2

Generic Types of Conventional Ammunition

James Bevan and Adrian Wilkinson

Overview

The typology of ammunition is a complex issue due to the wide range of ammunition types now available. For example, a North Atlantic Treaty Organization (NATO) armoured division is likely to stock over 1,600 different types of ammunition, which range from small items, such as 'igniter safety fuse electric' (ISFE), to much larger items such as free-flight rockets (FFRs) for multiple launch rocket systems (MLRSs). There are many different and often contradictory ways of categorizing ammunition types.

This chapter is therefore designed only for convenience in order to provide non-specialists with an overview of the more significant ammunition systems. It also provides a rough presentation of the potential each variety can pose when poorly managed or secured, including the risk of instability or mishandling leading to explosion (CHAPTER 13); the facility with which it can be diverted from national stockpiles (CHAPTER 15); and its utility in the construction of improvised explosive devices (IEDs) (CHAPTER 14).

Artillery

Artillery includes weapons and ammunition that are in the range of 75 mm calibre and above (some mortars also fall within this calibre range, and although not strictly classified as artillery, have been included here for convenience). Artillery is designed to deliver primarily indirect fire and includes the types discussed below. Because artillery ammunition is large in calibre, it

often contains significant amounts of explosive and incendiary material, which may become unstable when inadequately managed (CHAPTER 6).

Mortars over 100 mm in calibre[1]

Mortar 'bombs' are loaded with various explosive and non-explosive substances, including high explosive (HE), HE fragmentary, HE armour-piercing, and smoke and illuminating material (Ness and Williams, 2006, pp. 481–524). They range considerably in weight from under 10 kg to 130 kg.

Explosive risk	High
Risk of low-order diversion[2]	Moderate
Use in IEDs[3]	Yes

Field artillery

Field artillery ammunition is cartridge-based and manufactured in a range of formats to suit different applications, including: HE, HE fragmentary, and sub-munition-dispensing varieties for anti-personnel purposes; armour-piercing rounds for field and mountain guns; and smoke and illuminating cartridges (Ness and Williams, 2006, pp. 527–674). Ammunition designed for field artillery ranges in size from around 75 mm in calibre to close to 250 mm.

Explosive risk	High
Risk of low-order diversion	Moderate
Use in IEDs	Yes

Tank and anti-tank guns

Tank and anti-tank gun ammunition is cartridge-based and primarily designed to defeat armoured vehicles. There are various types with various applications, including: HE anti-tank (HEAT), which utilize hydro-dynamic[4] penetration; saboted[5] rounds, which use kinetic energy derived from high velocity to penetrate armour; and a range of complementary types, such as smoke and illuminating cartridges. Calibres range from around 60 mm to 125 mm (Ness and Williams, 2006, pp. 272–385).

Explosive risk	High
Risk of low-order diversion	Moderate
Use in IEDs	Yes

Naval and coastal defence guns

Naval and coastal defence guns use cartridge-based ammunition that is designed to defeat either surface (ship) or airborne targets. Ammunition types include mechanically fused fragmentary warheads that are designed to explode in the air, and HE rounds or armour-piercing ammunition for anti-ship purposes. Naval and coastal defence ammunition ranges in calibre from around 75 mm to 130 mm (Ness and Williams, 2006, pp. 389–404).

Explosive risk	High
Risk of low-order diversion	Moderate
Use in IEDs	Yes

Free-flight rockets

FFRs are unguided and designed to be used for area denial purposes. Early types were fired in barrages to improve the likelihood of hitting targets, but later types use sophisticated guidance systems and can be fired singly with great accuracy. They consist of a solid-fuel rocket motor and a variety of different warheads for various applications. They include HE fragmentation warheads for anti-personnel roles; anti-tank warheads; cargo (sub-munitions) and mine-laying variants; warheads for mine-clearing; and incendiary and smoke varieties. FFRs come in various calibres, from 50 mm multiple-launch, area-denial ammunition to single-launch, mine-clearing rockets of over 400 mm (Ness and Williams, 2006, pp. 683–717).

Explosive risk	High
Risk of low-order diversion	Moderate
Use in IEDs	Yes

Small arms, light weapons, and cannon ammunition

Small arms, light weapons, and cannon ammunition features a range of different ammunition types, from non-explosive cartridge-based ammunition to rocket-propelled HE projectiles. These varieties each pose different challenges for safe and secure stockpile management.

