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Improvised Explosive Devices (IEDs): An Introduction[1]

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Overview

In January 2003 the International Atomic Energy Agency sealed bunkers at the Iraqi Al Qaqaa facility. By the time US forces reached the facility on 10 April 2003, 377 tonnes of premium quality high explosive had been looted. Yet this stockpile probably accounted for less than 0.06 per cent of the total Iraqi ammunition and explosive stockpile (Bradley and Ricks, 2004).

Between July 2003 and October 2007, IED attacks in Iraq resulted in the deaths of over 1,600 coalition personnel (ICCC, 2007). Not surprisingly, these attacks have received escalating publicity in the international news media.

Yet it is the use of conventional ammunition in these weapons that remains less well publicized, and it is this use that impacts on the policy debate surrounding the effective stockpile management of conventional ammunition in all scenarios. In Iraq, and increasingly in Afghanistan and the Occupied Palestinian Territories, a significant majority of IEDs are manufactured from conventional ammunition, explosives, and other items diverted from military stockpiles.

Introduction

IEDs can be made from a wide range of non-military components, chemicals, and compounds that are readily available to civilians in most countries. However, the construction, and to an extent the deployment, of IEDs is made considerably easier if factory-manufactured explosives or complete rounds of ammunition are readily available for adaptation to illicit uses.

Diverted conventional ammunition (CHAPTER 15), explosives, and military demolition items can be used in a wide range of IED types, ranging from anti- personnel 'booby traps' and improvised mines to roadside bombs and armour-piercing projectiles.

Large calibre ammunition, such as artillery shells and mortar bombs, are particularly useful for IED construction, because they contain relatively large quantities of explosive. In addition, military stockpiles frequently contain demolition stores, such as detonators, detonating cord, and plastic explosives, that can greatly facilitate the construction of IEDs.

What is an IED?

The standard North Atlantic Treaty Organization (NATO) definition of an IED is:

> A device placed or fabricated in an improvised manner incorporating destructive, lethal, noxious, 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. (NATO, 2007, Part 2, sec. I, p. 2)

The phrase 'normally devised' is arguably context specific. At the global level, the majority of explosives for use in IEDs are manufactured using commercially available components, such as compounds derived from nitrate-based agricultural fertilizers or hydrogen peroxides. Yet, recent experience in post-conflict environments such as Iraq and Afghanistan suggest that, in situations where large volumes of conventional ammunition circulate among non-state actors, it is often more expedient to use military ammunition, explosives, and associated materiel. Military explosives also have the added advantage of being more powerful in terms of TNT equivalence than the majority of home-made explosives.

In recognition of increasing attention to the role of conventional ammunition used in IED construction, the following definition of an IED, which originates from the UK armed forces, can be considered supplementary to the NATO one:

> An explosive device, constructed using non-commercial methods, usually in a domestic setting; or a device using ammunition that has been modified to allow it to be initiated in a non-standard way and for a purpose not envisaged by the original equipment manufacturer (OEM).[2]

This chapter combines the definitions, but focuses on explosive devices, rather than the other (noxious, pyrotechnic, etc.) variants listed in the NATO definition.

IED component parts

It is generally accepted that all IEDs consist of the following component parts[3]:

- main charge;
- initiator;
- firing switch;
- safety and arming switch; and
- container.

The subject of this chapter is the use of conventional ammunition as the main charge of an IED. The chapter does not discuss other component parts.

Applications for conventional ammunition

The ongoing conflict in Iraq provides perhaps the best illustration of how a range of IEDs can be fabricated from conventional ammunition and explosives.

In Autumn 2003 US military commanders estimated that Iraqi military sites contained between 600,000 and 1,000,000 tonnes[4] of ammunition and explosives in over 130 ammunition storage sites (Klingelhoefer, 2005, p. 2). Yet this did not include the ammunition that was stored in over 10,000 cache sites that were subsequently discovered by coalition forces throughout Iraq prior to August 2004. The true scale of the losses from storage depots that are available to warring factions and non-state actors will probably never be known, other than that it was significant. A 9 November 2003 US Defense Intelligence

Agency report is alleged to have noted that the vast majority of explosives and ordnance used in anti-coalition IEDs has come from pilfered Iraqi ammunition stockpiles. Yet the problem was so large and the coalition forces so unprepared to deal with it that even by December 2003 only 250,000 tonnes[5] of ammunition were partially secured (Klingelhoefer, 2005, pp. 4–5).

Insurgent groups had therefore gained easy access to the full range of conventional ammunition types, including hand grenades, land mines, mortar rounds, and artillery shells—almost all of which have potential applications in IED construction.

Large calibre ammunition

The use of these types of ammunition varies. Some are hastily laid as single devices; others are used to manufacture more complex devices that use multiple linked main charges[6] that have been extracted from a number of projectiles and assembled into one powerful explosive device.

Although device construction varies significantly, most of the remotely initiated[7] roadside IEDs in Iraq illustrate a similar fusion of civilian commodities and conventional ammunition.

The 'firing pack' usually consists of a wireless device, such as a mobile phone, a battery pack, and a safe to arming switch/timer. An electrical detonator is usually placed in a small quantity of booster explosive, which is then placed in or next to the main explosive charge. The main charge will consist of one or more items of large calibre conventional ammunition.

