British army, the units involved with it and how the responsibility for EOD came to fall where it now lies.

In the army, responsibility for EOD is shared between the Royal Logistic Corps (RLC)¹ and RE. The Royal Navy (RN) and Royal Air Force (RAF) also have their own EOD capabilities, but these are outside the scope of this paper. However, lest the author be accused of single service parochialism, let it be noted that the RN

¹ The RLC was formed in 1993 from The Royal Army Ordnance Corps (RAOC), The Royal Corps of Transport, The Royal Pioneer Corps, the Army Catering Corps and the Postal and Courier element of RE. The EOD function came from the RAOC.
founded the first British EOD establishment, the Mine Warfare School at HMS Vernon, in 1875. The RAF, for their part, dealt with the first unexploded aircraft bombs to fall on the UK during the Second World War in October 1939. Both continue to do valuable work to this day.

1896 – 1913

1896 provides a convenient starting point both in terms of organisation and technology. The preceding two decades had seen a revolution in military technology, with the introduction into service of smokeless powders, high explosives, armour plate, breech loading and quick firing artillery and repeating small arms. This year was also when one of the forming corps of the RLC began to emerge in a form recognisable today. The Ordnance Store Department, made up of officers, and the Ordnance Store Corps, made up of soldiers, were renamed the Army Ordnance Department (AOD) and Army Ordnance Corps AOC), respectively.4

At this time Ordnance Officers were trained at the Royal Military Academy at Woolwich – the Shop – alongside Royal Artillery (RA) and RE officers. The Ordnance Officer’s Course was known as the ‘o’ course. As well as subjects such as store keeping and accounting, students studied mathematics, physics, electricity, chemistry, metallurgy, weapons, ammunition and explosives. Any modern ATO would recognise the broad principles of these latter elements. Once qualified, an Ordnance Officer could be employed in general ordnance supply duties or might be appointed as an Inspecting Ordnance Officer (IOO), whose role was to advise on the storage of ammunition and to inspect, repair and dispose of the army’s ammunition and explosives. The term “ammunition” was, and still is, taken to include all land service munitions, whether inert or explosive filled, as well as bulk demolition explosives and accessories. AOC soldiers employed on ammunition technical duties were called Laboratory Foremen. They were also trained on a long course at the Shop and were employed on similar duties as IOOs.5

In both cases, their long training and wide experience of the principles and details of ammunition and explosives made them the obvious choice whenever the need arose to dispose of an item of Unexploded Explosive Ordnance (UXO). This task was
termed the disposal of ‘stray ammunition’. This quaint term encompassed all munitions found away from military establishments and frequently included UXO in a ‘misfired’ or ‘blind’ state.6

IOOs and Laboratory Foremen deployed to the South African War of 1899 – 1902. Most of their work was centred on the supply and maintenance of British army ammunition, but they also disposed of large amounts of British and Boer ammunition. This included blind shells on the battlefield and stocks of artillery ammunition in storage. The latter frequently necessitated the demolition of several tonnes of explosives at a time.7

The Esher reforms of 1904 created the Army Council and, at the same time the AOD and AOC were placed under the Quarter Master General. As a product of this, Ordnance Officers were appointed to formation HQs.8 This was the beginning of a network of IOOs posted to garrisons up and down the country who were able to respond quickly to requests for assistance whenever ‘stray ammunition’ or other UXO were encountered.

Even before the start point of this paper, the RE had been responsible for laying mines and booby traps and were called upon to clear the enemy’s mines when they were encountered. Land mines as we now understand them - explosive filled and command or pressure initiated – first appeared during the American Civil War. Electrically initiated mines and ‘fougasses’3 were deployed by RE in the Zulu War of 1879, the Sudanese campaigns of 1884 - 88 and the South African War.9

1914 – 1918

IOOs and Laboratory Foremen accompanied the British Expeditionary Force (BEF) to France in 1914 and their role was initially similar to that in the South African War –

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2 “Misfired” munitions are those which have failed to fire while still in the weapon or at the firing point. “Blinds” are munitions that have been successfully fired, launched or dropped but which have failed to function on arrival at the target. Both are dangerous but, of the two, blinds present the greater danger as the fuzes are normally armed by the process of being fired, launched or dropped. The munition may truly be a “dud”, but is just as likely to have received insufficient stimulus to cause the fuze the function and may just need one more touch or movement to complete the action. The EOD operator usually has no way of knowing which is the case.

3 A fougasse is a buried explosive charge designed to project rocks or other fragmentation.
safety and maintenance of British ammunition and disposing of unexploded ordnance. As the campaign settled down into trench warfare the expenditure of ammunition on both sides, particularly artillery and grenade natures, dramatically increased and this created its own problems. One aspect of this was the large number of blinds. It is assessed that up to 30% of British shells failed to function at the target. Another was the large number of accidents that occurred – especially with the many new types of grenade. Both of these drew on the technical skills of the IOOs and Laboratory Foremen and led to a greater recognition of the need for proper ammunition management. Special ammunition schools were established in France and this paved the way for the establishment of a permanent ammunition school after the war.

The Germans also had their share of blinds, estimated at 25%, so shells littered the battlefield. They often sank into the mud and were left where they were. When they presented a problem IOOs were formally responsible for disposing of them, but often RA and RE officers were tasked on an ad hoc basis. This was logical as there were many more RA and RE officers than IOOs, they were often closer to the front and both had a background in explosives from their training at the Shop.

Britain was first subjected to bombardment from the air in 1915, when German airships attacked ports on the east coast. Before long London became a target and by 1917 the airships had been replaced by Gotha bomber aircraft. 8578 aircraft bombs were reported dropped on the UK and one source has estimated that around 500 failed to function. IOOs were mainly responsible for their disposal, evidenced by instructions contained in Intelligence Circulars that referred to Regulations for Army Ordnance Services although RA and RE officers were also involved, as the following passage shows:

The presence of an expert in explosives is necessary; he may be either an R.A. or R.E. officer of the district, a duly qualified Inspecting Ordnance Officer, or, under special circumstances, particularly in the case of a bomb of unknown type, an expert detailed by the War Office.

The ‘expert detailed by the War Office’ was usually an IOO from Woolwich Arsenal.
Although the First World War provided the impetus for many new weapons – aeroplanes, tanks and gas for example – it also saw the return of older forms of warfare. One of these was the traditional role of the military engineer – sapping and mining. In December 1914 the Germans dug mines under the British lines, filled them with explosives and detonated them. RE tunnelling companies were formed in February 1915 in response. They were manned mostly by ex miners. A deadly game of mine and countermine ensued for the next three years. The tunnellers became adept at handling explosives – both British and German – and frequently came across enemy booby traps underground. There was no one they could call on to assist them, so they learnt to deal with them themselves. When this skill – and their willingness to exercise it – became known, tunnellers were employed to deal with booby traps above ground. When tunnelling activity decreased in 1917, tunnelling companies were employed as booby trap specialists. Many of the principles they established were sound and remain applicable to this day, but at the end of the war miners were urgently needed in the civilian economy. The companies were quickly disbanded and much of the knowledge left the army with the miners.15

1919 – 1938

At the end of the First World War, the AOD and AOC were merged and were conferred with the ‘Royal’ title to form the RAOC. The need for technical support to ammunition had been recognised and a permanent school was established at Bramley in 1923. Initially entitled ‘B’ Branch, School of Instruction, it would eventually become the Army School of Ammunition. At the same time, the title of Laboratory Foreman was changed to Ammunition Examiner (AE).

An indication of the type of work IOOs performed is given by an incident that occurred in Shanghai in 1932, when the British Garrison was caught in the crossfire of Sino-Japanese fighting. An unexploded shell landed in the garrison and the IOO, Capt Townsend, was called. The shell exploded as he dealt with it, injuring him and causing the first recorded RAOC EOD casualty.16
As a second war against Germany became ever more likely in the 1930s, official minds turned to the possibility of air raids. Most of the effort was directed towards civil defence and gas precautions. The RAOC remained responsible for the disposal of air dropped bombs as well as all other land UXO, less mines and booby traps, as the following passage from the Police War Instructions of 1936 shows:

The War Office have undertaken general responsibility for the disposal of unexploded bombs, through their Inspecting Ordnance Officers, unless a suitably experienced officer of the Navy or Air Force is available nearer at hand. This work may involve especial danger having regard to the development of bombs fused to burst at any time up to 24 hours after being dropped. The police should not touch unexploded bombs until the arrival of the I.O.O.s, and should keep all persons at a safe distance. The I.O.O., or other appointed officer, will have to decide whether a bomb can safely be removed or whether it is necessary to blow it in situ.  

