

CHAPTER 3

Weapons Identification: Small Arms

Introduction

When most people think of ‘guns’, they are thinking of small arms. Broadly speaking, small arms are firearms intended for use by individuals. Small arms are the primary weapons issued to military, law enforcement, and other armed security personnel, and are widely owned and used by civilians for hunting, sport shooting, and other pursuits. The key characteristics of firearms considered to be small arms are their portability (they may be transported and operated by a single individual on foot), and their calibre (less than 20 mm) (ARES, 2017; forthcoming).

This chapter begins with a brief presentation of key types of small arms, addressing their history and technical development. The chapter then provides an overview of the most important physical features and markings by which these arms are identified. It also briefly examines feed devices (such as magazines), accessories, packaging, and shipping documentation, which can provide valuable information about the provenance of firearms. Ammunition for small arms is addressed in Chapter 4.

History and technical development

Today’s small arms have their roots in the Victorian era. Some manually-operated rifles, in particular, have changed little since the late 19th century. The revolver predates the invention of modern cartridges, and the archetypal self-loading pistol created in 1911 as the Colt ‘Government Model’ is still in military use today. Even the automatic machine gun was being sold to authorities around the world by 1897. By the end of the First World War, all of the categories of small arms now in use had been invented, if not finalized in their design or application (ARES, 2017).

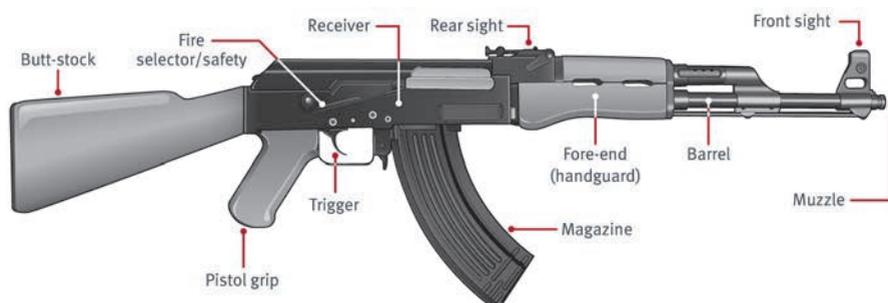
Firearms: a brief description

Modern firearms take many different forms, but they all have the following components: a ‘stock’ (and/or pistol grip), a ‘barrel’, and the ‘action’, which refers to the operating components of a weapon.²² One of the main parts of a stock (and, in some guns, the only part) is the ‘butt-stock’. This is the portion of a long gun

22 The word ‘firearm’ was originally coined in the medieval period and referred to any weapon making use of fire for destructive effect. Though it became, and remains for most English speakers, synonymous with ‘gun’, a ‘firearm’ can more properly be considered to be a man-portable gun (ARES, 2016a).

(such as a rifle or shotgun) which is braced against the shoulder when firing. In the case of handguns, the pistol grip is used to secure the weapon when firing. In the years following the Second World War, many long gun designs also came to feature a pistol grip. The barrel is the tube through which the projectile ('bullet') travels after a cartridge is discharged. The group of components that comprise the action varies depending on the type of firearm, but includes the components that load and fire ammunition, and that extract and eject fired cartridge cases (ARES, 2017). Figures 3.1 and 3.2 show the general arrangement and key physical features of a self-loading rifle and self-loading pistol—in this case, a self-loading rifle with a detachable box magazine and a self-loading pistol, respectively.

Figure 3.1 Typical features of a modern military rifle

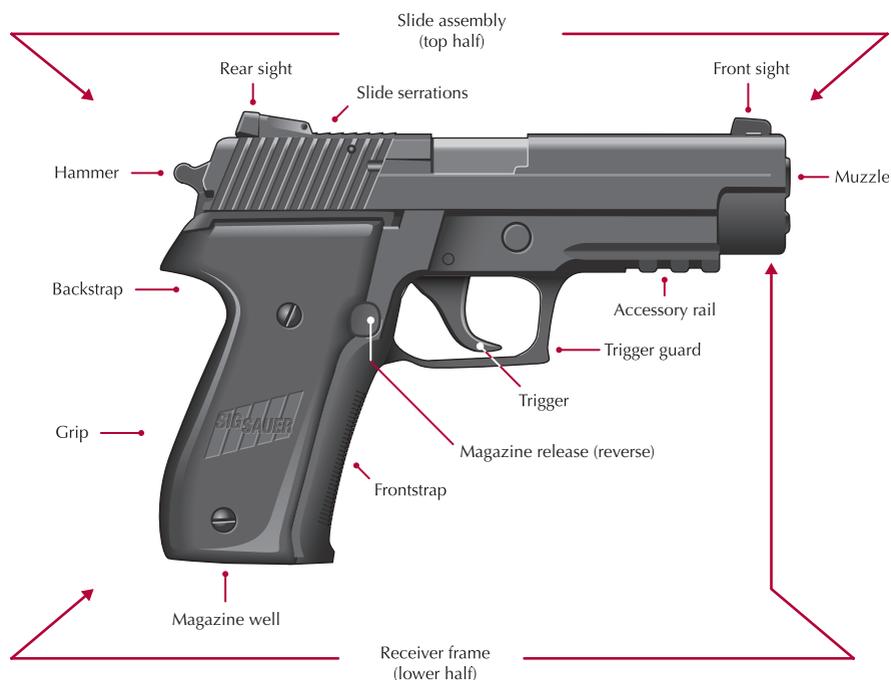


The ammunition used in most modern firearms is called a 'cartridge'. Cartridges consist of:

- a **projectile**, or bullet, which is fired from the gun;
- a **propellant**, which, when ignited by a primer (below), generates the gas pressure that propels the projectile out of the barrel;
- a **primer**, which consists of chemicals designed to be ignited by a firing pin in the weapon; and
- a **cartridge case**, which contains the components of a complete round of ammunition and, when the weapon is fired, blocks the escape of gases in a way that causes pressure to build up behind the projectile (Goad and Halsey, 1982; Jenzen-Jones, 2016a, p. 13).²³

23 With the exception of caseless ammunition. There are various types of ammunition, many of which are discussed in Chapter 4.

Figure 3.2 Typical features of a modern handgun



Nearly all firearms function in the same basic manner. The operator pulls the trigger, causing an internal mechanism to allow the weapon's firing pin to strike the primer, located in the base of the cartridge. The primer ignites the propellant, which generates rapidly-expanding gases as it burns. The build-up of pressure from the expanding gas within a sealed chamber (the 'breech') pushes the projectile down the barrel, out of the muzzle, and towards the target (see Figure 3.3). The discharge of a firearm is accompanied by a flash and blast at the muzzle, and by recoil that is typically perceived by the user (ARES, 2017).²⁴

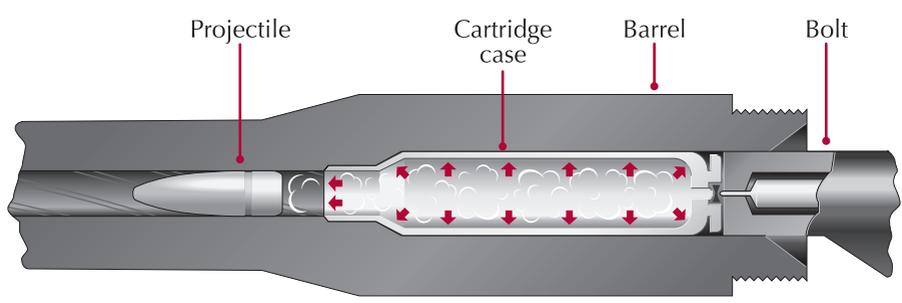
Modern firearms—with the notable exception of shotguns—primarily feature rifled barrels (see Figure 3.4). Rifling refers to the internal geometry, typically either spiral grooves or polygonal faces inside the bore which engage the projectile and cause it to rotate as it is accelerated up the barrel (see Figure 3.5). This

²⁴ This is properly known as 'perceived recoil' or 'felt recoil', but is often referred to simply as 'recoil' (ARES, 2017).

rotation imparts gyroscopic stability to the projectile, ensuring that it flies accurately and point first (ARES, 2016a).

Firearms make use of a variety of operating systems ('actions'). At their most basic, firearms allow the user to load and chamber a cartridge, fire the weapon, and then extract and eject the fired cartridge case. More complex operating systems allow for semi-automatic and automatic fire, in which the firearm is (re)cocked for the next shot when it is discharged (ARES, 2017).²⁵

Figure 3.3 The build-up of gas pressure behind a projectile during the firing sequence of a firearm

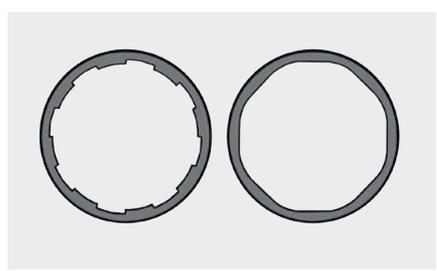


Note: The cartridge case and bolt face provide a gas seal.
Adapted from: Chinn (1955, p. 4)

Figure 3.4 Rifled and smooth-bore barrels



Figure 3.5 Conventional grooved rifling (left) and octagonal polygonal rifling (right)



Source: Wikimedia Commons

25 Automatic firearms are sometimes described as having 'fully-automatic', 'full automatic', or 'full auto' operation. While these terms are commonplace in civilian, military, and occasionally even technical use, the term 'automatic' is sufficient.

In general terms, firearms are either manually-operated or self-loading.

- **Manually-operated firearm:** a firearm which relies on the user, rather than the potential energy stored within a cartridge, to cycle the weapon (ARES, 2017).
- **Self-loading firearm:** a firearm which uses the energy stored in a cartridge to cycle the weapon's action, extracting and ejecting the cartridge case immediately after firing, and chambering a new cartridge from the weapon's magazine (ARES, 2017).

Whether operated by manual or purely mechanical means, each cartridge in a repeating weapon²⁶ is subjected to a similar operating cycle: it is loaded from the feed device (or manually loaded) into the gun's chamber, the bolt is locked to the rear of the breech, the cartridge is fired, the bolt is unlocked, and the cartridge is then extracted from the chamber and ejected. The vast majority of firearms in existence today are repeating firearms.

The most common types of operating system for manually-operated firearms are break-action, bolt-action, pump-action, and lever-action.²⁷ All of these systems rely on the shooter to physically manipulate one or more components of the firearm to unlock the action, extract (and generally eject) the fired cartridge case, chamber a new cartridge, and lock the action (ARES, 2017). These systems are most common among rifles and shotguns.

Self-loading firearms include a wide variety of operating mechanisms. Weapons firing low-powered ammunition typically utilize a simple blowback action.²⁸ More powerful ammunition requires a locked breech mechanism. This may be recoil-operated or gas-operated, or use some form of retarded blowback.²⁹

26 Generally speaking, a 'repeating' firearm is one in which the number of cartridges held in the weapon is greater than the number of barrels, where one or more cartridges are held elsewhere than the firing chamber, and where more than one shot can be fired before the weapon needs to be reloaded (ARES, 2017). Note that not all weapons make use of a locked breech design.