Cartridge-based small arms and light weapons ammunition

Small calibre cartridge-based ammunition is used in firearms and machine guns, and ranges from the smallest cartridges to those of 20 mm calibre (usually less than 14.5 mm). It is composed of a bullet, propellant, and primer, sealed within a (usually metallic) cartridge (Bevan and Pézard, 2006, pp. 26–27). Bullets are generally inert, and complete rounds of small calibre ammunition are designed to be durable and stable. In contrast to larger, explosive types of ammunition, they represent a minimal explosive or incendiary risk when poorly managed.

Explosive risk	Low
Risk of low-order diversion	High
Use in IEDs	No

Cannon ammunition

Cannon ammunition is cartridge-based and operates in the same way as ammunition designed for firearms. It is, however, larger (ranging from 20 mm to 57 mm) and often features armour-piercing, HE, and incendiary warheads, or combinations of the three (Ness and Williams, 2006, pp. 207–72). The addition of explosive and incendiary warheads makes them potentially less stable than small arms ammunition when poorly managed.

Explosive risk	Moderate
Risk of low-order diversion	Moderate
Use in IEDs	No

Projected grenades and hand grenades

Projected grenades are explosive weapons that are designed to fire from a cartridge (similar to a firearm) or from the muzzle of a rifle (termed a rifle grenade). Hand grenades are designed to be thrown by hand, and without the aid of a delivery weapon. The two types of grenade come in various formats and are filled with a variety of explosive and incendiary charges, ranging from white phosphorous to HE fragmentation. Most hand grenades and projected grenades are designed to detonate on impact, although some spin-stabilized grenades (a variety of projected grenade) are designed to explode in the air when in proximity to a target (a process known as air bursting). White phosphorous grenades pose a particular incendiary risk when inadequately managed.

Explosive risk	High
Risk of low-order diversion	High
Use in IEDs	Yes

Unguided light weapons ammunition

Unguided ammunition for use in light weapons varies considerably in type and application. Most types feature a two-stage, solid-fuel rocket motor and HE, HE fragmentation, or incendiary warhead. More recent developments include fuel-air 'thermobaric' warheads.

Mortar bombs of 82 mm calibre and below may also be considered as unguided light weapons ammunition.

Explosive risk	High
Risk of low-order diversion	High
Use in IEDs	Yes

Guided light weapons ammunition

Guided ammunition for light weapons includes missiles for use in anti-tank guided weapons (ATGWs) and man-portable air defence systems (MAN-

PADS) (CHAPTER 12). These weapons all use two-stage, solid-fuel rocket motors and explosive warheads. Most anti-tank missiles employ HE warheads, which include shaped charges that are designed to defeat modern armour and two-stage warheads designed for use against reactive armour. MANPADS warheads are generally fragmentary. Both ATGW and MANPADS missiles are delicate pieces of equipment, which require careful handling. Because of their sophistication and capacity against modern military targets, they are politically sensitive, and controls on their transfer have received increasing attention in recent years.

Explosive risk	High
Risk of low-order diversion	High
Use in IEDs	No[6]

Mines

Mines are usually defined as anti-personnel (AP), anti-vehicle (AV),[7] or anti-helicopter (AH). There are many different types of mines, which are designed for widely differing applications and employ different fuses. In many respects, they are harder to categorize than other conventional munitions.

AP mines may be blast or fragmentation, ground laid, or scatterable, with mechanical, tripwire, or electronic fusing systems. The explosive weight is usually below 250 g, although there are exceptions.

AV mines may be pressure, tripwire, electronic, or sensor fused. They can be buried, surface laid, or off-route, and contain an explosive weight of up to 7.5 kg. Warhead options include blast, shaped charge (HEAT), ballistic disc self-forging fragment (Misznay Schardin), or explosively formed projectiles.

AH mines are relatively new, highly complex, and unlikely to be encountered in large numbers in post-conflict environments or decaying stockpiles.

Whatever the type of mine, they all contain: 1) a warhead; 2) a fuse and/or sensor; 3) a power source (even if one reliant on chemical potential energy); and 4) a safety and arming unit.

Explosive risk	High
Risk of low-order diversion	High
Use in IEDs	Yes

Pyrotechnics

The range of pyrotechnic devices is vast, from safety matches and smoke grenades, through gas generators to explosive bolts, and it is not practical to list them all in this short overview. They are often defined by the desired effect, e.g. 1) light; 2) sound; 3) heat; 4) mechanical movement; 5) decoy; 6) cutting, etc.