1939 – 1945

By March 1939, the War Office believed that there were too few IOOs available to cope with the aftermath of a modern air raid. Various suggestions were made, including using Air Raid Precautions (ARP) Department wardens and even a force of retired soldiers recruited by the British Legion. The Home Office objected, stating that the task was a military responsibility.  

The matter was still unresolved in November 1939 when a War Office letter reiterated the problem of there being too few IOOs:

…the Police will report all cases of unexploded bombs to the nearest Military Authority who will arrange for the disposal of them. The military personnel finally responsible for this service are the Inspecting Ordnance Officers who are few in number and most of whom would accompany any land force which might be sent overseas.
It was agreed that a civilian force would be raised to undertake the disposal of air
dropped bombs at home, but until this force could be fully trained the war office
would retain responsibility. As a stop gap it was decided that RE would provide
Bomb Disposal Parties. This is the first instance of any military unit with the title
‘Bomb Disposal’. RE were allotted the task for the following reasons:

a. There were too few IOOs.

b. Unexploded bombs might be expected to be buried, so digging would
be required to gain access.

c. RE were trained in such skills as sandbagging, field fortifications and
the use of demolition explosives.

The original BD Parties RE consisted of a Junior NCO and two sappers. It was
initially envisaged that their role would be limited to gaining access to a bomb, sand
bagging and destruction in situ. In more difficult cases an IOO was to be called.\(^{20}\)

The civilian Bomb Disposal organisation never came to be and the War Office
formally accepted responsibility for Bomb Disposal in the UK on 11 May 1940:

I am directed by the minister of Home Security to refer you to Air Raid
Precautions Department Circulars 233/39 and 239/39 and to pages 32 and 33 of
the ARP Training Manual No 2, and to inform you that it has now been decided
that the duty of dealing with unexploded bombs and ammunition except where
they fall on Admiralty or Air Ministry property shall remain the responsibility
of the War Office.\(^{21}\)

Originally, RAOC retained the responsibility for dealing with unexploded Anti-
Aircraft (AA) shell, as these were items of Land Service Ammunition (LSA).\(^{22}\) It was
found that BD sections were frequently called to buried AA shell, so this
responsibility was also passed to RE on 11 May 1940.\(^{23}\)
Two military documents, GHQ Standing Operation Instructions and The Manual of Bomb Disposal (Provisional) 1941, laid down the division of responsibility for EOD between the services. They also gave definitions and it is worth pausing here to examine what was meant by ‘Bomb’ in ‘Bomb Disposal’, as this has led to much confusion in the public’s mind and a great deal of inter cap badge rivalry in the army over the years. Before the Second World War, ‘bomb’ was used to describe any explosive device that was placed or thrown by hand or projected in some way, other than an artillery shell. We have the examples of what would now be termed an Improvised Explosive Device (IED) being used by Fenians and anarchists in the late 19th century and variously described as ‘infernal machines’ or bombs and frequently accompanied by terms such as ‘outrage’. From the First World War onwards, projectiles fired from mortars were and still are called bombs. The use of hand and rifle grenades increased dramatically in the First World War and they were often referred to as bombs. Grenade specialists were formed into ‘bombing parties’, led by ‘bombing officers’ and they were taught at ‘bombing schools’. Finally, explosive filled projectiles dropped from aeroplanes were also called bombs. They were initially dropped by hand, so the word fits well with the other usages.

GHQ Standing Operation Instructions said:

The term “bombs” includes all missiles (other than mines), however filled that may be discharged from aircraft and all AA shell, however filled\(^{24}\)

The Manual of Bomb Disposal (Provisional) 1941 stated:

Bomb Disposal comprises the disposal of unexploded projectiles of various kinds eg high explosive bombs of various sizes, incendiary bombs, A.A. shell, parachute mines of the magnetic and non magnetic type, gas bombs and any other form of missile dropped from enemy aircraft.\(^{25}\)

It is clear from the above two statements that the meaning of the word ‘bomb’ had shifted to denote air dropped ordnance to the exclusion of land service munitions. This was a perfectly logical step, as air attack presented the greatest threat at the time.
Formation Order of May 1940 authorised the raising of 25 BD Sections RE, which absorbed the existing BD Parties. These were controlled by the Inspector of Fortifications, a War Office department. Another 109 Sections were authorised in June, and this was raised again to give a total of 220 sections in July. These were to be organised into 25 BD companies. On 29th August the title Inspector of Fortifications was amended by the addition of Directorate of Bomb Disposal (IF & DBD). Later in the year the BD Coys were organised into BD Groups, which covered a specific area. The RE BD organisation eventually grew to a strength of some 10,000 personnel and gave sterling service throughout the war. 151 officers and 339 Other Ranks were killed. 26

At first there was no formal training for Bomb Disposal Officers (BDOs), but some were sent to the RAF armaments school and eventually an Army Bomb Disposal School was formed. Courses were initially of two weeks duration, but grew to four weeks by the end of the war.

RAOC continued to deal with aircraft bombs when this was necessary, for example when bombs fell on their depots or when there were no RE BD units available. Two George Crosses were awarded to IOOs for aircraft bomb disposal on Malta, and two George Medals were awarded for similar work on Gibraltar. However, the RE BD organisation disposed of the vast majority of air dropped bombs – over 52000. 28

1946 – 1966

At the end of the war there were huge stockpiles of ammunition and explosives requiring disposal. Some of this was stored in British ammunition depots, others in captured enemy ammunition sites and more still on the battlefields. There were minefields at home and abroad, as well as individual items of UXO from grenades to large aircraft bombs that had been fired or dropped in training and on operations.

In the western desert RE BD Coys cleared and destroyed enemy ammunition dumps under the technical supervision of IOOs and AEs. In Europe RAOC Enemy Ammunition Depot Clearance Units and Mobile Ammunition Repair Units undertook
similar work. In the UK RE BD Coys were employed clearing mines from beaches, a task which took decades to complete. The RAOC Explosives Disposal Unit (EDU) was formed at Trawfynnedd, with outstations at Poole and Cairnryan. This unit was responsible for the disposal of the majority of British LSA. The EDU was disbanded in 1947, with the disposal of surplus as well stray ammunition passing to the Command Ammunition Inspectorates RAOC. A Battlefield Area Clearance Unit (BACU) was formed, consisting of Polish and Ukranian civilian searchers, supervised by RE SNCOs. This unit came directly under the Director General Military Training at the War Office.

DBD was renamed HQ BD Units (UK) RE in 1948. The RE BD organisation was rapidly reduced after the war and by 1949 consisted of three BD companies (renamed squadrons) and a plant squadron. The BD Squadrons were disbanded in 1950, with all personnel concentrated in a HQ and 5 troops. In August 1950 HQ BDU (UK) RE moved from London to Broadbridge Heath Camp at Horsham. This unit eventually became 33 Engr Regt (EOD) RE. In addition to the regular unit, there were six TA BD squadrons. In 1950 an Army Emergency Reserve (AER) was formed, made up of specialist units. By 1955 there were three AER BD Regiments which replaced or absorbed the TA squadrons.

In a repeat of the proposals made in 1938-39, the War Office attempted to divest itself of the bomb disposal role in 1954-55. Again the Home Office agreed to take on the responsibility in principle and again the idea came to nothing.

From the mid 1950s to the mid 1980s It was assumed that any future air attack on the UK would be mainly nuclear and that any conventional attack would be in the form of guided weapons. There was a great deal of controversy in the 1950s and 60s over who would dispose of any unexploded nuclear weapons and guided missiles. RE proposed a BD organisation based on the AER BD Regiments with RAOC technical support, while RAOC counter-proposed an organisation based on the Ammunition Inspectorates with RE plant support. The argument rumbled on until the 1970s with no decisive conclusion. The same disputes occurred over the disposal of Chemical and Biological weapons.
While the nuclear debate was ongoing the future of BACU came into question. BACU had to task IOOs and AEs from the Ammunition Inspectorates to dispose of explosive arisings. In 1960 it was agreed that BACU would be taken over by RAOC, but this was reversed in 1962 and the unit was absorbed into HQ BDU (UK) RE.\(^{37}\)

At the same time that these debates were beginning, a terrorist bombing campaign had begun in the Crown colony of Cyprus. In earlier campaigns, such as that in Palestine, many of the devices were based on military booby traps and were dealt with by RE field units. More complex devices were referred to IOOs who were acknowledged as subject matter experts in explosives and explosive devices. In Cyprus, the government wanted any devices that were made safe to be used as evidence against captured terrorists. They asked the War Office for the assistance of explosives experts and a team of IOOs and AEs were seconded to the Cyprus police. These were later formed into 1 Ammunition Disposal Unit (Internal Security). Between 1955 and 1960 thousands of devices were dealt with and two AEs were killed. This campaign established the principle of securing convictions from forensic evidence gained during EOD operations.