27 Break-action weapons are not repeating firearms, whereas bolt-, pump-, and lever-action types are (ARES, 2017).

28 A simple blowback action is one in which the bolt is not locked to the breech on firing, being held in place only by its own inertia and the return spring. This is only suitable for relatively low-pressure ammunition, such as handgun cartridges or some cartridges for automatic grenade launchers (ARES, 2017).

29 For explanations of these actions, see ARES (2017).

The key distinction within self-loading firearms is between semi-automatic and automatic firearms.

- **Semi-automatic firearm:** a self-loading firearm which is capable of firing only one shot with each trigger pull (ARES, 2017).
- **Automatic firearm:** a self-loading firearm which is capable of firing multiple shots with a single trigger pull (ARES, 2017).

Most rifles in military service today are self-loading designs capable of automatic fire. Semi-automatic versions are available for many of these rifles, which are used for civilian self-defence, law enforcement, and sporting and hunting applications in some countries (Jenzen-Jones, 2017d). It can often be difficult to visually differentiate automatic from semi-automatic variants of the same basic design, and so the term 'self-loading' is preferred in these cases. Self-loading pistols are the dominant class of handgun today, in widespread global use by armed forces, law enforcement and, in many countries, civilians. They are also known as 'semi-automatic pistols' (ARES, 2017).

Handguns

The modern term 'handgun' came into use in the early 20th century as an umbrella term for non-repeating pistols, self-loading pistols (see Image 3.1), and revolvers (see Image 3.2).³⁰ Today the self-loading pistol dominates (see Figure 3.6); revolvers, though still frequently encountered in the civilian world, are less commonly used by militaries or law enforcement personnel. In militaries, pistols are primarily used as weapons for personal defence only. Pistols are still widely used by law enforcement agencies, civilians, and criminals, however, primarily because they are highly portable and concealable (ARES, 2017).

Sub-machine guns

The sub-machine gun (SMG) was conceived as a fully portable automatic weapon that could be employed at close range by an individual user. SMGs have shorter barrels than most machine guns and rifles, and typically fire pistol-calibre

³⁰ Following their introduction in the 19th century, revolvers were commonly known as 'revolver pistols'. This label is uncommon today, but remains technically accurate.

Image 3.1 A Soviet Baikal PM 9 × 18 mm self-loading pistol



Source: N.R. Jenzen-Jones/ARES

Image 3.2 A Belgian C.F. Galand 12 × 15.5 mm revolver



Source: N.R. Jenzen-Jones/ARES

Figure 3.6 Typical arrangement of a modern self-loading pistol, showing some internal components

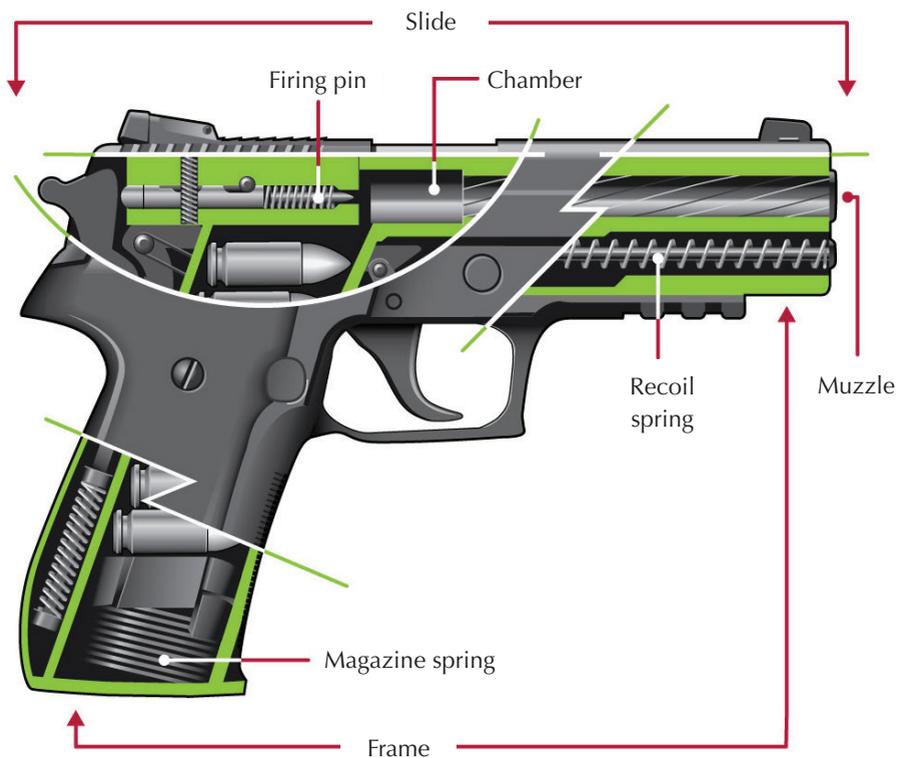


Image 3.3 An Italian Beretta Model 12S 9 × 19 mm SMG



Source: N.R. Jenzen-Jones/ARES

ammunition from high-capacity magazines (see Image 3.3).³¹ Handgun ammunition is significantly less powerful than typical rifle ammunition and requires a shorter barrel to achieve its optimum performance. As a result, SMGs have a shorter effective range (typically around 100 m) compared to rifles and machine guns (ARES, 2017). Their blowback system of operation is very simple to manufacture and maintain, and is the dominant operating mechanism for this category of firearm (ARES, 2016a).

The term ‘SMG’ also includes most firearms described as ‘personal defence weapons’ (PDWs) (see Image 3.4). The latter term is primarily a description of a weapon’s intended role rather than a useful technical distinction, although it may also imply a use of high velocity ammunition intended to penetrate body armour.³² Generally, SMGs are compact and lightweight.

³¹ Both the common 9 × 19 mm Parabellum cartridge and a high-capacity drum magazine originally designed for the Luger pistol (1902) were incorporated into the first deployed SMG in 1918, the German Bergmann MP.18,1 (Forgotten Weapons, 2017b; Popenker and Williams, 2012).

³² Two relatively common rounds in service are the 4.6 × 30 mm HK and 5.7 × 28 mm FN (ARES, 2016a).

Image 3.4 A German Heckler & Koch MP7 4.6 × 30 mm SMG



Note: This type of SMG is regarded by some as a ‘personal defence weapon’. There is a void at the base of the pistol grip; the box magazine is absent in this image. There is also a muzzle protector covering the flash hider.

Source: N.R. Jenzen-Jones/ARES

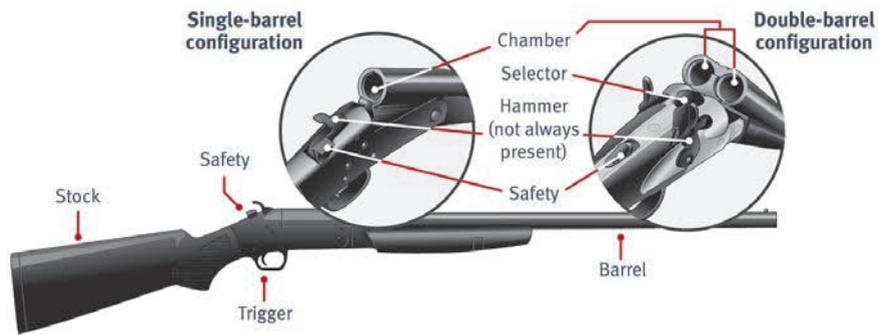
In recent years, the short-range SMG has fallen from favour among militaries and law enforcement agencies, which increasingly use compact variants of self-loading rifles instead (ARES, 2017; Jenzen-Jones, 2017d).³³

Shotguns

The simplest common modern shotgun design, the break-open breech-loading type, was fully developed by the 1870s (Greener, 1910; Taylor, 2016). Figure 3.7 shows the typical features of a break-action shotgun, in both single-barrel and double-barrel configurations. While break-action shotguns are rarely seen in law enforcement or military service, they remain popular with civilian shooters and criminals, and are sometimes encountered with shortened (‘sawed-off’) barrels and/or stocks to enhance their concealability.

33 The short-range SMG’s fall from favour largely coincided with the introduction and proliferation of assault rifles, especially compact variants such as the Colt XM177 (first introduced in 1966) (ARES, 2016a). Even semi-automatic pistol-calibre carbines used by law enforcement personnel have been largely supplanted by intermediate calibre equivalents.

Figure 3.7 Typical features of a break-action shotgun



Adapted from: ATF (2018)

The first successful pump-action shotguns were introduced by Winchester in 1897 (Taylor, 2016). These types of shotguns are now in common civilian and law enforcement use (see, for example, Images 3.5, 3.6). Their typical features are shown in Figure 3.8. Bolt and lever-action shotguns of a design introduced in the late 19th century are in limited use, almost entirely by civilians. Self-loading shotguns, using systems of operation developed for machine guns and rifles, did not become popular until the mid-20th century (ARES, 2016a).³⁴ While self-loading shotguns are widely used by sport shooters and law enforcement agencies,

Figure 3.8 Typical features of a pump-action shotgun



Adapted from: ATF (2018)

34 An example of this type of weapon is the recoil-operated Browning Automatic 5.

Image 3.5 An American Remington Model 870 Wingmaster 12-gauge pump-action shotgun



Source: Bear Arms Firearms Reference Collection via ARES

Image 3.6 An Italian Benelli M1 Super 90 12-gauge self-loading shotgun



Source: N.R. Jenzen-Jones/ARES

true automatic shotguns have never achieved mainstream usage.³⁵ Shotguns have only ever filled very specific niches in military service, but are frequently encountered in conflict zones due to their ready availability on the civilian market and their widespread use by law enforcement personnel (ARES, 2017).

Rifles

In the 1860s, breech-loading rifles and carbines were introduced to take advantage of new self-contained cartridges.³⁶ The definitive manually-operated mechanisms

³⁵ As is the case with rifles, semi-automatic shotguns are sometimes erroneously referred to as ‘automatic shotguns’. They are also referred to as ‘auto-loading shotguns’ or ‘autoloaders’ which may also generate confusion (see, for example, Remington, n.d.).

³⁶ Early rifles were expensive niche weapons, primarily produced for sporting purposes. Military interest was limited to specialist rifle units until the mid-19th century, when rifled muskets firing the Minié-type bullet became common (ARES, 2017).

Image 3.7 A Turkish conversion of a French Berthier Modèle 1907-15 8 × 50R mm bolt-action rifle



Note: Despite being a very old design, similar rifles are still encountered in limited numbers in conflict zones.
Source: N.R. Jenzen-Jones/ARES

still used today emerged from this period of innovation, including the bolt, lever, and pump actions (ARES, 2017; see Image 3.7). Bolt-action rifles remain in limited military service today, often as dedicated sniper rifles with an effective range of more than 1,000 m for individual targets (Jenzen-Jones, 2017c; 2017d; see Image 3.8). Lever- and pump-action rifles, however, have fallen out of favour for military and law enforcement purposes (ARES, 2016a). The French invention of smokeless powder in the 1880s allowed for increased velocities and reduced fouling, resulting in the first self-loading and automatic rifle designs (Jenzen-Jones, 2017d).