Explosively formed projectiles (EFPs)

Explosively formed projectiles are often referred to as shaped charges, although this can be confusing to the technically uninitiated, because EFPs do not perform like the majority of more traditional high-explosive anti-tank (HEAT) shaped charges. HEAT shaped charges consist of a metallic cone, whereas EFPs utilize a metallic disc, which results in different target effects. A HEAT warhead will produce a molten jet of metal that penetrates the target by hydro-dynamic effects; an EFP produces a fragment that mainly uses kinetic energy as the attack mechanism (although at shorter ranges it may act as a 'dirty' HEAT warhead). A rough estimate is that an EFP can penetrate a thickness of armour equal to around the diameter of its charge, whereas a typical shaped charge will go through six or more charge diameters. The EFP has the advantage that it can be effectively used as a 'stand-off' (longer-range) weapon; a HEAT round cannot be effectively used this way, due to jet disintegration effects over distance.

Given access to explosives, EFP warheads can be easily manufactured to high standards by a metal machinist, using readily available materials such as metal piping or copper sheeting. The pipe is filled with high explosive and capped with a concave steel or copper liner. The explosive shapes and compresses the liner into a hot metallic fragment, which can penetrate thick armour at optimum range. This IED warhead can be effective against modern main battle tanks and armoured personnel carriers.

Armoured vehicles are becoming increasingly sophisticated and well protected against EFPs. One way to counter this is to use large quantities of explosive. Even the best armoured vehicle cannot survive an explosion large enough to throw it into the air. These large buried IEDs are not particularly common, being used in less than 10 per cent of attacks in Iraq (Stevens, 2006), perhaps because of the significant quantities of explosive used and the relatively long time they take to emplace, with the consequent risk of detection during the process. When they are used, however, they tend to produce catastrophic results: in November 2005 a large buried IED killed 13 and wounded 7 coalition personnel.

Types of IED and initiation modes

IEDs will differ depending on the role that the users intend them to perform. They may be designed to cause widespread loss of life and destruction of infrastructure, or for targeted attacks on personnel and vehicles. Their role (and intended impact) depends on where they are situated, their destructive capabilities, and how the explosive device is 'delivered' to the target. The list of types of delivery in Table 14.1 is not exhaustive.

IED technology is only limited by the ingenuity of the person manufacturing or deploying the devices, so multiple configurations are always plausible. One design constraint, however, relates to the attackers' preferences for proximity to the target. In some cases, the attackers may choose to commit suicide in the process of carrying out the attacks; in others, they may wish to escape harm or detection by remaining distant from the device. The modes of initiation given in Table 14.2 are intended to provide an illustration and are not comprehensive.

Table 14.1
Types of IED delivery systems

Type of delivery	Target	Remarks
Vehicle-borne	Personnel/infrastructure	LVBIED* VBIED**
Person-borne	Personnel	PBIED***
Passive	Personnel/vehicles	Land mine types
Directional	Vehicles/infrastructure	Projected devices, missiles, and rockets
Placed	Personnel/vehicles/ infrastructure	

* Large vehicle-borne IED.

** Vehicle-borne IED.

*** Person-borne IED.

Effect on development

Readily available ammunition and explosives from unsecured stockpiles fuel armed violence, which can cause significant loss of life and damage, but can also potentially impact on post-conflict development. For example, on 19 August 2003 an IED that used conventional ammunition as its main explosive charge detonated at the UN headquarters in Baghdad, resulting in the deaths of the UN Special Representative and 22 international and NGO staff. As a result of this incident, the UN withdrew the majority of its personnel from Iraq, and UN operations in the country, including reconstruction and development activities, effectively ceased.

Table 14.2
IED initiation modes

Initiation mode	Initiation system	Remarks
Timed	Chemical decay	
	Clockwork	
	Electronic timer	
Command-initiated	Suicide	PBIED Can also be timed
	Radio-controlled (RCIED)	
	Command wire (CWIED)	
	Passive infrared	
	Active infrared	
	Projectile-controlled (PCIED)	Uses a rifle bullet to connect a circuit from a distance
Victim-operated (VOIED)	Booby traps	
	Pressure pads	
	Pull switches	

Progress to date

Unsecured conventional ammunition and explosives stockpiles are a risk for any state that experiences insurgency or civil war. Iraq is not a unique case, but it stands as an example of how access to ammunition stockpiles in post-conflict environments can provide heavy firepower to non-state actors and, ultimately, compromise post-conflict recovery. However, most commentators have failed to make the critical link between IEDs and conventional ammunition—and, notably, the issue of stockpile security. Recognizing these linkages again stresses the need for effective stockpile security and the rapid securing of stockpiles that are left open to looting. Failings in Iraq stand testament to the dangers that can arise when states or international forces fail to take such necessary measures.

Conclusion

The easy availability of ammunition stocks in immediate post-conflict environments can, unless properly secured (CHAPTER 7), act as a major source of operational capability for warring factions or non-state actors.

Failure to identify and secure such stockpiles in immediate post-conflict environments can have strategic implications for peace-building processes by adversely affecting the balance of power within a developing state. Iraq should serve as a classic example of initial tactical military success leading to strategic failure due to ineffective planning for the immediate post-conflict environment. While it is clear that ammunition stockpiles did not prompt the insurgency, its pace and intensity would arguably have been much less vigorous if these armaments had not been available.

Notes

1 This chapter is designed to illustrate the use and impact of conventional ammunition as components of IEDs. It is not intended to cover counter-IED philosophy, principles, techniques, tactics, technology, or procedures.

2 British Army Ammunition Technical Officers Course, provided by Ian Biddle.

3 Sometimes also simplistically referred to by the mnemonic SPICE: switch, power source, initiator, compartment, and explosives.

4 540,000 to 900,000 metric tonnes.

5 227,000 metric tonnes.

6 The primary explosive component of a projectile.

7 Remote initiation can be achieved using a variety of civilian wireless technologies, including garage door openers, car alarms, key fobs, door bells, and toy car remote control systems. Some IEDs use personal mobile radios and mobile phones, which allow attackers to initiate IEDs from greater distances and are more effective against countermeasures.

Further reading

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