In 1960 the titles of IOOs and AEs were changed to Ammunition Technical Officer (ATO) and Ammunition Technician (AT). This was to reflect the growing complexity of modern munitions and terrorist devices. In the UK the Command Ammunition Inspectorates were brought under the command of a single unit entitled No 1 Ammunition Inspectorate and Disposals Unit (1 AIDU).\(^{38}\) This later became 11 Ord Bn (EOD) RAOC, then 11 EOD Regt RLC. Shadow EOD units were also formed for rapid deployments to emergencies. One of these was 321 EOD Unit which was deployed to Northern Ireland in 1970 where it remains to this day as 321 EOD Squadron RLC.

There was much debate within the army during the 1960s as to who should have responsibility for IEDD, RE or RAOC. The RE case can be summarised as follows: RE were the army’s ‘bomb disposal experts’. This was borne out by their experience with air dropped bombs during the Second World War. In counter insurgency operations, IEDs were more akin to booby traps and presented problems of mobility to friendly forces, both RE tasks. RE claimed that RAOC were too inclined to
dismantle devices by hand to gain evidence, and doubted whether the gain justified the risk.

The RAOC case was based on the following: Existing doctrine placed the role with them. Indeed, the whole bomb disposal role had been theirs until 1940. More importantly, RAOC was already successfully undertaking the task. The scientific and technical training ATOs underwent allowed them to operate from first principles, meaning that new IED developments could be countered as they were found. RAOC claimed that RE were insufficiently trained – their EOD courses were only a few weeks long. Also, the RE’s preferred solutions at the time – moving IEDs with 4 in 1 buckets and/or destruction in situ, were impractical in most cases and lost valuable evidence.

What had actually happened was that in the 1950s, there was still a real threat from air attack, particularly with nuclear weapons. RE had considered this to be the growth area in EOD and had concentrated on it. At the same time RAOC recognised the growth of counter insurgency and capitalised on this. When the air attack threat receded, the RE were presented with an RAOC fait accompli.39

In the US forces the term ‘Explosive Ordnance Disposal’ had been in use since the second world war. This term more accurately described the gamut of disposal tasks being undertaken by all three services. In 1966 NATO adopted this term and terms such as bomb, mine or ammunition disposal became obsolete. However, ‘Bomb Disposal’ has stuck in the mind of the public and has been retained with varying degrees of official recognition. EOD vehicles of all three services carry these words and in the RE, BDO is still the official term for an EOD operator.

This appendix takes us up to the adoption of the term EOD in 1966. Over the next few decades EOD was to undergo massive changes in some areas, while retaining many of the features of earlier decades. IEDD was to grow and change in Hong Kong and Northern Ireland, while Conventional Munitions Disposal was to remain the mainstay of both RAOC/RLC and RE.
## APPENDIX B

### SIGNIFICANT INCIDENT DATABASE SAMPLE

### Historic Significant Incidents

<table>
<thead>
<tr>
<th>Hard Copy?</th>
<th>Log Ser No</th>
<th>Date</th>
<th>Location</th>
<th>Town</th>
<th>ATO</th>
<th>Task Type</th>
<th>Device Group</th>
<th>Device Type</th>
<th>Device Mk or Model</th>
<th>TPU Mk</th>
<th>Main Charge Group</th>
<th>Main Charge Type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4869</td>
<td>22/04/1969</td>
<td>RUC Springfield Road</td>
<td>Belfast</td>
<td>IED</td>
<td>Time</td>
<td>Blast</td>
<td></td>
<td>CEX</td>
<td></td>
<td></td>
<td>Gelamex</td>
</tr>
</tbody>
</table>

### Historic Significant Incidents

<table>
<thead>
<tr>
<th>NEQ (Kg)</th>
<th>Shrapnel (Kg)</th>
<th>Initiator Group</th>
<th>Initiator Type</th>
<th>1st Firing Switch Group</th>
<th>1st Firing Switch Type</th>
<th>Multiple Firing Switch?</th>
<th>2nd Firing Switch Group</th>
<th>2nd Firing Switch Type</th>
<th>3rd Firing Switch Group</th>
<th>3rd Firing Switch Type</th>
<th>4th Firing Switch Group</th>
<th>4th Firing Switch Type</th>
<th>Arming Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.3</td>
<td></td>
<td>Elec Det</td>
<td>No 8</td>
<td>Alarm Clock</td>
<td>Mechanical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Historic Significant Incidents

<table>
<thead>
<tr>
<th>Power Source Group</th>
<th>Power Source Type</th>
<th>Container</th>
<th>Target</th>
<th>Attribution</th>
<th>Deployment</th>
<th>Come-on?</th>
<th>Ambush?</th>
<th>'Lost Lives' Ref</th>
<th>Cas Killed</th>
<th>Cas Injured</th>
<th>EOD Cas Killed</th>
<th>EOD Cas Inj</th>
<th>Own Goal?</th>
<th>1st Use?</th>
<th>EOD 1st Use?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery</td>
<td>4.5v</td>
<td>SF</td>
<td></td>
<td>Placed by hand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Historic Significant Incidents

<table>
<thead>
<tr>
<th>RSP Codes</th>
<th>RSP Clear</th>
<th>Functioned during RSP?</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1st Time. 1st IED atk on RUC. Wire cut by priest.</td>
</tr>
</tbody>
</table>
**APPENDIX C**

**THE DEVELOPMENT OF UK IEDD DOCTRINE**

**OPERATOR QUESTIONNAIRE**

This research project aims to understand how IEDD developed as a result of the EOD experience in Northern Ireland in the 1970s. The author is an Ammunition Technician Warrant Officer who has served on High Threat IEDD tours in Northern Ireland and Iraq.

Please answer the following questions as fully as possible. If you wish to provide more detail than space allows, please copy and use the attached continuation sheet. If there is anything you would like to clarify or discuss in more detail, please do not hesitate to contact the author. I would welcome any suggestions for additional or amended questions and any further comments or feedback.

---

**PRE-TOUR**

1. What was your parent unit before you deployed to NI on your first tour?

2. How long had you been in the army? An AT/ATO?

3. What rank were you?

4. What EOD/IEDD had you done before being nominated for NI?

---

**SELECTION & TRAINING**

5. How were you nominated? Was there any form of selection?

6. What training was there? How long? Where?

7. What was the course content?

8. Was it relevant/useful/remote related to what you actually did in NI?

9. Who instructed? What experience/knowledge of EOD/IEDD/NI did they have?

---

**ARRIVAL IN NI**

10. Was there any in-theatre briefing or training?
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>11.</td>
<td>How long before you were on the streets?</td>
</tr>
<tr>
<td>12.</td>
<td>Where were you deployed to? (Which SF base?)</td>
</tr>
<tr>
<td>13.</td>
<td>Who was in your team?</td>
</tr>
<tr>
<td>14.</td>
<td>How were teams structured? (No 1, No 2 etc - who did what?)</td>
</tr>
<tr>
<td>15.</td>
<td>What was your daily routine (if there was one?)</td>
</tr>
<tr>
<td>16.</td>
<td>How long was your tour for?</td>
</tr>
</tbody>
</table>

**THE JOB**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>17.</td>
<td>How many tasks did you do?</td>
</tr>
<tr>
<td>18.</td>
<td>What was the threat considered to be (officially)?</td>
</tr>
<tr>
<td>19.</td>
<td>What did you consider the threat to be?</td>
</tr>
<tr>
<td>20.</td>
<td>How did you feel about the job?</td>
</tr>
<tr>
<td>21.</td>
<td>How did you feel about NI in general?</td>
</tr>
</tbody>
</table>

**RSPs**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>22.</td>
<td>Were there laid down RSPs?</td>
</tr>
<tr>
<td>23.</td>
<td>What might a typical RSP be for, say:</td>
</tr>
<tr>
<td></td>
<td>a. A time device (box in doorway etc)</td>
</tr>
<tr>
<td></td>
<td>b. A suspect car.</td>
</tr>
<tr>
<td></td>
<td>c. Suspected VOIED/booby trap</td>
</tr>
</tbody>
</table>
d. Suspected CWIED.

e. Suspect RCIED.

f. Mortars.