Self-loading rifles were first widely adopted during and after the Second World War. They are the primary weapon for most infantry, and are in widespread use among non-state armed groups (Jenzen-Jones, 2017d). Self-loading rifles also

Image 3.8 A Canadian PGW Defence Technologies Timberwolf .338 Lapua Magnum (8.6 × 70 mm) bolt-action rifle



Note: In this case, the bolt-action rifle is fitted with a telescopic sight and suppressor. This type of rifle is representative of a dedicated sniper rifle in modern military service.
Source: Chloe Tousignant/ARES

Image 3.9 A French Manufacture d'armes de Châtellerault Carabine de Cuirassier Modèle 1890 8 × 50R mm bolt-action rifle



Note: This type of bolt-action rifle was historically considered to be a 'carbine'.

Source: N.R. Jenzen-Jones/ARES

dominate law enforcement and civilian markets. Semi-automatic variants of assault rifles, which are often referred to as 'modern sporting rifles' and are popular among civilians in some countries, should not be confused with true (i.e. automatic) assault rifles, nor labelled as such (ARES, 2016a; Jenzen-Jones, 2017b).³⁷

The term 'carbine' is widely used, but it is too imprecise to meaningfully define any particular group of small arms in modern usage and often causes confusion. It originated as a reference to a specific military rifle of reduced size, weight, and smaller calibre issued primarily to cavalry and other units which did not require a full-sized rifle (see Image 3.9). Since then, the term carbine has devolved into a colloquial or marketing term for any relatively short-barrelled shoulder arm, and, as such, has little descriptive value and should be avoided (ARES, 2016a; 2017).

Anti-tank rifles and anti-materiel rifles

Anti-tank rifles (ATR) originated in the First World War as a response to the deployment of the tank in 1916 (see Image 3.10). Typical examples include manually-operated and semi-automatic rifles firing either very high-velocity 7.92 mm ammunition, or larger calibres of 12.7–20 mm, all of which fired solid, armour-piercing projectiles.³⁸ During the Second World War, tank armour became

³⁷ Recent combat experience has resulted in a limited return to more powerful, medium-range, self-loading and automatic infantry rifles (often called Designated Marksman Rifles or DMR) to plug a 'capability gap' and operate out to 800 m (Jenzen-Jones, 2016a).

³⁸ The concept was first embodied in the Mauser M1918 Tankgewehr, functionally a scaled-up bolt-action rifle, and further developed by the Soviets with their PTRS-41, an adaptation of self-loading rifle technology to a much larger 14.5 × 114 mm cartridge (ARES, 2017).

Image 3.10 An Imperial German Mauser Tankgewehr 18 13 × 92SR mm anti-tank rifle



Source: Rock Island Auctions

essentially impervious even to comparatively powerful small- and medium-calibre cartridges, and ATRs fell out of use. Today, the task of defeating tanks has been taken over by combatants armed with recoilless weapons and portable rocket and missile launchers. However, militaries repurposed ATRs for use against other targets, and rifles in similar calibres are now known as ‘anti-materiel rifles’ (AMRs) (ARES, 2017).³⁹

The US Barrett M82 (1982) was specifically developed for the anti-materiel role (see Image 3.11), and its derivatives and similar designs are now in widespread use alongside very limited numbers of older ATRs. AMRs are employed against a variety of targets, including soft-skinned vehicles (vehicles with no armour),

Image 3.11 An American Barrett M82A1 .50 BMG (12.7 × 99 mm) anti-materiel rifle



Source: Wikimedia Commons/Heavenneath

³⁹ Both ‘anti-tank rifles’ and ‘anti-materiel rifles’ are role-based terms, and these weapons should still be described by their technical characteristics and calibre (for example, manually-operated rifle chambered for 12.7 × 99 mm). Several weapons widely considered to be AMRs are technically light cannon (ARES, 2017).

light armoured vehicles, aircraft on the ground, and personnel at long range (up to 2,000 m), and for explosive ordnance disposal (ARES, 2016a; 2017). To maximize effectiveness, these rifles often use ammunition with incendiary and explosive as well as armour-piercing characteristics (see Chapter 4).⁴⁰

'Assault rifles'

Assault rifles are a specific subset of self-loading rifles. The term 'assault rifle' was coined in Germany during the Second World War to describe the Sturmgewehr StG 44, a compact automatic rifle firing shortened ammunition that was more powerful than ammunition used in SMGs but less powerful than ammunition used in military rifles and machine guns (ARES, 2016a; Clapham et al., 2016).⁴¹ The purpose of these weapons was to provide greater effective range than a SMG while also allowing for controllable automatic fire from the shoulder (Jenzen-Jones, 2017d). The definitive assault rifle still in common use globally remains

Image 3.12 A British Imperial Defence Services MG4A5 5.56 × 45 mm self-loading rifle



Note: This type of self-loading rifle is considered by some to be an 'assault rifle' and/or a 'carbine'. It is difficult to visually distinguish this British example from US-made AR-15 and M16/M4 series rifles.

Source: N.R. Jenzen-Jones/ARES

⁴⁰ A modern, in-service example is the Nammo 12.7 × 99 mm NM140F2 multipurpose cartridge (Nammo, 2014, p. 57).

⁴¹ The ammunition used in SMGs has a muzzle energy of approximately 500–800 J, while ammunition used in military rifles and machine guns has approximately 3,000–4,000 J muzzle energy (ARES, 2016a).

the Russian AK type, and its 7.62×39 mm cartridge is similarly ubiquitous (see Box 3.1). Assault rifles developed and deployed by Western countries are chambered for lighter cartridges.⁴² The 5.56×45 mm cartridges fired by some of these rifles (such as that in Image 3.12), which were inspired by the Armalite AR15, remain a NATO standard and are common in many parts of the world.⁴³ Assault rifles have supplanted both SMGs and other rifles as the new standard infantry weapon (Jenzen-Jones, 2017d; Popenker and Williams, 2004). While the term ‘assault rifle’ can be defined, it is relatively difficult to assess and does not add value to most reports (see Box 3.2).⁴⁴ Its use is therefore not recommended, except in specific circumstances; ‘self-loading rifle’ or ‘automatic rifle’ is generally preferred (ARES, 2017).

Box 3.1 Myths and misconceptions: ‘AK-47’

Strictly speaking, there are no Soviet or Russian AK-47 rifles to be found in the field, as this designation refers to a small number of prototype weapons that were never issued. The original mass-produced rifle based on the AK-47 prototype was designated simply AK (Avtomat Kalashnikova) in 1948, and was followed by the modernized AKM (Avtomat Kalashnikova Modernizirovanny) in 1959.⁴⁵ Similarly, despite persistent accounts in Western publications, there was never a Soviet rifle designated the ‘AK-49’. The first Soviet Kalashnikov to be named for its year of introduction was the AK-74 (Avtomat Kalashnikova obraztsa 1974). There are now nearly 200 variants, derivatives, and copies of AK rifles (both licensed and unlicensed), which are produced throughout the world (Ferguson and Jenzen-Jones, 2014b; Jenzen-Jones, 2018). At least 70 million AK-type rifles have been produced since 1949, making it the most common self-loading military rifle in existence (Jenzen-Jones, 2017d).

The name ‘AK-47’ is often incorrectly applied to any Kalashnikov-derived rifle, regardless of type or country of origin. Even weapons specialists and the original manufacturer (now known as Concern Kalashnikov) have incorrectly used the term AK-47 to refer to AK variants chambered for 7.62×39 mm (for example see Image 3.13).⁴⁶ As a result of this indiscriminate usage, most firearms

42 So-called ‘small-calibre, high-velocity’ (SCHV) cartridges.

43 The 5.56×45 mm NATO cartridge was joined in the 1970s and 1980s by the Russian 5.45×39 mm and the Chinese 5.8×42 mm (Jenzen-Jones, 2017d).

44 The term is generally defined partly as a function of muzzle energy, being a rifle capable of automatic fire and chambered for an intermediate-power cartridge typically producing 1,300 J to 2,600 J of muzzle energy (ARES, 2017).

45 The very first production AK (sometimes called the ‘Type 1’) featured a largely stamped receiver before the ‘Type 2’ was introduced with a milled receiver in 1951 (followed by the ‘Type 3’, which also had a milled receiver) (Ferguson and Jenzen-Jones, 2014b; Jenzen-Jones, 2018). These early AK types may still be encountered in the field; however, even these feature a visibly machined trunnion block and are sufficiently rare that they may be conflated with the more common pre-AKM variants (the ‘Type 2’ and ‘Type 3’).

46 See, for example, Concern Kalashnikov (2014).

► identified in the news media as AK-47 rifles are not Soviet/Russian AK models. Most are AKM rifles or other derivatives of the original AK, which appear similar to the untrained eye. It is therefore recommended that the term AK-47 be avoided. When the specific model of a particular rifle cannot be identified, the catch-all term ‘AK-type’ should be used instead.⁴⁷ If the weapon bears the physical features of a known model, more specific terms, such as ‘AK-pattern’ or ‘AKM-pattern’ may be used.

Image 3.13 An Egyptian Maadi Company for Engineering Industries Misr 7.62 × 39 mm self-loading rifle



Note: This is a copy of the Soviet AKMS. Such weapons are often misidentified as visually-similar Soviet/Russian rifles.
Source: N.R. Jenzen-Jones/ARES

Machine guns

Machine guns operate in a similar fashion to contemporary self-loading and automatic rifles (see above). Early machine guns were large and heavy weapons that were mounted on vehicles or semi-mobile mounts, such as heavy tripods. The first light machine guns (LMGs) were fielded in the early 1910s, resulting in the redesignation of the heavier counterparts as ‘medium’ or ‘heavy’ machine guns (Gander, 1993; Popenker and Williams, 2008).⁴⁸ Modern LMGs are chambered for rifle ammunition and are usually operated by a single individual but, unlike assault rifles, they are designed for sustained automatic fire (typically in short bursts). They therefore tend to feature heavier barrels and a bipod. Many machine

⁴⁷ ‘Kalashnikov-type’ is also used, although the weapon in question may be confused with other weapons designed by Kalashnikov and bearing his name, such as the Pulemet Kalashnikova (‘Kalashnikov machine gun’), or PK, and the later PKM (Pulemet Kalashnikova Modernizirovannyy).

⁴⁸ Indeed, the M1918 Browning Automatic Rifle was directly adapted as a LMG, primarily by the addition of a bipod (Ballou, 2010).