Pyrotechnic devices combine high reliabilty with very compact and efficient energy storage, essentially in the form of chemical energy that is converted via expanding hot gases into the desired effect. The controlled action of a pyrotechnic device (initiated by any of several means, including an electrical signal, optical signal, or mechanical impetus) makes possible a wide range of automated and/or remote mechanical actions, e.g. deployment of safety equipment and services (ejector seats), or precisely timed release sequences (carrier shells).

Incendiary risk	Moderate
Risk of low-order diversion	Low
Use in IEDs	No

Explosives

Explosives may be categorized as primary high explosives, which are shock- and flame-sensitive, and are used in detonators and initiators; or secondary high explosives, which are initiated by shock and are used in main fillings of other ammunition or as demolition charges.

Modern military secondary high explosives have good long-term stability and are specifically formulated for the type of ammunition that they are to be used in (e.g. RDX/Wax for demolition charges, or RDX/TNT for main fillings).

The chemical formula of an explosive should also be checked, as different nations often refer to the same type of explosive in different ways (e.g. RDX by NATO and Hexogen by former Warsaw Pact countries).

Explosive risk	High
Risk of low-order diversion	High
Use in IEDs	High

Guided missiles

Guided missiles come in a wide range of types, sizes, and functions, from shoulder-launched anti-tank (ATGMs) and shoulder-launched surface-to-air missiles (MANPADS), through medium systems such as ATGWs to large surface-to-surface guided systems such as the Army Tactical Missile System (ATACMS) launched individually from an MLRS platform. The smaller, man- or vehicle-portable varieties are considered under guided light weapons ammunition (see above).

Guided missiles differ from FFRs in that they have a guidance system and usually a much more sophisticated fusing system.

Explosive risk	High
Risk of low-order diversion	Low
Use in IEDs	No (too valuable for other uses)

Notes

1 Mortars under 100 mm in calibre are designated light weapons due to their portability; see UNGA (1997; 2003).

2 Low-order diversion is the theft of relatively minor quantities of munitions by individuals and small groups of individuals (CHAPTER 15).

3 Conventional ammunition is now often used as the main explosive charge in IEDs in post-conflict environments (CHAPTER 14).

4 In non-specialist terms, hydro-dynamic penetration equates to a shaped explosive charge that, upon detonation, creates a high-velocity jet of molten metal (technically in a state of 'superplasticity') in order to penetrate solid armour.

5 A sabot is support that is designed to carry a dart-shaped projectile along a rifled barrel. Upon leaving the barrel, the sabot falls away after having imparted momentum to the projectile.

6 When in ready-to-fire configuration.

7 Or, alternatively, anti-tank (AT).

Further reading

Bevan, James and Stéphanie Pézard. 2006. 'Basic Characteristics of Ammunition: From Handguns to MANPADS.' In Stéphanie Pézard and Holger Anders, eds. *Targeting Ammunition: A Primer.* Geneva: Small Arms Survey, pp. 17–45.

Foss, Christopher. 2006. *Jane's Armour and Artillery 2006–2007*. Coulsdon: Jane's Information Group.

Ness, Leland and Anthony Williams. 2006. *Jane's Ammunition Handbook 2006–2007*. Coulsdon: Jane's Information Group.

O'Halloran, James and Christopher Foss. 2006. *Jane's Land-based Air Defence 2006–2007*. Coulsdon: Jane's Information Group.

Bibliography

Bevan, James and Stéphanie Pézard. 2006. 'Basic Characteristics of Ammunition: From Handguns to MANPADS.' In Stéphanie Pézard and Holger Anders, eds. *Targeting Ammunition: A Primer*. Geneva: Small Arms Survey, pp. 17–45.

Foss, Christopher. 2006. *Jane's Armour and Artillery 2006–2007*. Coulsdon: Jane's Information Group.

Ness, Leland and Anthony Williams. 2006. *Jane's Ammunition Handbook 2006–2007*. Coulsdon: Jane's Information Group.

O'Halloran, James and Christopher Foss. 2006. *Jane's Land-based Air Defence 2006–2007*. Coulsdon: Jane's Information Group.

UNGA (United Nations General Assembly). 1997. *Report of the Panel of Governmental Experts on Small Arms*. 27 August. Reproduced in UN document A/52/298 of 27 August.

——. 2003. *Continuing Operation of the United Nations Register of Conventional Arms and Its Further Development*. A/58/274 of 13 August.