**EQUIPMENT, WEAPONS AND VEHICLES**

24. Please tell me about the following: eg, Did you have it? Did you use it? Under what circumstances would you use it/not use it? What did you think of it?

a. Hand tools.

b. Hook and line.

c. Body armour/EOD suit.

d. X-Ray.

e. Explosives:
   1. Detonators or similar.
   2. Detcord/Cordtex or similar.
   3. PE4 or similar.
   4. Cutting charges/CLC or similar.
   5. Torpex Candles/Maxi-Candles or similar.
   6. Destructor Incendiary or similar.
   7. Anything else.

f. Weapons:
   1. Disrupters - Pigstick or similar.
(2) Shotgun or similar.

(3) 84 mm Carl Gustav or similar.

(4) Personal weapons (rifles/pistols/SMG etc)

(5) Anything else.

g. Foaming pig/bomb blankets/trailers/bins or any other form of suppression.

h. Wheelbarrow or any other remotely operated equipment.

i. Vehicles.

25. What did you not have at the time, but would have liked? Did you ask for it? Did you get it?

26. In hindsight, what would you have liked to have?

PRINCIPLES & PHILOSOPHY OF IEDD/SOPs etc

27. Was there any IEDD philosophy?

How did it compare to the current:
   a. Preservation of life?

   b. Preservation of property?

   c. Preservation of forensic evidence.

   d. Return the situation to normality?

28. Were there any laid down principles of IEDD? (eg remote means where possible, disablement by disruption etc)?
<table>
<thead>
<tr>
<th>Q.</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>29.</td>
<td>Were there CATO SOPs or any other SOPs?</td>
</tr>
<tr>
<td>30.</td>
<td>Were there mandatory actions you had to follow?</td>
</tr>
<tr>
<td>31.</td>
<td>Were there soak times? Who set them? Did they change? Were there primary and secondary soaks?</td>
</tr>
<tr>
<td>32.</td>
<td>Was there any ECM? Did you have to use it?</td>
</tr>
<tr>
<td>33.</td>
<td>Did you have to refer up? If so, in what circumstances?</td>
</tr>
<tr>
<td>34.</td>
<td>Were you expected to take risks to save property?</td>
</tr>
<tr>
<td>35.</td>
<td>How did you treat explosions?/Finds?</td>
</tr>
<tr>
<td>36.</td>
<td>What sort of support/top cover did you get from the chain of command?</td>
</tr>
<tr>
<td>37.</td>
<td>Was there anything you were supposed to do, but usually didn't?</td>
</tr>
<tr>
<td>38.</td>
<td>Was there anything you were not supposed to do, but usually did?</td>
</tr>
<tr>
<td>39.</td>
<td>At the time, was there anything you wanted to change about the way you did EOD? Did you suggest it? Was it accepted?</td>
</tr>
<tr>
<td>40.</td>
<td>In hindsight, what would you change about the way you did EOD?</td>
</tr>
</tbody>
</table>

**OTHER**

<table>
<thead>
<tr>
<th>Q.</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>41.</td>
<td>Did you serve more than one tour in NI?</td>
</tr>
<tr>
<td>42.</td>
<td>When was/were your later tour(s)?</td>
</tr>
<tr>
<td>43.</td>
<td>How had things changed between your 1st and subsequent tour?</td>
</tr>
</tbody>
</table>
44. Was it for the better or worse?

45. Are there any incidents or stories you would like to recount?

46. Is there anything I've missed?

47. Would you be willing to be interviewed by this researcher?

48. Do have any documents or photographs that are relevant to this research project? If so would you be prepared to allow their use in this project?

49. Can you suggest anyone else who might be willing and able to help with this project?

Thank you for taking the time to complete this questionnaire. If there is anything further you would like to discuss, please contact the author below.

WO2 (SQMS) B T Cochrane
621 Sqn, 11 EOD Regt RLC
RAF Northolt
West End Road
Ruislip
Middlesex
HA4 6NG

Tel: 95233 8566
Mil: 0208 833 8566
Civ: 07899 065752
Mob: btcochrane@hotmail.com
# APPENDIX D

## EOD FATALITIES AND RELEVANCE TO CURRENT *DOCTRINE*

<table>
<thead>
<tr>
<th>Ser</th>
<th>Casualty</th>
<th>Date</th>
<th>Location</th>
<th>Situation</th>
<th>IED</th>
<th>Cas Action</th>
<th>EOD Doctrine</th>
</tr>
</thead>
</table>
| 1   | Capt David Stewardson| 09 Sep 71 | Castlerobin | Box found at Orange Lodge doorway.          | VOIED  | Manual entry                          | Save Life  
Remote equipment is to be employed where possible.  
Pre-planned when time allows.  
Minimum amount of time at risk.  
Neutralisation by disruption.  
EOD suit.                                         |
Remote equipment is to be employed where possible.  
Mandatory soak times.  
Pre-planned when time allows.  
Minimum amount of time at risk.  
Primary soak  
One-man risk.  
EOD suit.                                         |
| 3   | SSgt Chris Cracknell | 15 Mar 72 | Belfast  | Car abandoned outside police               | VOIED/RCIED | 2 x ATOs at same IED, pulling off car  | Save Life  
Remote equipment is to be employed                                         |
<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Date</th>
<th>Location</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Sgt Tony Butcher</td>
<td>320</td>
<td>station.</td>
<td>seat. Failed RC (or decoy) with VO inside main charge.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td></td>
<td>where possible. Pre-planned when time allows.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Minimum amount of time at risk.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Neutralisation by disruption.</td>
</tr>
<tr>
<td>5</td>
<td>Maj Bernard Calladene</td>
<td>29 Mar 72</td>
<td>Belfast Car abandoned in street.</td>
<td>Manual approach to VBIED.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Save Life Remote equipment is to be employed where possible.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Mandatory soak times.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Pre-planned when time allows.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Minimum amount of time at risk.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Neutralisation by disruption.</td>
</tr>
<tr>
<td>6</td>
<td>Capt JH Young</td>
<td>15 Jul 72</td>
<td>Silverbridge, Forkhill Milk churn found at side of road.</td>
<td>VOIED Hammered lid off a milk churn containing an IED.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>Save Life Remote equipment is to be employed where possible.</td>
</tr>
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<td></td>
<td>Pre-planned when time allows.</td>
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<td>Minimum amount of time at risk.</td>
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<td></td>
<td>Neutralisation by disruption.</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>EOD suit. Plannned Ops for suspected command and VO IEDs in rural areas.</td>
</tr>
<tr>
<td>No</td>
<td>Name</td>
<td>Date</td>
<td>Location</td>
<td>Description</td>
</tr>
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<td>-----------------------------------------------------------------------------</td>
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<tr>
<td>7</td>
<td>WO2 WJ Clark</td>
<td>03 Aug 72</td>
<td>Clady</td>
<td>Oil drum found by side of road. VOIED Cordtexed lid off metal drum. Removed det &amp; part of MC by hand. Returned to investigate wooden box inside drum.</td>
</tr>
<tr>
<td>8</td>
<td>Sgt Ron Hills</td>
<td>05 Dec 72</td>
<td>Lurgan/Kitchen Hill</td>
<td>Mortar attack – hung up bomb. Mk 1 Mortar bomb Investigating hung up mortar bomb, fell out of tube. Exploded as he approached. No secondary soak. Safety Fuze between cap and det.</td>
</tr>
<tr>
<td>9</td>
<td>Capt Barry Gritten</td>
<td>21 Jun 73</td>
<td>Londonderry</td>
<td>Examining find of IEDs and BME in Nissen hut. Occupied find. VOIED Probably VOIED in MC.</td>
</tr>
<tr>
<td></td>
<td>Name</td>
<td>Date</td>
<td>Location</td>
<td>Event Description</td>
</tr>
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</tr>
<tr>
<td>11</td>
<td>SSgt A N Brammah</td>
<td>18 Feb 74</td>
<td>Moybane</td>
<td>Unexplained explosions.</td>
</tr>
<tr>
<td>12</td>
<td>SSgt Vernon Rose</td>
<td>07 Nov 74</td>
<td>Stewartstown</td>
<td>Explosion at electricity sub station.</td>
</tr>
<tr>
<td>13</td>
<td>WO2 J A Maddocks</td>
<td>02 Dec 74</td>
<td>Derrylin/Gortmullan</td>
<td>CWIWED MC found and moved by civpop.</td>
</tr>
<tr>
<td>No</td>
<td>Name</td>
<td>Date</td>
<td>Location</td>
<td>Description</td>
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<td>------------------------------------------</td>
</tr>
</tbody>
</table>
| 14 | WO2 E Garside | 17 Jul 75  | Forkhill   | Suspect can at side of road.             | CWIED         | Save Life
Remote equipment is to be employed where possible.
Pre-planned when time allows.
Planned Ops to have aviation imagery sortie flown after cordon firm. |
| 15 | Cpl Brown     |            |            |                                          |               | Save Life
Remote equipment is to be employed where possible.
Pre-planned when time allows.
Minimum amount of time at risk.
Neutralisation by disruption.
| 16 | Sgt M Walsh   | 09 Jan 77  | Newtown Butler | Milk churn left in garage.              | VOIED         | Save Life
Remote equipment is to be employed where possible.
Pre-planned when time allows.
Minimum amount of time at risk.
Neutralisation by disruption.
| 17 | Sig Reece     | 02 Aug 79  | Armagh     | On route back from car clearance.        | CWIED         | Save Life
Remote equipment is to be employed where possible.
Pre-planned when time allows.
Minimum amount of time at risk. |
| 18 | Gnr Furminger |            |            |                                          |               | Save Life
Remote equipment is to be employed where possible.
Pre-planned when time allows.
Neutralisation by disruption.
| 19 | WO2 Mick O' Neill | 31 May 81 | Newry      | Suspect car used in shooting found abandoned. | VOIED         | Save Life
Remote equipment is to be employed where possible.
Pre-planned when time allows.
Minimum amount of time at risk. |
| 20 | WO2 John Howard | 08 Jul 88 | Belfast    | CWIED explosion at swim centre.          | VOIED         | Save Life
Remote equipment is to be employed where possible.
Pre-planned when time allows.
Minimum amount of time at risk. |
<table>
<thead>
<tr>
<th>PHILOSOPHY</th>
<th>PRINCIPLES</th>
<th>MANDATORY ACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Save Life</td>
<td>Remote equipment is to be employed where possible.</td>
<td>Primary soak</td>
</tr>
<tr>
<td>Pr3eserve Property</td>
<td>Mandatory soak times.</td>
<td>Secondary soak.</td>
</tr>
<tr>
<td>Return to Normality</td>
<td>Pre-planned when time allows.</td>
<td>One-man risk.</td>
</tr>
<tr>
<td>Preserve and Collect Forensic Evidence</td>
<td>Commands are to categorise tasks.</td>
<td>EOD suit.</td>
</tr>
<tr>
<td></td>
<td>Minimum amount of time at risk.</td>
<td>Manual approaches under full ECM active cover.</td>
</tr>
<tr>
<td></td>
<td>Neutralisation by disruption.</td>
<td>Planned Ops for suspected command and VO IEDs in rural areas.</td>
</tr>
<tr>
<td></td>
<td>Remote methods where possible. If not, semi-remote methods. Manual as a last resort.</td>
<td>Planned Ops to have aviation imagery sortie flown after cordon firm.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vehicles moved their own length and jolted.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Full ECM active cover available to REST</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RCIEDs inhibited with full ECM active cover.</td>
</tr>
</tbody>
</table>
References