Image 3.14 A Belgian FN Herstal Minimi Para 5.56 × 45 mm LMG



Note: This type of LMG is referred to in US military service as a 'squad automatic weapon'.
Source: N.R. Jenzen-Jones/ARES

Image 3.15 A British L86A2 5.56 × 45 mm LMG



Note: This type of LMG is referred to in British military service as a 'light support weapon'.
Source: N.R. Jenzen-Jones/ARES

guns are belt-fed and/or feature interchangeable barrels, although some have fixed barrels and box magazines. LMGs are also sometimes referred to as 'squad automatic weapons' (SAW) or 'light support weapons' (LSW) (ARES, 2017; see Images 3.14, 3.15).

The general-purpose machine gun (GPMG) is a belt-fed weapon that can be used by dismounted infantry (soldiers operating on foot) or attached to a heavier mount or vehicle for sustained fire applications (Popenker and Williams, 2008; see Image 3.16).⁴⁹ The more flexible GPMG supplanted both the dedicated medium machine gun and so-called 'heavy' machine guns chambered for smaller calibres (such as the Maxim gun) (ARES, 2017).⁵⁰ The subcategory is probably best defined by the Belgian FN MAG 58 (1958) and the Russian PK (1961) types.

Image 3.16 A Hungarian copy of the Soviet PKM 7.62 × 54R mm GPMG



Source: Kristóf Nagy/ARES

⁴⁹ Early examples include the German MG 34 and MG 42.

⁵⁰ The modern HMG is a larger-calibre weapon typically operated by a crew and classified as a light weapon (see Chapter 5).

Box 3.2 Myths and misconceptions: ‘assault weapon’

The term ‘assault weapon’ is essentially meaningless outside of specific legal usage in the United States, where it has been defined by a range of primarily cosmetic features to be found on various designs of military rifles (typically, but not exclusively, assault rifles), rather than the operating characteristics of the weapon itself (ARES, 2017). These definitions, largely introduced in the 1994 Assault Weapons Ban, actually covered civilian-owned, semi-automatic rifles, albeit those closely based upon their selective-fire military counterparts (ATF, 2015; ARES, 2016a).⁵¹ Beyond this, politicians, the popular media, and the general public have adopted the term essentially as a synonym for ‘assault rifle’.

The term ‘assault weapon’ has never been used in specialist circles except when referring to certain types of light weapon, including the M47 Dragon anti-tank guided weapon (US Army, 1982). Without qualifying language, however, the term is so imprecise as to apply to almost any offensive weapon, and it is highly recommended that it should not be used except when referring to a particular model of weapon by name, such as the MK 153 Mod 0 shoulder-launched multipurpose assault weapon (SMAW) (USMC, 2005; see Image 3.17).

Image 3.17 A US Marine test-firing an American Nammo-Talley MK 153 Mod 2 83 mm shoulder-launched multipurpose assault weapon, 2013



Note: This shoulder-fired rocket launcher is categorized as a light weapon.

Source: United States Marine Corps

51 To confuse matters even further, these ‘semi-automatic assault weapons’—a clear contradiction in terms—were sometimes referred to as ‘SAWs’, leading to confusion with the term ‘squad automatic weapon’, described above (ATF, 2015).

Physical features

The following section identifies the key physical features of most small arms and explains how to use these features to identify and analyse individual weapons. The ideal outcome of any analysis of a particular weapon is to identify its type, model, make and/or manufacturer, country of origin, and serial number. This is not always possible for a variety of reasons, but even a more limited analysis can reveal important insights into regional arms flows, and the type and possible sources of weapons acquired by specific government agencies, non-state armed groups, and criminal organizations.

When attempting to identify a weapon, the first step is to examine the whole item in profile. Examining the whole item often allows for the recognition of a distinctive combination of features before each feature is examined individually. As explained above, many small arms share several common features. Each of these features reveals important information about the weapon under examination. Figure 3.9 shows the main parts of a typical rifle, in this case a Soviet AKM self-loading rifle.

Figure 3.9 Typical features of a modern military rifle



Note: With handguns, what might be termed the 'receiver' is typically referred to as a 'frame'. The slide of a self-loading pistol is similar to the 'upper' receiver of a rifle. Pistols by definition lack a butt-stock (ARES, 2017).

Source: Chloe Tousignant/ARES

Image 3.18 A German Mauser Kar98K bolt-action rifle (top) and its component parts (bottom)

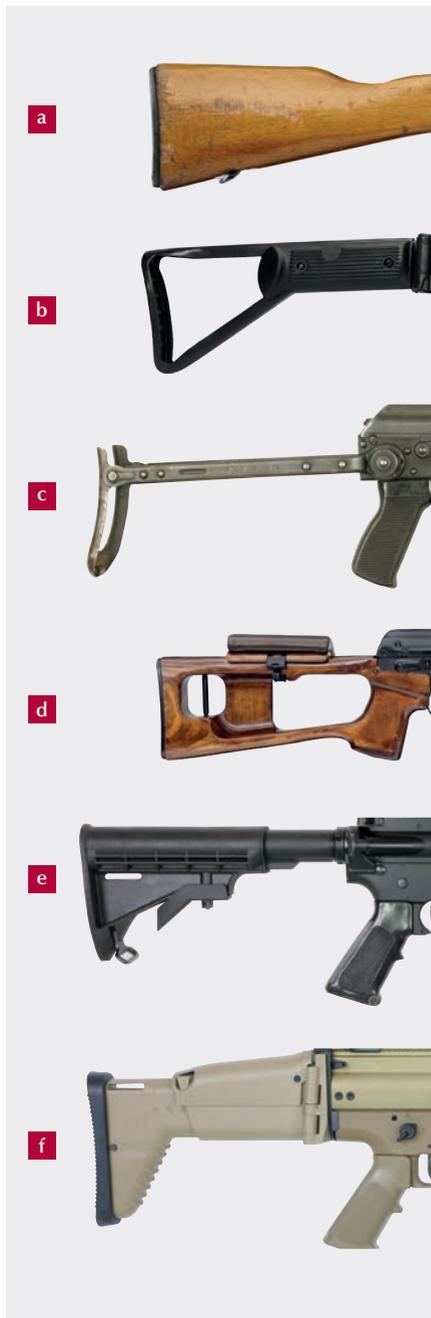


Note: The bottom image shows the wooden stock with all of the rifle's other components, including stock fittings, removed.
Source: Othais McCarthy

Stocks, butt-stocks, and fore-ends

Stocks were originally one of three primary components of primitive firearms (hence the expression 'lock, stock, and barrel' ; see Image 3.18 for an example of a weapon and its components). The stock contained and protected the two other parts; it also offered surfaces for the user to grasp and shoulder the weapon. Many recent designs have moved away from this concept, relying instead on the receiver to serve these functions, in concert with separate butt-stocks, fore-ends, and pistol grips (see below). Nonetheless, the stock remains a key component of many designs.

Butt-stocks (also 'buttstocks') are the portion of a weapon designed to be braced against the shoulder. Butt-stocks promote accuracy and, where relevant, control automatic fire. They may be integral to the stock itself or a separate component. In many modern designs, the butt-stock is the only 'stock' on the weapon (hence the terms 'stock' and 'butt-stock' are frequently used interchangeably). Most butt-stocks are either fixed (see Images 3.19a, d) or collapsible.

Image 3.19 Examples of butt-stocks

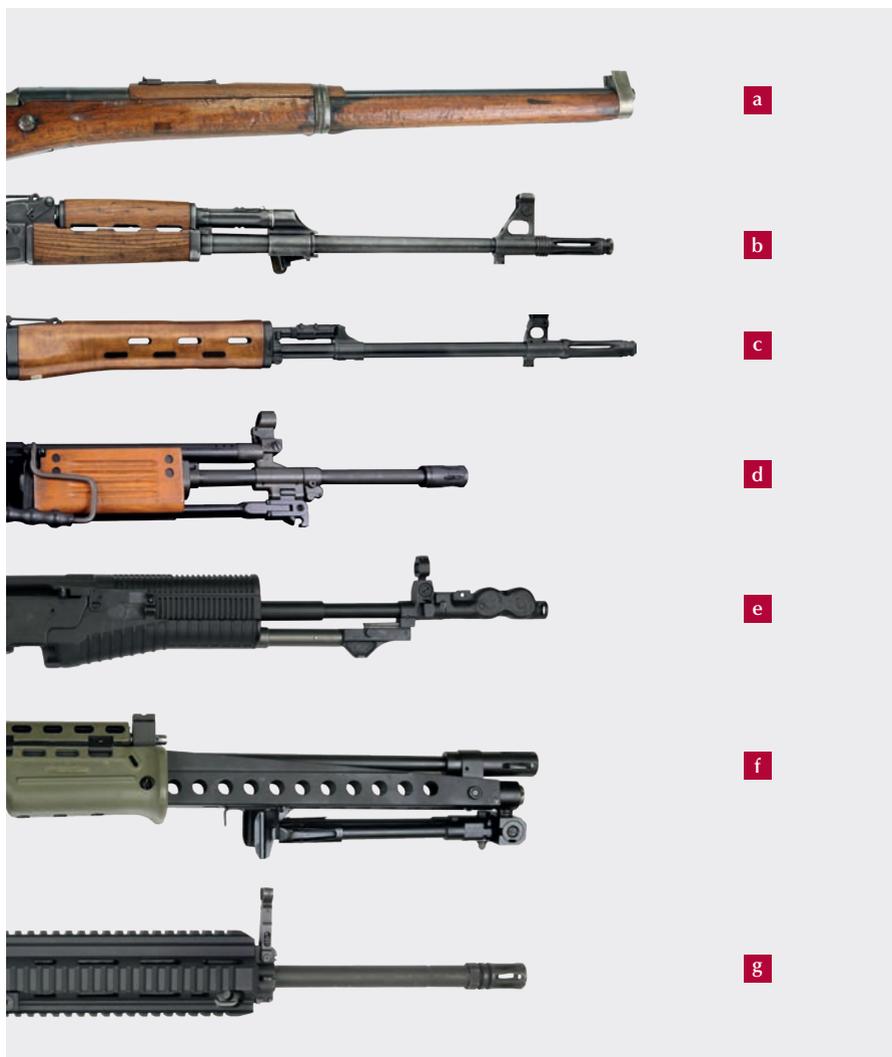
Collapsible butt-stocks are typically top-folding, under-folding (3.19c), side-folding (3.19b, f), or telescoping or 'collapsible' (3.19e). Some folding stocks are also telescoping (3.19f). Modern butt-stocks, especially those fitted to precision rifles, often incorporate other adjustable components, such as cheek pieces.

Fore-ends, or handguards, are the portion of the weapon designed to be grasped with the support hand, that is, the hand that is not used to pull the trigger. Handguards often cover portions of the barrel that would quickly become too hot to handle, particularly during automatic fire. Collectively, fore-ends and butt-stocks (along with other non-critical, ergonomic components of the weapon, such as a pistol grip) are often referred to as 'furniture'. These individual components are most often made of wood (Images 3.20a, b, c, d), polymer (3.20e, f), or metal (3.20g). In some weapons, such as pump-action shotguns, the fore-end may serve a mechanical purpose.