Chapter One: Introduction

3 *EOD Statistics*, Joint Service EOD Operations Centre (JSEODOC), 11 EOD Regt RLC, Didcot.
4 The names of all RAOC and RLC personnel killed on EOD operations can be seen at the EOD Memorial at the gate of the Defence Munitions Centre, Kineton. The names of those killed in Northern Ireland are also commemorated at the 321 EOD Sqn RLC memorial garden at RAF Aldergrove (the garden was moved when the unit relocated from Lisburn in 2008) and also on a stone at the Northern Ireland Memorial Garden at Place Barracks, Holywood. The names of Metropolitan Police Expos killed on duty are commemorated on a plaque at their offices in Cannon Row, London.

5 *Army Doctrine Publication ‘Land Operations’* (AC 71819), Chapter 1, Para 101, Director General Development and Doctrine.
7 A&ERs, Vol 3 Pam 21 Part 5, 1993. DEMSS North Historical Library, Kineton. Copy also in author’s collection. This sentence has not been transferred to JSP 364, but as an idea it remains very much extant.
8 Extracted from A&ERs, Vol 3 Pam 21 Part 5, 1993 and JSP 364 Chapter 11 Para 12.
9 A soak time is a safe waiting period that must be observed before a manual approach may be made to a suspect IED.
10 ‘Commands’ in this context means the formations that task and control EOD teams. In Northern Ireland this was the three brigades, 3 Brigade in the south, 8 Brigade in the west and north and 39 Brigade covering the greater Belfast area. The Brigades would always be guided by the SATO or CATO.
11 Neutralisation in this context means rendering the device inoperable. Disruption is a neutralisation method that violently separates the components of an IED before the device can function.
13 High Threat theatres are those in which perpetrators actively target EOD teams with IEDs. An operator must pass the RLC High Threat IEDD course before being allowed to operate there.
14 Electronic Counter Measures – equipment designed to detect and defeat Radio Controlled IEDs.
15 This means that, as part of the clearance operation, all motor vehicles must be moved from their original position before being handed over in order to preclude the possibility of an IED being concealed under one of the wheels. The reasons for this are discussed in Chapter Eight.
17 An example of a convention would be the phrase ‘Suit - Weapon, Weapon – Suit’ – ie a disruptive weapon should always be carried when making a manual approach in an EOD suit. If you need to carry a weapon, you need to wear the suit. If you need to wear the suit you should have a weapon with you. This is good advice, but does not appear in any current publication.
19 There have been female EOD operators since 1998, but the masculine term is used to avoid convoluted wording.

Chapter Two: Background

4. DISTURBANCES: Anarchist Bomb explosion in Greenwich Park and funeral of M Bourdin. TNA HO 144/257/A55660.
8. The New York Times wrote in his obituary on 25 April 1898: ‘Sir Vivian Dering Majendie CB, her Majesty’s Chief Inspector of Explosives since 1871 is Dead. – Col Sir Vivian Dering Majendie, who was born in 1826, was educated at Leamington College and entered the Royal artillery in 1854. He served in the Crimea and the Indian Mutiny. From 1861 to 1871 he was Captain Instructor and Assistant Superintendent at the Royal Laboratory at Woolwich. Since that time he had served as Chief Inspector of Explosives. Among his publications are “Up Among the Pandies”, “Ammunition” and “Official Guide Book to the Explosives Act”.’
9. EXPLOSIVES: Construction of buildings for examination and detonation of bombs on Duck Island, St. James’ Park. HO 45/9741/A55680. This is also discussed in Hogben A. Designed to Kill- Bomb Disposal from World War One to the Falklands, Patrick Stevens 1987 pp 216-217, quoting from the same source.
10. Originally published in Vanity Fair, 23 April 1892.
21. For a detailed account of these events see Kee. Op Cit and Hopkinson M. Green Against Green - The Irish Civil War, Gill and MacMillen, Dublin, 1988.
22. Coogan T P. Op Cit, Ch 5.
23. Types Of Bombs Used in The 1939 IRA Activities, Scotland Yard 1939, Metropolitan Police Counter Terrorist Command Explosives Officers Technical Library, London. Copy also held in the Author’s personal collection.

Police War Instructions, Section 10, May 1936; Home Office Memorandum, 15 Mar 1939 TNA HO 186/2827; War Office 79/H.D./697 (M.O.3) 05 Nov 1939. TNA HO 186/2827; SD.1/C/91/40, 19 Nov 1940. TNA WO 199/427; Home Security Circular No 88/40, 11 May 1940. TNA HO 186/2827; K997, 1940. See Appendix B for a detailed account of how this came about.

Hossack A. Historical Analysis of Terrorist Campaigns with observations on current operations in Iraq Dstl/CP10135 (2004).


Photographs from the collection of Ch Insp FW Bird, in author’s collection. Bird served in the Palestine Police, then in Cyprus and Aden. He became an expert on the forensics of bomb making and seemed to appear wherever there was a colonial IED campaign.

Harrison W. Sabotage Bombs in Cyprus, DEMSS North Historical Library, Kineton. Copy also in author’s collection.


Jewish Road Mines – Chemical – 1946, collection of Ch Insp FW Bird, in Author’s possession.

Collection of Ch Insp FW Bird, in Author’s possession.

Ibid.

Ibid.

4182/PP &TJ/AN Terrorist Methods with Mines and Explosives dated Dec 1946, HQ Chief Engineer, Palestine and Transjordan, 1946. Author’s collection.


Ibid p 96.


MacDonald PG. Stopping The Clock, Robert Hale, 1977, Chapter 8 includes a fictionalised account of a manual Render Safe Procedure. MacDonald served as an IOO in Cyprus during the EOKA campaign.


Sabotage in Aden from 1st April 1958 to 30th June 1967, Author’s collection.

MacDonald. Op Cit, Ch 9.


Ibid.

MacDonald PG. Op Cit, p123.

Ibid, Ch 10.

EOD Operations in Honk Kong Vol I, 1967, DEMSS North Historical Library, Kineton. SSgt Reynolds suffered serious injuries to his hand. Reynolds went on to become a Warrant Officer Class 1 and, after he retired from the army, he became a civilian instructor at the Army School of Ammunition. 25 years after this incident he taught the author the basics of ammunition and explosives, but he never mentioned how he lost his fingers.


Coogan. Op Cit, Ch 14.


Coogan. Op Cit, p 331


Sources differ on the actual cause of McDowell’s death. Some state that he was electrocuted on touching a 5400 volt cable. Taylor P, Op Cit pp 53 - 69 and Cusack J & McDonald H, Op Cit p 29. Others suggest he was fatally


This is discussed in detail in Chapter 9.

Chapter Three: Methodology.

22. *Ibid*
23. *Ibid*
24. *Ibid*
27. Adapted from Denscombe. *Op Cit*, p133.
28. Since starting the project, the author has obtained a microfiche set of most EOD reports from 1969 to 1992 which can be examined by those who cannot gain access to the Operational Archive.
29. CATO SOPs for IEDD in Northern Ireland, EOD Branch, HQNI, 2003. 38 (Irish) Bde G9 Operational Archive

Chapter Four: Literature Review.

Chapter Five: The Developing IED Threat.

1 One of the exponents of this view, Major (Retd) ‘Chris Hunter’ (Pen name – real name known to author), said ‘On my tour in Iraq in 2004, I learned that the level of bomb-making ability achieved by the IRA in 30 years was surpassed in just 12 months. In Afghanistan it took them almost 18.’ http://www.mirror.co.uk/news/top-stories/2010/07/20/bomb-disposal-experts-in-afghanistan-deserve-our-thanks-and-more-help-115875-22425357/ accessed 12 Oct 2011.

2 http://www.washingtonpost.com/wp-dyn/content/article/2006/08/23/AR2006082301390.html. Accessed 07 Nov 2010. During 2007-8, this author served as the Weapons Intelligence Section Warrant Officer in southern Iraq, and saw at first hand dozens of examples of devices and device components that were made in and supplied by Iran.


Beat them with 450 men; the Adenis beat them with 700 men; the Kenyans beat them with 500 men.

MacStiofain S. MacStiofain, later to be PIRA’s first Chief of Staff, was imprisoned in England with a number of EOKA terrorists.

For example, Martin Meehan, a former PIRA commander in Belfast, described PIRA missions as spontaneous and unplanned with little or no direction. Taylor P. Provos - The IRA and Sinn Fein, Bloomsbury Publishing, London, 1997, pp 88-89.

Ibid, p 95.
Ibid, p 96.
Ruari O’ Braidigh, the president of Provisional Sinn Fein at the time, said the death of 18 month old Angela Gallagher on 03 September 1971 was ‘one of the hazards of urban guerrilla warfare’. McKittrick et al. Op Cit, entry 119, p 97.
Quoted in Alonso. Op Cit, p 164.
For an example see Bishop & Mallie. Op cit, p 122.

On 12 December 1972, Republican News celebrated a bombing of a linoleum factory with the headline ‘£1000,000 Up In Smoke’ and promised that a £50 million grant from the British Government would soon be swallowed up. Geraghty T. The Irish War- The Military History of a Domestic Conflict, Harper Collins, London, 2000 p 206.

The next day it was bombed again. Geraghty. Op Cit, p 211.
Bishop & Mallie. Op Cit, p154. MacStiofain gives the same reasons for the use of the car bomb. MacStiafain.

Author’s collection
Oppenheimer. Op Cit, p 249. Also PIRA bomb making training pamphlet 1972 in author’s collection.
Figure arrived at by author from a review of McKittrick et al. Op Cit..
The Terrorist Arsenal, G2 Weapons Intelligence, HQNI, 2000, 38 (Irish) Bde G9 Operational Archive, Lisburn.
DIFS, Construction of home made bombs found at St Mary’s Training College, Falls Road, Belfast on 8/5/66, 16 May 66, 38 (Irish) Bde G9 Operational Archive, Lisburn. The letter does not say if they were thrown at or from the school. A Captain GJ Browne dismantled them.

Ibid.
Ibid.
Ibid.
DEMSS North Historical Library, Kineton.

EOD Report 4869 dated 22 Apr 69, 38 (Irish) Bde G9 Operational Archive, Lisburn.


The Identification of Improvised Explosive Devices, Director of Land Service Ammunition, 1993, DEMSS North Historical Library, Kineton.


Barzilay. Op Cit, p 166

PIRA Explosives Training Manual, Jan 1972, 11 EOD Regt RLC. Copy also in author’s collection.


IIIED Task No 291705, 21 Jul 1994, JSEODOC, Didcot. Picture from 11 EOD Regt RLC.


McKittrick et al. Op Cit, entries 2883-2893, pp 1094-1098.


IIBD Task No 91, 07 Dec 1976, Department of Industrial and Forensic Science, 38 (Irish) Bde G9 Operational Archive, Lisburn.


Ibid.

The Identification of Improvised Explosive Devices, Director of Land Service Ammunition, 1993, DEMSS North Historical Library, Kineton.


McKittrick et al. Op Cit, entries 2883-2893, pp 1094-1098.


Bishop & Mallie. Op Cit, pp 171-172. This is based on interviews with Joe Cahill in 1985-86.


Davies, Op Cit, pp 1-3.

1216, p 487. Also mentioned in Anderson B.

Department of The Army, April 1966, pp 96-97, which describes it as typical of foreign unconventional devices.

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Taylor. Op Cit, p133

Bishop & Mallie. Op Cit, p87. MacStiofain himself makes no mention if this incident in his memoirs.

NIO Chronology of Events Vol 1 69-71. There is no record of this incident in the EOD logs or reports.


Hennessy. Op Cit, p 58. Like the earlier incident in Crossmaglen, there is no EOD report on file for this attack.


Ibid.

Ibid.

Ibid.


McKittrick et al. Op Cit, entries 491 & 492, p 232.


Ibid.


ICTD Summary of Incidents –October 1974, author’s collection and McKittrick et al, Op Cit, entries 1215 & 1216, p 487.

McKittrick et al. Op Cit, entry 3551, pp 1400-1401.


For example this switch is shown in TM 31-200-1 Unconventional Warfare Devices and Techniques, US Department of The Army, April 1966, pp 96-97, which describes it as typical of foreign unconventional devices.
Terence McDermott, a 19 year old electrician was killed. This was found during the so called ‘Falls curfew’.

Department of Industrial and Forensic Science, 38 (Irish) Bde G9 Operational Archive, Lisburn.

Operational Archive, Lisburn.

Loyalist bomb making equipment.

Lisburn.

Op Cit, p 220.

MacStiafain. Op Cit, pp 220-221.


This was found during the so called ‘Falls curfew’.


Catalogue of IEDs, EOD Branch HQNI, 1972, 38 (Irish) Bde G9 Operational Archive, Lisburn.


Catalogue of IEDs, EOD Branch HQNI, 1972, 38 (Irish) Bde G9 Operational Archive, Lisburn.


Catalogue of IEDs, EOD Branch HQNI, 1972, 38 (Irish) Bde G9 Operational Archive, Lisburn.


Terence McDermott, a 19 year old electrician was killed.


Catalogue of IEDs, EOD Branch HQNI, 1972, 38 (Irish) Bde G9 Operational Archive, Lisburn.

Styles. Op Cit.


For example EOD Report 6730, 12 Sep 1972, 38 (Irish) Bde G9 Operational Archive, Lisburn.


EOD Report 7178, 23 Oct 1972, 38 (Irish) Bde G9 Operational Archive, Lisburn. This was in a find of Loyalist bomb making equipment.


Figure arrived at by Author from a review of McKittrick et al, Op Cit.

The Terrorist Arsenal, G2 Weapons Intelligence, HQNI, 2000, 38 (Irish) Bde G9 Operational Archive, Lisburn.

Ibid

TIS. 11 EOD Regt RLC.


old tactic. An identical device had been rendered safe 16 years previously on 23 Oct 1986. EOD Report 9169, 19 Apr 73, 38 (Irish) Bde G9 Operational Archive, Lisburn.

Author’s observation on military courses and training.

RCIED History Database, 38 (Irish) Bde G9 Operational Archive, Lisburn. Copy also held by author.

Ibid.

Author’s observation on military courses and training.

RCIED History Database, 38 (Irish) Bde G9 Operational Archive, Lisburn. Copy also held by author.