Note: (a) A fixed wooden butt-stock on a Chinese Type 81 self-loading rifle; (b) A side-folding metal and polymer butt-stock on a Chinese Type 81-1 self-loading rifle; (c) An under-folding metal butt-stock on a Yugoslavian Zastava M70AB2 self-loading rifle; (d) A fixed wooden 'skeletonized' thumb-hole stock on a Russian SVD self-loading rifle; (e) A telescoping ('collapsible') multi-position polymer butt-stock on a British Imperial Defence Services MG4A5 self-loading rifle; (f) A side-folding, telescoping polymer butt-stock on a Belgian FN Herstal SCAR-H self-loading rifle.

Sources: N.R. Jenzen-Jones/ARES; Robert Stott; Small Arms Survey

Image 3.20 Examples of fore-ends



Note: (a) A wooden 'full-stock' fore-end on a Turkish conversion of a French Berthier Modèle 1907-15 bolt-action rifle; (b) A wooden handguard on a Serbian Zastava M76 self-loading rifle (note gas tube above barrel); (c) A wooden laminate handguard on a Russian SVD self-loading rifle (note gas tube above barrel); (d) A wooden 'slab-style' handguard on an Israeli IMI Galil ARM self-loading rifle (note gas tube above barrel, and stowed carrying handle and bipod); (e) A polymer fore-end on a Russian AN-94 self-loading rifle (note gas tube below barrel and unusual muzzle device); (f) A polymer fore-end and metal 'outrigger' barrel support on a British L86A1 LMG (note the stowed bipod); (g) A metal 'quad-rail' fore-end (featuring accessory rails at the 12, 3, 6, and 9 o'clock positions) on a German Heckler & Koch HK416D self-loading rifle.

Sources: N.R. Jenzen-Jones/ARES; Small Arms Survey

Fore-ends may also feature bipods, bayonet lugs, rail interface systems, or leaf sights for launching grenades. Rail interface systems are increasingly common (see Image 3.20g). Rail systems provide attachment points for a range of accessories, but are primarily intended for mounting optical sights. Such rails are also sometimes attached, either permanently or as an accessory, to the receiver of a firearm. The most popular rail system is the US standard M1913 ('Picatinny') rail, from which the standard NATO rail was derived (see Images 3.20g and 3.21).⁵²

Image 3.21 A US military M4 self-loading rifle with various upgrades



Note: The fore-end features accessory rails (in this case MIL-STD-1913 'Picatinny' rail) at the 12, 3, 6, and 9 o'clock positions, as well as a length of accessory rail on the upper receiver surface. An optical sight is mounted to the receiver accessory rail and a combined forward-grip/bipod is mounted to the 9 o'clock position of the fore-end 'quad-rail'.

Source: US Army

Barrels and muzzle attachments

As explained above, the barrel of a firearm is a critical pressure-bearing component through which the projectile is accelerated before it leaves the weapon (through the muzzle) and flies towards the target. Many models and variants of firearms are most easily differentiated by their barrel length, and several 'families' or 'series' of firearms include a number of models that are essentially the same except for their barrel length (see Image 3.22). It is important to be aware that

⁵² For further information, see Arvidsson (2009).

barrels and muzzle attachments are occasionally swapped out for barrels of different lengths or fitted with different attachments, either permanently or temporarily. For example, the barrel of the Beretta ARX series of rifles can be removed and replaced with a different barrel in seconds (Ferguson, Jenzen-Jones, and McCollum, 2014). Such cases highlight the importance of precisely documenting and reporting on weapons exactly as they are encountered.

Muzzle attachments include a range of devices affixed to a weapon's barrel to achieve a desired effect. These are most commonly flash suppressors (often called 'flash hiders'), compensators, and/or muzzle brakes. Flash suppressors reduce the visibility of muzzle flash to observers by dispersing flammable waste gases as they emerge from the barrel, and preventing them from reigniting.⁵³

Image 3.22 Barrels of different lengths on Israeli IMI Galil family weapons



Source: Small Arms Survey

53 It is important to note that the spectacular muzzle flashes featured in movies and video games are most often artificially produced, and are not representative of actual flashes, particularly not of muzzle flashes observed during daylight.

Flash suppressors vary in size, shape, and design, from the simple cone seen on the Russian RP46 machine gun, to the enclosed 'bird cage' of the M16A2 or SIG 540 and 550 series (Image 3.23e), and 'prong' designs on the FN SCAR series of rifles (Image 3.23g). Various muzzle devices may be fitted to different models of firearms within the same family of weapons.

Compensators literally 'compensate' for the effects of recoil that cause the muzzle of a firearm to rise when fired. To this end, they redirect muzzle gases to counteract the recoil forces (see the distinctive AKM-pattern 'slant brake' in Image 3.23d). They are typically highly effective, but actively increase sound signature and generate significant lateral muzzle blast.

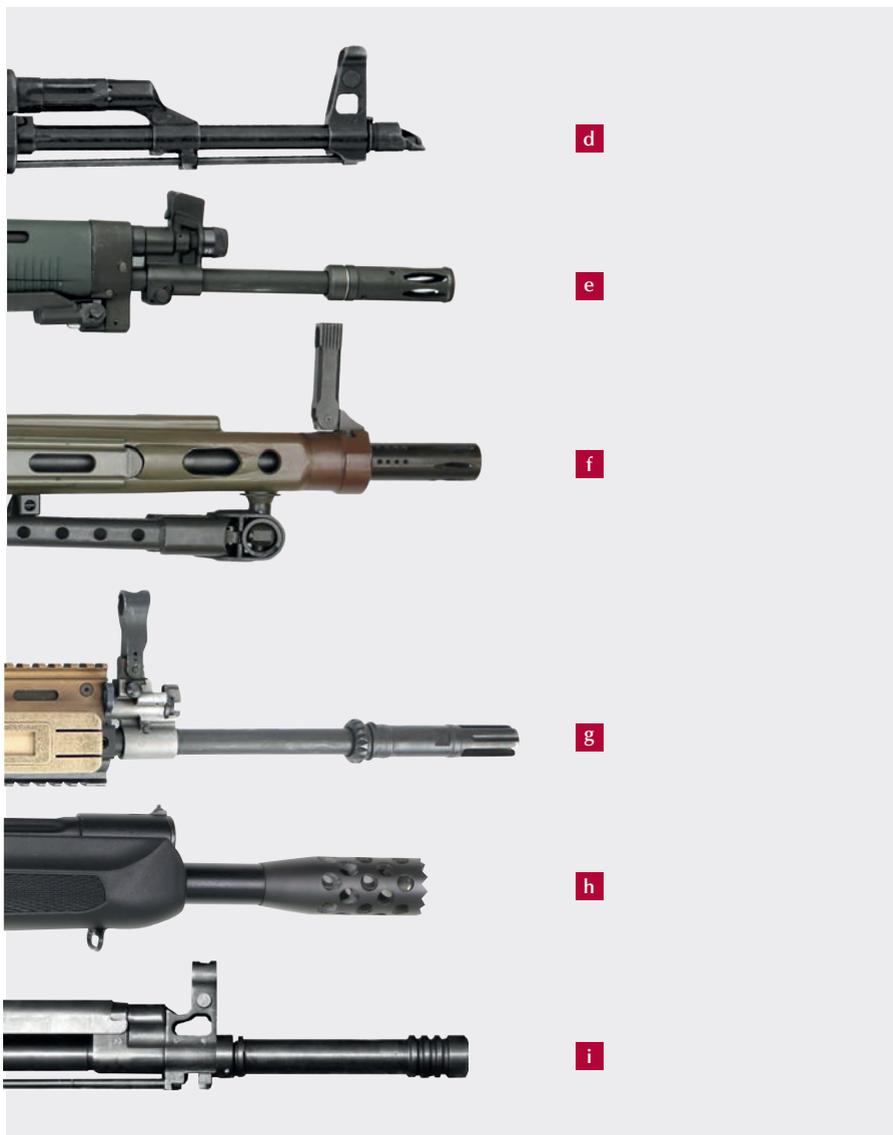
Other common attachments include bayonet lugs, 'stand-off' breaching devices (Image 3.23h), rifle grenade launching spigots, which are typically found on military rifles (Image 3.23i), and sound suppressors (see Box 3.3).

Image 3.23 Examples of muzzle attachments



Note: (a) A bare muzzle on a US Guide Lamp M3 SMG; (b) A threaded muzzle on an Italian Beretta Model 125 SMG; (c) A thread protector or 'muzzle nut' on a Chinese Type 56-1 self-loading rifle (note also the under-folding integral bayonet).

Image 3.23 Examples of muzzle attachments (continued)



Note: (d) A compensator/flash suppressor on a Soviet AKM self-loading rifle; (e) A 'bird cage' style flash suppressor on a Swiss SIG SG 540 series self-loading rifle; (f) A 'modified bird cage' flash suppressor on a Spanish CETME AMELI LMG (note also folding bipod); (g) A 'three-prong' type flash suppressor fitted to a Belgian FN Herstal SCAR-H; (h) A 'stand-off' muzzle brake/breaching device on a Russian Saiga-12 series self-loading shotgun; (i) An integral grenade-launching spigot muzzle on a Chinese Type 81 self-loading rifle.

Sources: N.R. Jenzen-Jones/ARES; Small Arms Survey

Box 3.3 Myths and misconceptions: ‘silencers’

So-called ‘silencers’, also known as suppressors or moderators, are muzzle devices or barrel designs intended to reduce the noise of firing a weapon.⁵⁴ Suppressors are most commonly found on rifles (see Image 3.24), SMGs, and handguns. However, suppressor designs have also been produced for many other firearms. The most common modern designs comprise a combination of one or more expansion chambers and a series of ‘baffles’, which reduce the velocity of muzzle gases and, consequently, the noise signature of the firearm. In many cases, suppressors also reduce muzzle flash and lead to increased accuracy (Paulson, 1996).

The term ‘silencer’ is misleading, as weapons fitted with these devices are not rendered silent. In most cases, suppressors reduce the decibel (dB) level of gunshots to a ‘hearing safe’ level (Paulson, 1996). The degree of sound suppression varies by weapon and suppressor design, calibre, cartridge, projectile, propellant type, and other factors. Suppressors are commonly portrayed as tools of assassins and hitmen but, in reality, they have a wide range of applications. In some jurisdictions, using suppressors is explicitly understood as an appropriate way to reduce hearing damage to the shooter, to reduce noise disturbance during hunting or sports shooting near residential areas, to avoid panicking livestock, and to enhance safety on firing ranges by allowing for clearer communication (BASC, 2009; Home Office, 2016).

Image 3.24 A Finnish Ase Utra suppressor fitted to an early model Australian Thales EF88 5.56 × 45 mm self-loading rifle



Source: N.R. Jenzen-Jones/ARES/Ase Utra

- 54 While ad hoc solutions for suppressing the audible signature of a weapon have been used irregularly since the advent of firearms, the first commercially successful design was produced by Hiram Percy Maxim in the early 1900s, and patented in 1909 (McCullum, 2012). It was referred to in early advertising as the ‘Maxim Silencer’ and the patent title is ‘Silent firearm’ (Greener, 1910; Maxim, 1909).

Magazines, drums, belts, and clips

Arms are commonly encountered with ammunition, often found loaded into box magazines, drum magazines, belts, and clips (see Box 3.4). Collectively, these items are known as ‘feed devices’.⁵⁵ The most commonly encountered feed devices are detachable box magazines (see Image 3.25). These items are traditionally made of stamped and often ribbed metal, but may also be plastic, and are sometimes translucent. Crucially, they include a spring and a follower to permit feeding of cartridges. Magazines often have a distinctive shape, which makes them useful for identifying the weapons to which they are attached. AKM-pattern weapons, for example, are often noted for their distinctive banana-shaped magazines. The shape of these magazines is markedly different from AK-74 magazines, which are straighter in appearance.

‘Drum’ magazines are higher capacity derivatives of the detachable box magazine. In drum magazines, cartridges are stored in a circular (rather than linear) arrangement.⁵⁶ Common drum magazines hold between 40 and 100 cartridges (see Images 3.26 and 3.27).

Image 3.25 Examples of detachable box magazines



Note: (a) A metal detachable box magazine with a slight curve to its profile, fitted to a German Heckler & Koch HK416D self-loading rifle; (b) A metal detachable box magazine with a pronounced curve to its profile, fitted to a Serbian Zastava M70B1 self-loading rifle; (c) A metal detachable box magazine with a painted finish and polymer butt-plate, fitted to a Belgian FN Herstal SCAR-H self-loading rifle; (d) A metal detachable box magazine fitted to an Italian Beretta Model 12S SMG; (e) A translucent polymer detachable box magazine fitted to a German Heckler & Koch HK417 self-loading rifle.

Source: N.R. Jenzen-Jones/ARES

⁵⁵ Note that although ammunition boxes (including drum-type examples) are often installed into fixtures on a machine gun mount for convenience and to increase the reliability of feed, they do not themselves constitute a feed device.

⁵⁶ Some arrangements are helical (see Image 3.26).

Image 3.26 Detachable drum (left) and helical drum (right) magazines



Sources: Lposka/Wikimedia Commons; Vitaly V. Kuzmin

The highest capacity feed devices are generally machine gun belts, which include disintegrating and non-disintegrating varieties. Disintegrating belts feature links that are separated during the firing cycle and are thrown clear of the weapon in a similar fashion to empty cartridge cases (see Image 3.28b). In most cases, they may be collected and reused. Non-disintegrating belts (sometimes called ‘continuous belts’) are older, but are still in widespread use (see Image 3.28a). Belts and links are often useful for identification, as are the belt feed mechanisms of machine guns (see Image 3.29). For example, the visually-similar DShK and DShKM heavy machine guns have different feed mechanisms (see Image 3.30).⁵⁷

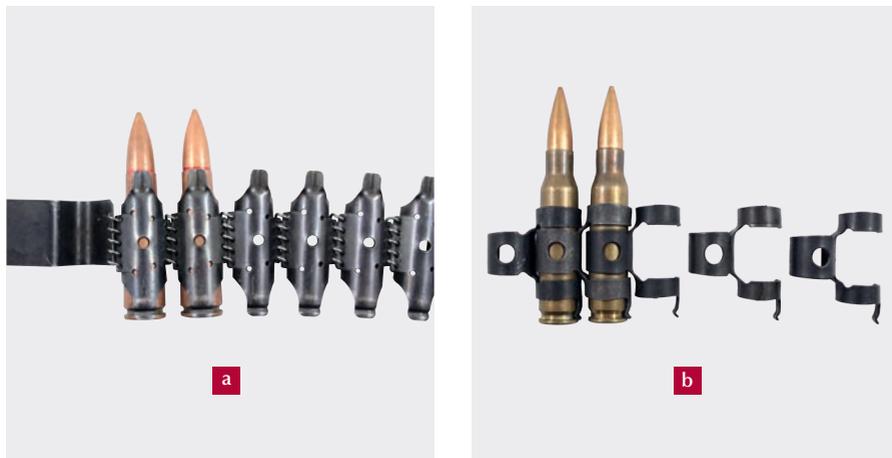
Image 3.27 A non-disintegrating belt of 7.62 × 39 mm cartridges contained within the external drum-type container of an RPD LMG



Source: Kristóf Nagy/ARES

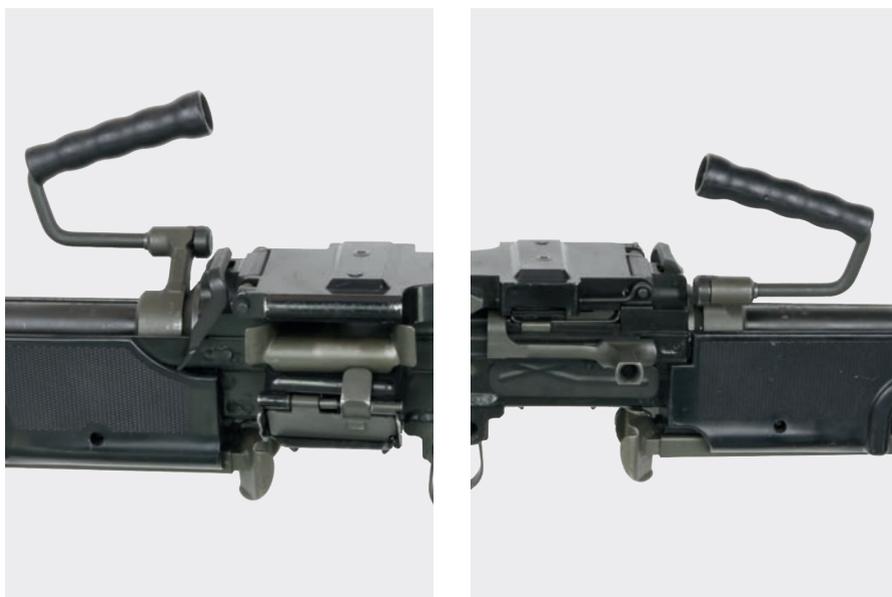
⁵⁷ While heavy machine guns are technically light weapons, Image 3.30 provides an excellent example of differentiating otherwise similar looking guns.

Image 3.28 Non-disintegrating and disintegrating machine gun belts



Note: (a) Non-disintegrating belt (7.62 × 39 mm cartridges in a belt used by the Soviet RPD LMG); (b) Disintegrating belt and links (7.62 × 51 mm cartridges in M13 links, as used by the American M240 general-purpose machine gun, for example).
Source: Jack Dutschke/ARES

Image 3.29 Left- and right-side views of a typical belt feed mechanism, including top cover, in this case an FN Herstal Minimi LMG



Source: N.R. Jenzen-Jones/ARES

Image 3.30 The belt feed mechanisms of DShK (left) and DShKM (right) HMGs



Note: These mechanisms exhibit distinctive differences in geometry, which is an important differential identification feature for distinguishing these otherwise similar guns.

Source: N.R. Jenzen-Jones/ARES

The presence (or absence) of a certain type of feed device sometimes provides clues regarding sources of weapons and other items, the level of weapons knowledge of the user, or other logistical considerations. Criminals sometimes remove a weapon from a crime scene but abandon used magazines or drums, which may allow for partial identification of the weapon system. For example, magazines such as those for AKM- or FN Herstal FAL-pattern weapons, which are designed to be ‘rocked’ into place and retained by means of a pivoting ‘paddle’, have lugs at the front and rear that can be easily identified. Magazines designed to be simply pushed into place will have a slot into which the magazine catch locates, such as the push-button found on AR15-pattern rifles (see Image 3.31). Belts and links provide similar clues. Links, in particular, are rarely recovered by combatants.

Typically, 'Western' machine guns employ disintegrating links, while equivalents from former-Warsaw Pact countries use non-disintegrating belts. There are exceptions, of course. Some Warsaw Pact models have been redesigned (or converted) to use disintegrating belts and some 'Western' machine guns use non-disintegrating belts. The FN Herstal MAG, for example, has been offered to customers in both configurations (FN, c.1990).

Feed devices may also feature their own markings, which are described under the 'Weapon markings' section, below. However, as magazines are the single most interchangeable component of a firearm, these markings may reveal little about the weapon with which they are used.

Image 3.31 AR-15-type (left) and AK-type (right) magazines



Note: Identifying characteristics include the slot into which the magazine catch locates on the AR-15-type (M16) magazine, and the pronounced lugs at the top of the AK magazine, the rear of which is retained by means of a pivoting 'paddle'-type magazine release.

Source: Kristóf Nagy/ARES

Box 3.4 Myths and misconceptions: 'clip' or 'magazine'?

The word 'clip' is frequently misused in place of 'magazine'. In fact, clips are a completely different type of feeding device. Unlike magazines, clips generally lack a significant spring or follower, relying upon the feed mechanism of the firearm and/or the user to feed the clip and/or its ammunition into the weapon (see Image 3.32). There are several types of clips. 'En bloc' clips are retained within the receiver until empty and then, typically, automatically ejected by the firearm (Ferguson, 2016). 'Chargers' or 'stripper clips', which are not generally loaded into the firearm, are simple strips, typically made of metal, shaped to hold several cartridges and store them conveniently for rapid loading into a magazine (Diehl and Jenzen-Jones, 2012).⁵⁸ A final form of clip is the 'moon' (circular) or 'half-moon' (semi-circular) clip used to hold revolver cartridges in groups for faster re-loading. Unlike common use of the charger clip or the en bloc clip, the moon clip is retained within the weapon until manually expelled along with the empty cartridges (ARES, 2017).

Image 3.32 Clips versus magazines



Note: (a) Examples of en bloc (left) and charger/stripper clips (right). (b) A (transparent polymer) removable box magazine for comparison.

Source: Wikimedia Commons/Amenhtp/Rama

Finishes

The finish of certain components of a weapon can serve as an important identifying characteristic (see examples in Image 3.33). 'Finish' is the catch-all term used to describe a variety of processes which protect a firearm from handling, wear,

⁵⁸ Chargers or stripper clips are sometimes made of other materials, including plastic and cardboard.

Image 3.33 Examples of firearm finishes



Note: These finishes are offered by a US company selling reproduction ‘Old West’ firearms.

Source: Cimarron Firearms Co

and the elements. Unfinished metal components are typically at risk of rusting, especially in field conditions.⁵⁹ Wooden components are also finished, generally with various oils, waxes, and sealants. In some cases, firearms may be finished to a high standard. These weapons are sometimes known as ‘luxury’, ‘premium’, or ‘presentation’ guns, or by their make or manufacturer’s grading system.⁶⁰ They often feature nickel, silver, or gold metal finishes (see Box 3.5), wooden components that are carved or have distinctive patterns, inlaid precious materials, and engraving.⁶¹

Finished items come in a wide array of colours, but the most common finish formulation is ‘bluing’ (sometimes ‘blueing’), named for its distinctive blue to blue-black colouration. The term ‘bluing’ is sometimes used to refer more generally to a wide range of oxidation processes, including ‘hot’ and ‘cold’ bluing, browning, and phosphatizing (known commercially as ‘Parkerizing’ or ‘Bonderizing’) (Muel-ler and Olson, 1968). Additionally,

59 Unfinished firearms and metallic firearms components—that is, those which remain bare metal—are often referred to as being ‘in the white’.