Ibid.

EOD Report 9169, 19 Apr 73, 38 (Irish) Bde G9 Operational Archive, Lisburn.

EOD Report 9431, 13 May 73, 38 (Irish) Bde G9 Operational Archive, Lisburn.

RCIED History Database, 38 (Irish) Bde G9 Operational Archive, Lisburn. Copy also held by author.

Ibid.

EOD Report 9431, 13 May 73, 38 (Irish) Bde G9 Operational Archive, Lisburn.

RCIED History Database, 38 (Irish) Bde G9 Operational Archive, Lisburn. Copy also held by author.

Ibid.

EOD Report 135479, 29 Jun 1982. This incident is also mentioned in Smith S, Op Cit, pp 205-206.


EOD Reports 6442, 20 Aug 72, 6450 21 Aug 72, 6478 and 6485 23Aug 72, 6675 06 Sep 72 and 6677 07 Sep 72, 38 (Irish) Bde G9 Operational Archive, Lisburn.


115480/2 Murder: Sgt Hills, dated Dec 1972 and associated witness statements. 321 EOD Sqn RLC SAT Archive.

ICTD/Special/77/1 Development of IRA Home-Made Mortars, ICTD, 1977, 321 EOD Sqn RLC SAT Archive, Aldergrove. Copy also in author’s collection.

Terrorist Arsenal, G2 Weapons Intelligence, HQNI, 2000, 38 (Irish) Bde G9 Operational Archive, Lisburn.


Terrorist Arsenal, G2 Weapons Intelligence, HQNI, 2000, 38 (Irish) Bde G9 Operational Archive, Lisburn.


For example on 16 Apr 1987, 16 tubes were fired at Bessbrook Mill SF Base. IEDD Report 135906, 17 Apr 87, 38 (Irish) Bde G9 Operational Archive, Lisburn.


Mk 15 Mortar Historical Database, EOD Branch HQNI, 38 (Irish) Bde G9 Operational Archive, Lisburn.

Copy also held by author.


Mk 15 Mortar Historical Database, EOD Branch HQNI, 38 (Irish) Bde G9 Operational Archive, Lisburn.

Copy also held by author. Picture from author’s collection.


Ibid.
Chapter Six: IEDD At The Start Of Operation BANNER.

2. Ibid. This list is very similar to one published five years previously in an American open source book: Lenz RR. Explosives and Bomb Disposal Guide, Charles C Thomas, Springfield Illinois, 1965.
3. Ibid.
4. Ibid.
6. Ibid
8. Ibid.
9. While employed in EOD Branch HQNI, this author drafted the world wide Generic High Threat SOPs for IEDD, which were used as the template for the SOPs used in Iraq and Afghanistan. The starting point was CATO SOPs.
12. Ibid.
15. DLSA was an ATO with the rank of Brigadier who served as the head of the ATO/AT trade group and was responsible for all army ammunition, explosives safety and EOD matters. The post was abolished in 2002 and its responsibilities passed to the Principal ATO (PATO) at HQ Land. Since then most of PATO’s responsibilities have been passed to the Joint EOD and Search Staff Branch at HQ Land, although PATO remains the head of trade.
16. TAB 21/1/63, DLSA, 02 May 1966, DEMMS North Historical Library, Kineton.
17. 321 EOD Unit Operational Records, 38 (Irish) Bde G9 Operational Archive, Lisburn.
22. 03190/2 Murder: SSgt Cracknell and Sgt Butcher, dated 04 Apr 1972 and associated witness statements. 321 EOD Sqn RLC SAT Archive, Aldergrove.
23. SCRDE/69/40 Body armour for Explosive Ordnance Disposal (Mark I Ensemble), December 1969. DEMMS North Historical Library, Kineton. Copy also in author’s collection.
24. BM to FE 457033 (CATO) dated 05 Jun 1968. 11 EOD Regt RLC TIS Library.
29. DH Green, quoted in Smith. Op Cit, p 40.
32. Questionnaire ATO 2 Nov 2010.
33. Ibid.
35. Slide from lecture pack of G Styles, in author’s collection.
EOD Report 2178, 30 Sep 1971, 38 (Irish) Bde G9 Operational Archive, Lisburn
Coldrick M. quoted in Ryder C, Op Cit, p 49.
08395/1 Murder: WO2 Davies, dated 31 Dec 1971 and associated witness statements. 321 EOD Sqn RLC
SAT Archive, Aldergrove.
03805/2 Murder: Maj Calladene, dated 28 Apr 1972 and associated witness statements. 321 EOD Sqn RLC
SAT Archive, Aldergrove.
Coldrick M, quoted in Ryder. Op Cit, p 49.
R Harvey, quoted in Smith. Op Cit, p 63.
_Smith, Op Cit _p 74.
Interview ATO 5 10 Nov 2010.
Scourfield-Evans, quoted in Smith. _Op Cit_ , p 68.
G J Lawrence. Copy in author’s collection.
EOD Report 1266/1/R298, 09 Feb 1971, 38 (Irish) Bde G9 Operational Archive, Lisburn. This incident is also
EOD Report 1000,29 Jul 1971, 38 (Irish) Bde G9 Operational Archive, Lisburn. This incident is also described
EOD Report 1026, 30 Jul 1971, 38 (Irish) Bde G9 Operational Archive, Lisburn. This incident is also
described in Styles. _Op Cit_ , pp 114.
EOD Report 1791, 10 Sep 1971, 38 (Irish) Bde G9 Operational Archive, Lisburn
EOD Report 1800, 12 Sep 1971, 38 (Irish) Bde G9 Operational Archive, Lisburn
Archive, Lisburn.
Coldrick M, quoted in Ryder. _Op Cit_ , p 55.
09962/2 Murder: Capt Young, dated 08 Sep 1972 and associated witness statements. 321 EOD Sqn RLC SAT
Archive, Aldergrove.
10023/2 Murder: WO2 Clark, dated Aug 1972 and associated witness statements. 321 EOD Sqn RLC SAT
Archive, Aldergrove.
For example _EOD Report 4869_, 01 Apr 1972, 38 (Irish) Bde G9 Operational Archive, Lisburn.
For example _EOD Reports 5162_, 03 May 1972 and 6494, 24 Aug 1972, 38 (Irish) Bde G9 Operational
Archive, Lisburn.
Chapter Seven: The EOD Fatalities.

2. 06010/1 Murder Of Capt D Stewardson RAOC, dated 09 and 11 Sep 1971, and associated witness statements. 321 EOD Sqn RLC SAT Archive, Aldergrove.
5. Ibid.
10. Ibid p 119.
18. Ibid.
22. Ibid.
26. Ibid.
31. 09962/2 Murder: Capt Young, dated 08 Sep 1972 and associated witness statements. 321 EOD Sqn RLC SAT Archive, Aldergrove and EOD Report 5845, 6 RMP Operational Archive.
32. Ibid.
115480/2 Murder: Sgt Hills, dated Dec 1972 and associated witness statements, 321 EOD Sqn RLC SAT Archive, Aldergrove.


Ibid.

Smith. Op Cit.


Barzilay D. The British Army In Ulster Vol 2, Century Books, Belfast 1975

This was not actually the case as the first live RCIED had been rendered safe in 1972 on 25 April 1972. EOD Report 5088, 25 Apr 1972, 38 (Irish) Bde G9 Operational Archive, Lisburn.


Ibid.


Ryder. Op Cit, p172.

Vetch was a piece of Electronic Counter Measures (ECM) equipment designed to deliberately initiate an RCIED that was operating on the GPO band.


Ibid.


Patrick. Op Cit, pp 71-76.

Ibid p 146.

Ibid, p 145.


Ryder. *Op Cit*, p 172


Chapter Eight: Near Misses and Other Lessons.


3. Questionnaire, ATO 1, Nov 2010.


11. *Ibid*.


16. CATO SOPs for IEDD in Northern Ireland, 38 (Irish) Bde G9 Operational Archive, Lisburn.

17. Taught to author on STT Course, Jan 1994.


19. Author’s collection.

20. RSP code for Pigstick disruptor.


23. The author served under M C Wickham when he was SATO in 1994 and CATO from 2004 to 2006.


Chapter Nine: An Analysis of Successful Attacks on EOD Teams.


2 Ibid.

3 Ibid.

4 These statistics relate to EOD operators only, not other EOD team members.

5 This figure is arrived at by combining the number of IEDS reported as rendered safe and the number of reported explosions. Taken from EOD Statistics, HQNI 2007, 38 (Irish) Bde G9 Operational Archive, Lisburn.