60 Different manufacturers may use a range of terms such as ‘presidential grade’, ‘double fine’, ‘AAA’, etc.

61 These distinctive patterns, which result from various grain orientations, are the ‘figure’ of the wood (Wood Magazine, n.d.). Distinctive wood figure, along with scratches, dents, and other marks, may help to distinguish a particular weapon.

Image 3.34 A range of firearms-specific paint finishes



Source: Cerakote

metal plating has long been a common method of preventing corrosion on firearms and other metal products.⁶² The most common plating consists of silver-coloured finishes, such as silver, nickel, or chrome.

While bluing remains the dominant traditional method of firearms finishing, paint coatings are becoming more popular (see Image 3.34). Some paints have improved in quality to the point that they are as resilient as bluing, while remaining simpler and cheaper to apply (Cerakote, 2017a; 2018). They range in quality and complexity from a single coat of commercial spray paint to more complex and professional systems involving multiple priming layers and oven curing at specific temperatures (Cerakote, 2017b). In some cases, both oxidation processes and paint are applied to give a maximum amount of protection to a firearm.⁶³

62 Most plating methods are electrolytic ('electroplating'), involving the submersion of the part to be plated in an electrolyte solution containing dissolved ions of the desired metal compound. An electric current is used to deposit these ions on to the surface of the part being plated. Electroless plating is also used for some applications, and relies on an autocatalytic reaction instead of electricity (SPC, n.d.). Modern arms now often incorporate aluminium components, which cannot be blued chemically, and these components are typically anodized—a type of electrolytic metal plating. Plating is also used on steel components, generally to apply a silver or nickel finish for decorative purposes or a chrome finish to resist corrosion more effectively than bluing. Various vacuum deposition methods, most often physical vapour deposition (PVD) or chemical vapour deposition (CVD), are also sometimes used to produce thin films and coatings on various components (Mueller and Olson, 1968; SPC, n.d.).

63 See, for example, *Forgotten Weapons* (2017c).

Box 3.5 Myths and misconceptions: ‘golden guns’

When expensive or ornate guns are found in conflict zones, they often become the basis of exaggerated claims and tall stories. Weapons of this type, many of which are finished in gold or gold-coloured plating, are often attributed to overthrown dictators and other high-ranking former regime officials. Such stories are notoriously difficult to verify. In Libya, for example, Western media were fascinated by tales of a ‘golden gun’ captured from Colonel Qaddafi himself.⁴³

Contrary to some media claims, there is no single ‘golden gun’ of this type in Libya. In fact, 50 ‘golden’ Belgian-made ‘Renaissance’ grade pistols were exported to Libya as part of a 2009 arms deal. The weapons were intended for a brigade commanded by one of Qaddafi’s sons (Jenzen-Jones, 2016c). They are all engraved with custom details, including the name of the brigade, and feature customized hardwood grip panels inlaid with the Libyan seal (see Image 3.35).

Image 3.35 An FN Herstal High-Power ‘Renaissance’ grade handgun, documented in Misrata, Libya, July 2016



Source: Stanislav Krupa via ARES

These handguns have now been documented in several locations in Libya, including on illicit arms markets operating via social media, with the sellers often claiming the weapon in question belonged to Qaddafi. Other guns reportedly belonging to Qaddafi include a Smith & Wesson revolver and an FN Herstal Five-seveN self-loading pistol (ARES, n.d.; Krupař, 2016).

While high-ranking military and government personnel in conflict zones may own presentation grade guns, researchers should thoroughly investigate third-party claims regarding the provenance of these weapons. Some guns of this type may be visually unique and easily tied to a particular individual or incident. Many others, however, are produced in quantity and require a close examination of both the individual weapon’s physical features, and unique identifying markings such as its serial number. Weapons of this type may have very interesting stories attached to them, but will frequently become a target for exaggeration and deception.

64 See, for example, Gatehouse (2011; 2016).

Weapon markings

Markings are words, letters, numbers, and symbols intended to convey information about the weapon, such as its make and/or manufacturer, country of origin, model, calibre, modes of operation, exporting or importing company or country, serial number, etc. The markings on small arms and light weapons are often one of the best sources of identifying information. The vast majority of arms are marked by the manufacturer, and many are also marked by parties that transfer, import, export, or assemble the weapons (Jenzen-Jones and McCollum, 2016).

Markings were traditionally engraved or stamped by hand. Most markings were either machine stamped, often pressed deep into the metal by a powerful roller tool ('roll-marked'), or cast in place (in which case they may sometimes be raised rather than depressed). Modern markings are often engraved, etched with

Image 3.36 Factory markings reflecting manufacture prior to and after November–December 1971



Note: (a) Factory marking reflecting manufacture prior to November–December 1971, marked: 'FABRIQUE NATIONALE D'ARMES DE GUERRE–HERSTAL–BELGIQUE'. (b) Factory marking reflecting manufacture after November–December 1971, marked: 'FABRIQUE NATIONALE HERSTAL BELGIQUE'.

Source: Jenzen-Jones and Spleeters (2015)

lasers, or, in the case of polymer components, applied using heat. Weapons are marked during and, in some cases, after production (Jenzen-Jones and McCollum, 2016).

Changes in the location, style (including font), content, and other aspects of markings often provide important clues regarding the provenance and date of manufacture of a particular weapon. For example, between November and December 1971, FN Herstal amended its factory marking from ‘Fabrique Nationale d’Armes de Guerre Herstal Belgique’ to ‘Fabrique Nationale Herstal Belgique’ (see Image 3.36). The former factory name marked on a rifle thus indicates that it was made before November 1971 (Jenzen-Jones and Spleeters, 2015). This is one way of determining the age of weapons even when production dates are absent or not visible.⁶⁵ Investigators should also be aware of counterfeit and reproduction firearms, which may be marked in a misleading or confusing manner (see Box 3.6).

Box 3.6 Counterfeit and reproduction firearms

Counterfeit or copy weapons are produced in certain parts of the world, particularly in the Khyber Pakhtunkhwa region of Pakistan and in the Philippines (see Chapter 6). These weapons are sometimes marked in a way that does not reflect their true origin, model, or other properties. The spurious markings, which often mimic the markings on authentic firearms, are used to increase the market value and/or obscure the point of origin of the counterfeit weapon (Hays and Jenzen-Jones, 2018) (see Images 3.37 and 3.38). Reproductions of historical arms are produced both for and by consumers interested in weapons which may not otherwise be readily available, including civilian ‘copies’ of military weapons. These firearms are often produced by legitimate manufacturers and marketed as reproductions (see Image 3.39).⁶⁶ Nonetheless, the physical features and markings on such weapons may confuse some investigators, especially if not closely scrutinized. Similarly, some weapons are refurbished or refinished in ways that are not consistent with their original purpose or design. For these reasons, markings should always be assessed in combination with the physical characteristics of a weapon.

Image 3.37 Markings on a Chinese-made counterfeit pistol, purporting to have been produced by FN Herstal in Belgium



Note: The markings that the producer attempted to replicate should have read: ‘FABRIQUE NATIONALE D’ARMES DE GUERRE HERSTAL’.

Source: McCollum (2014b)

65 See, for example, Jenzen-Jones and Elliott (2015).

66 See, for example, Reed (2016).

- **Image 3.38** Spurious markings on a self-loading rifle falsely claimed to be an AK-103



Note: This self-loading rifle was offered for sale on the black market in Yemen. It featured black polymer furniture and an AK-74-type muzzle brake, making it physically similar to an AK-103.

Source: ARES (n.d.)

- Image 3.39** The Troy Industries GAU-5/A/A, a modern reproduction of the Vietnam War-era GAU-5/A self-loading rifle



Note: This self-loading rifle was adopted by the US Air Force and famously used by US special operations forces (the so-called 'Son Tay Raiders') during Operation Ivory Coast in 1970. An inspection of the reproduction markings may fool a non-specialist, and it is difficult to distinguish the fact that it is a reproduction by an assessment of its physical features without close inspection.

Source: Troy Industries

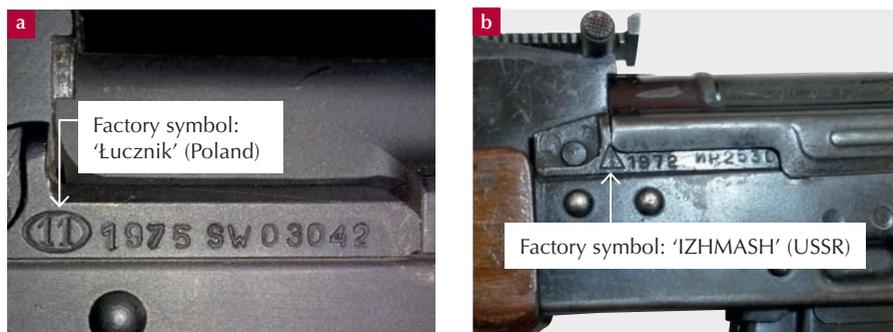
Make, manufacturer, factory, arsenal, and country markings

Small arms usually have markings that denote the make and/or manufacturer, country of origin, and, less frequently, the production facility and/or storage arsenal. These markings are often useful in identifying and tracking weapons.

Factory, arsenal, and country markings can dramatically reduce the number of potential countries of origin and manufacturers of a particular weapon, which, in turn, aids in the identification of the model or variant of the weapon. Manufacturer and factory markings consist of the name of the manufacturer or factory, an alphabetical or alphanumeric code, a symbol, or a combination thereof. Military firearms, particularly those which have traditionally been produced at state facilities, are rarely marked with a country of origin, but are likely to feature the name (or factory code or logo) of the factory where the weapon was produced (see Image 3.40).

Civilian and law enforcement weapons typically display the commercial name of the manufacturer, but sometimes are marked with only country of origin, or even country of import markings. However, with the shift later in the 20th century towards commercial procurement of military weapons, combined with the

Image 3.40 Examples of factory markings



Note: (a) Factory marking (11 in oval; FB “Łucznik” factory code) on a Polish Zakłady Metalowe “Predom-Łucznik” kbk AKMS self-loading rifle. Note also the production date (1975) and serial number (SW03042), the latter stamped in part on the bolt assembly (visible as the top cover has been removed). (b) Factory marking (arrow in triangle; IZHMAHSH factory code)⁴⁶ on a Soviet AKMS self-loading rifle. Note also the year of production (1972) and serial number (MP2530), the latter stamped in part on the top cover (530).

Source: ARES (n.d.)