8 Graph developed by Author from figures taken from EOD Statistics, HQNI 2007, 38 (Irish) Bde G9 Operational Archive, Lisburn.

9 Observation by author, derived from conversations with EOD personnel who have served in Afghanistan.


12 Ibid.

13 Ibid.


17 03805/2 Murder: Maj Calladene, dated 28 Apr 1972 and associated witness statements. 321 EOD Sqn RLC SAT Archive, Aldergrove.


24 Developed by Author from reports on EOD fatalities, 321 EOD Sqn RLC, SAT Archive, Aldergrove.


26 03805/2 Murder: Maj Calladene, dated 28 Apr 1972 and associated witness statements. 321 EOD Sqn RLC SAT Archive, Aldergrove.


32 Developed by Author from reports on EOD fatalities, 321 EOD Sqn RLC, SAT Archive, Aldergrove.
Chapter Ten: The Response.


TAB21/1725 dated 08 Dec 1972. DEMSS North Historical Library, Kineton. Copy also in author’s collection.

Questionnaires ATOs 2 to 8, Oct and Nov 2010.

TAB21/1726 dated 19 Dec 1972. DEMSS North Historical Library, Kineton. Copy also in author’s collection.

Ibid.

EOD Aide Memoire. CILSA, Dec 1972. Scan of aide memoire provided by Richard Gill. Copy in author’s collection.

Interview RJS Oct 2010.

Interview ATO 14, Dec 2010 and author’s own observation and experience.

AS of A Precis No AP4 dated Dec 1972. DEMSS North Historical Library, Kineton. Copy also in author’s collection.

Ibid.

Ibid.

Ibid.

AS of A Precis AP4 - Access and Render Safe Procedures Applying In an IED Incident, May 1975, DEMSS North Historical Library, Kineton.


TAB 21/1986. DEMSS North Historical Libray, Kineton. Copy also in author’s collection.

Ibid Sect 1.

Ibid Sect 3.

Ibid Sect 3. The attempted use of an IED’s own means of initiation was a factor in the death of SSgt Olaf Schmid in Afghanistan in 2009.

Ibid.


621 EOD Sqn RLC Tech Library.

Interview ATO 14, Dec 2010.


Sunday Telegraph Magazine, 10 Jan 1975.


TAB21/1725 dated 08 Dec 1972 and AS of A Precis No AP4 dated Dec 1972. DEMSS North Historical Library, Kineton. Copy also in author’s collection.


AS of A Precis No AP4 dated Dec 1972. DEMSS North Historical Library, Kineton. Copy also in author’s collection.

Ibid.

Ibid.

Ibid.


Chapter Eleven: Equipment – Enabler or Driver Of Development?

2. Questionnaire ATO 1, Dec 2010.
6. EOD Operations in Hong Kong 1967-68 Vol 1 and 2, CRAOC Hong Kong, DEMSS North Historical Library.
7. Ibid.
16. 06010/1 Murder of Capt D Stewardson RAOC dated 09 and 11 Sep 1971, and associated witness statements. 321 EOD Sqn RLC SAT Archive.
This is a plastic tube, not dissimilar to washing line that is filled with a granular high explosive, usually PETN which detonates at a velocity of around 6200 metres per second.


EOD Operations in Hong Kong 1967-68 Vols 1 and 2, CRAOC Hong Kong, DEMSS North Historical Library

For example EOD Report 1266/1/R298 dated 09 Feb 1971.

Questionnaire ATO 6, Nov 2010.

Markham D. *EOD Equipment and It's Development*, DEMSS North Historical Library, Kineton.

Questionnaires ATO 10 and ATO 11, Dec 2010.

Author’s collection.

321 EOD Sqn RLC, Lisburn.

For example EOD Report 6648, 05 Sep 1972, 38 (Irish) Bde G9 Operational Archive, Lisburn.


The author carried a prepared blast incendiary on his EOD van in Northern Ireland in 1994. This was shortly after WO1 McCleland was injured by a VOIED concealed in a mortar baseplate vehicle. The intention was that should a similar situation arise, the vehicle would be burnt out. The opportunity never arose as the next mortar baseplate came in the form of an adapted tractor.


The author was trained on the use of Wheelbarrow mounted shotgun on courses at the Army School of Ammunition in 1993 and 1994. When deployed in Northern Ireland in 1994 shotgun was carried but never used. They were withdrawn in 1998 but reissued in 2006 for use in Iraq. Again, training was given and they were carried on team kits but rarely, if ever, used.

Trial No 26 - Dalek, Army School of Ammunition, 1972, DEMSS North Historical Library, Kineton.

Barker. *Op Cit*.


Questionnaire ATO 3 Aug 2006.

Questionnaire ATO 11 Oct 2010.

Questionnaire ATO 4 Nov 2010.

Questionnaire ATO 12 Nov 2010.

Trial No 26 Murder: SSgt F Beckett dated 08 Feb 1974 and associated witness statements. 321 EOD Sqn RLC SAT Archive.

Author’s collection.


Trial No 26: DALEK, Army School Of Ammunition, 1972, DEMSS North Historical Library

The EOD Robot, HQNI, 38 (Irish) Bde G9 Operational Archive, Lisburn.


The EOD Robot, HQNI, 38 (Irish) Bde G9 Operational Archive, Lisburn.

Questionnaire ATO 3, Aug 2006.

Questionnaire ATO 7, Nov 2010.

Questionnaire ATO 11, Dec 2010.

Questionnaire ATO 12, Nov 2010.

The EOD Robot, HQNI, 38 (Irish) Bde G9 Operational Archive, Lisburn.

Ibid.

Lt Col M C Wickham. Copy also in Author’s collection.

Ibid.

Ibid.


Lenz. *Op Cit*, p265

Questionnaires, RHW, Clouter, BB, HM, GJL and RG.
Chapter Twelve: Personnel Selection and Training.

2 This unit is now 621 Sqn, 11 EOD Regt RLC.
3 Questionnaire ATO 1, Nov 2010.
4 Ibid.
5 Low threat theatres are normally referred to as the ‘Joint Service environment’. This dates from the policy, in place until 2009, that stipulated that only RLC operators could carry out IEDD in a high threat theatre, whereas operators from all services could operate in other theatres.
6 Qualified operators receive a license to operate, which usually lasts for six months. At the end of their licensing period, every operator is re-tested with simulated IED incidents and must perform adequately before their license is renewed. The author ‘licensed’ four times before attending the RLC High Threat IEDD course.
7 Questionnaire ATO 3, Aug 2006. This is echoed by most other respondents.
8 Questionnaire ATO 4, Nov 2010.
11 Ibid.
12 Ibid.
13 Ibid
14 Author’s experience and observation.
15 Questionnaire ATO 1, Nov 2010.
17 Ibid
18 Questionnaire ATO 1, Nov 2010.
19 Questionnaire ATO 1, Nov 2010.
22 Questionnaire ATO 6, Nov 2010.
23 Questionnaire ATO 5, Jul 2008.
24 Questionnaire ATO 9, Nov 2010.
25 Questionnaire ATO 13, Nov 2010.
26 Questionnaire ATO 10, Nov 2010.
27 Questionnaire ATO 1, Nov 2010.
28 Questionnaire ATO 12, Nov 2010.
29 Authors experience and observation, based on being a student and a trainer. This is echoed by most other students and trainers the author has interviewed on this subject.
30 Interview ATO 18, Sep 2009.


2 JSEODOC Statistics, 11 EOD Regt RLC, Didcot.


5 Ibid.

6 Regulations for Army Ordnance Services (RAOS) Vol II 1900, 1914.

7 *Army Ordnance Corps Gazette* Nov 1908.


11 Macksey, K. *For Want of a Nail – The Impact on War of Logistics and Communications*. Brassey’s (UK) 1989.

12 Ibid.


15 Police War Instructions, Section 10, May 1936.

16 Home Office Memorandum, 15 Mar 1939 TNA HO 186/2827.

17 War Office 79/H.D./697 (M.O.3) 05 Nov 1939. TNA HO 186/2827.


19 Home Security Circular No 88/40, 11 May 1940. TNA HO 186/2827

20 K997, 1940. TNA HO 186/2827.

21 Home Security Circular No 88/40, 11 May 1940. PRO HO 186/2827


25 79/HD/1340 (S.D.1) 11 Dec 1940. TNA WO 32/9760


30 TNA WO 271/146 and WO 166/17392

31 TNA WO 32/18972

32 Ibid.

33 20/Engrs//7201/MOS) 04 June 1954. TNA WO 31/17417.

34 TNA WO 32/18739

35 Ibid.


37 TNA WO 32/18739.