67 Now marketed under the ‘Kalashnikov’ brand of Concern Kalashnikov.

Image 3.41 Make, manufacturer, and country of origin markings on a German Heckler & Koch USP self-loading pistol



Note: This image also shows the stylized 'HK' logo, calibre marking (.45 Auto), and serial number (25-024604).
Source: N.R. Jenzen-Jones/ARES

introduction of various legal controls on markings in many states, most recently-produced weapons feature make and/or manufacturer markings as well as a country of origin marking (see Image 3.41). In either case, the originating town, city, or even full postal address of the manufacturer is sometimes listed. In some cases, manufacturing-related markings may be difficult to distinguish from retailer or importer markings.

The 'make' of the weapon is generally analogous to a weapon's 'brand', and is typically marked on the weapon. In some cases, the weapon will be marked with the 'make' rather than 'manufacturer'.⁶⁸ Image 3.42 shows a Russian Baikal self-loading shotgun marked with the make (Baikal). The manufacturer of this weapon is Concern Kalashnikov (not marked), which produces three brands of weapons at two major manufacturing plants. The 'manufacturer' of a weapon is the entity that actually produces that weapon. Make and manufacturer are often confused. A simple rule to remember is that what is marked on the weapon can generally be considered its make. This may also be the manufacturer (see Image 3.43). If a manufacturer or 'make' marking is consistent with the overall physical features of a weapon, a tentative identification is relatively easy to establish.

⁶⁸ This is sometimes the case when weapons are produced under a 'white label' approach, where subsequent sellers will mark the weapon as if they produced it.

Image 3.42 Make marking on a Russian MP-155 self-loading shotgun



Note: The make, 'Baikal', is marked clearly on the gun.

Source: Concern Kalashnikov

Image 3.43 Make and manufacturer markings on a Belgian FN Herstal SCAR-H self-loading rifle



Note: See the FN Herstal logo at bottom, and 'FN HERSTAL BELGIUM' at top.

Source: N.R. Jenzen-Jones/ARES

Country markings take the form of the name of the country of origin, a national coat of arms, a crest, or other symbol (see Image 3.44). Typically, these markings appear in an indigenous or official language of the country in which the weapons are manufactured, but in some cases the language is that of the country of service (for example, for foreign contracts) (see Image 3.45; Box 3.7). In some cases, country markings may narrow the possible years of production. For example, weapons marked 'Yugoslavia' were produced when Yugoslavia was a recognized state (between 1929 and 2003). Country of origin may also be indicated by proof marks (see below).

Image 3.44 Country marking on a Yugoslavian Zastava Arms M48A bolt-action rifle



Note: The marking shows the Federal People's Republic of Yugoslavia crest.

Source: N.R. Jenzen-Jones/ARES

Image 3.45 A Russian Mosin Nagant rifle marked on the top of the receiver in Russian (Cyrillic script), but manufactured in Châtelleraut, France



Source: McCollum (2014b)

Box 3.7 State participation in the small arms and light weapons supply chain

State facilities (also known as ‘arsenals’ or ‘armouries’) are often involved in the small arms and light weapons supply chain. Some only manufacture weapons or only store them, while others perform both functions, occasionally leading to confusion over the actual place of manufacture. These facilities may also repair, refurbish, maintain, or issue weapons. Some facilities assemble weapons from prefabricated parts, even when they have the capability to build from scratch different models of firearms, while other facilities manufacture some components and import others (for example, facilities in Saudi Arabia and Egypt) (Gaub and Stanley-Lockman, 2017). Increasingly, manufacturers of small arms and light weapons are international corporations with subsidiaries and facilities in more than one country. Weapon designs may also be licensed for production by other companies around the world (Jenzen-Jones, 2017d).⁶⁹ Because of this range of possibilities, it is important to document all markings wherever possible, and as accurately as possible, to allow for the potential revision of an identification in light of new information.

Model and calibre designations

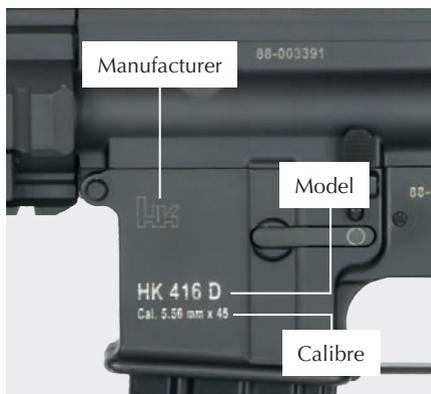
Model designations are another important source of information. Many small arms, whether military or commercial, are marked with a model and iterative variant designation. For example, the designation ‘L85A2’ refers to an updated ‘A2’ variant of the British L85 rifle (Ferguson, 2017c). This is not always the case and varies by country and/or manufacturer; Russian AK- and AKM-pattern rifles, for example, are generally not marked in this way. While some variants of a weapon bear the same model designations, other close or exact copies are marked very differently. Some militaries assign their own designations to weapons, some of which differ significantly from the designation assigned by the designer or manufacturer. For example, the Barrett M82A1M anti-materiel rifle was adopted by the US Army as the M107. Barrett later produced a product called the M107A1, to position the rifle as the successor to the M107 (Choat, 2012; Vining, 2016).

Some companies also assign different designations to the same model of weapon. For example, the Heckler & Koch pistol marked as the VP9 in the United States is marked ‘SFP9’ in Europe.⁷⁰ Furthermore, model and calibre designations may be added by importers, assemblers, and other parties after manufacture. In some cases, the importer’s or assembler’s markings are not technically correct. For example, many of the AK-type rifles imported into the United States are erroneously

69 For a more detailed discussion of the licensed and unlicensed production of small arms, see Jenzen-Jones (2017d, pp. 33–38).

70 As seen on Heckler & Koch’s US and European websites in late 2017.

Image 3.46 Model and calibre markings on a German Heckler & Koch HK416D self-loading rifle



Note: The model reads 'HK416D' and the calibre is marked as 'Cal. 5.56 mm × 45'.

Source: N.R. Jenzen-Jones/ARES

ly marked as 'AK-47' rifles. Not only are these rifles not technically 'AK-47' models, but most were not even made in Russia or Bulgaria.⁷¹

While somewhat less useful than other markings, calibre designations can also help distinguish many similar models of firearms. Many weapons are offered by manufacturers in a range of calibres. For example, the Remington Model 700 bolt-action rifle has been produced in more than 15 calibres and has been converted by independent gunsmiths to other calibres (Lacy, 1989; van Zwoll, 2014). Calibre designations may be rendered in imperial or metric

units, and may use either the decimal point or decimal comma. Of course, they may also be marked using non-English scripts or conventions. Ideally the full calibre (for example, 7.62 × 39 mm) will appear, but it is also common to find the less helpful bore/bullet diameter only (for example, 7.62 mm). Model and calibre designations often appear together (see Images 3.46 and 3.47).

In the case of shotguns and muzzle-loading weapons, the gauge or 'bore' of the gun will typically appear, often along with proof marks, on the underside of the barrel. Viewing these markings may require the disassembly of the weapon.

It is important to note that sometimes the calibre of the weapon and the calibre designation do not match. When gunsmiths change the calibre of a weapon, they should also re-mark it with the new calibre designation, but this does not always happen. Therefore, it may be necessary to test-fit a cartridge (or fired cartridge case) into a weapon or obtain a chamber cast to determine the correct calibre (see Image 3.48).⁷²

⁷¹ See, for example, Images 3.47c and 3.60.

⁷² See, for example, Ferguson (2017a). The test-fitted cartridge should ideally be a dummy cartridge (see Chapter 4). You should not place a live cartridge into the action of any firearm if you do not have the appropriate safety and handling training.

Image 3.47 Examples of model and calibre markings



Note: (a) Markings ('Tabuk' and 'Cal. 7.62×39mm') on the right side of the rear sight block of an Iraqi Tabuk self-loading rifle. (b) Markings ('CQ' and 'CAL. 5.56MM') on a Chinese CQ self-loading rifle. (c) Markings ('WASR 10/63' and 'Cal. 7.62×39mm') on a Romanian GP WASR 10/63 semi-automatic rifle, rebuilt to Pistol Mitralieră md. 1963 standard. These are post-production markings engraved by an importer.

Sources: C.J. Chivers/*The New York Times*; Bradley E. Owen/Osprey Security Services via ARES; N.R. Jenzen-Jones/ARES

Image 3.48 A rifle with a calibre marking on the top surface of the receiver



Note: The marking reads simply '7 M M'. After a chamber cast and test-fitting of a dummy cartridge, it was determined to be chambered for 7 mm Mauser (7 × 57 mm).

Source: Ferguson (2017a)

Serial numbers and date markings

Serial numbers have been in use for at least 150 years, and were first marked by manufacturers for their own accounting and marketing purposes (ARES, 2017). Today most serial numbers are engraved, cast, or stamped onto firearms by producers as a way of tracing, dating, and identifying the weapon (see Images 3.49–3.53). They are most often an alphanumeric code, and sometimes incorporate factory, model, or year designations. Manufacture dates are routinely stamped adjacent to the true serial number on some firearms, such as certain AK-type rifles (see below).

Serial numbers are useful for tracing weapons when they are recorded in documentation pertaining to manufacture, import, export, licensing, or in-country transfer. Due to national and international legal requirements, a primary serial number is usually marked on a firearm or light weapon's main assembly (nearly always the receiver/frame), though the precise location of the number varies between weapons (Ferguson, Jenzen-Jones, and McCollum, 2014; Jenzen-Jones and McCollum, 2016). The simplest serial numbers are single, 'rolling' numbers for a given model or variant. Serial numbers for mass-produced arms run into the millions. However, manufacturers frequently use more than one range of serial numbers in certain cases, including when:

- serial numbers become excessively long;
- weapons are exported to a particular country or customer;
- a new variant of the weapon is introduced; or
- a new factory is brought online.

Typically, a prefix and/or suffix will be applied to the serial number to differentiate a new range of serial numbers from the old range. Some firearms are assigned multiple serial numbers by the same factory. Generally, one of these numbers can be conceived of as the 'master' number, used by the factory to uniquely identify the weapon, and track overall production. One or more other serial numbers may also be applied, commonly representing other metrics, such as the number of the weapon within a production run. This practice is uncommon but awareness of it is essential when tracing some firearms, such as the Belgian-made FN Herstal FAL self-loading rifle (Jenzen-Jones and Spleeters, 2015). Firearms may also receive an alternative or additional serial number as part of the importation process, when a weapon has been rebuilt or built from parts by a party other than the original parts' manufacturer(s), or when national or regional marking practices are applied. Other circumstances in which weapons receive new serial numbers include when the original serial number is illegible due to wear or defacement, or when the manufacturer used foreign alphabets or numerals.

Image 3.49 Serial number marking on a Russian AK-103-2 self-loading rifle



Note: The serial number is '071464557'. This self-loading rifle was produced by IZHMAASH.

Source: ARES (n.d.)

Image 3.50 Part-serial number (3042) stamped on a recoil spring guide assembly from a Polish kbk AKMS self-loading rifle



Note: This is the same weapon as shown in Image 3.40a; note the repetition of the last digits of the serial number.
Source: ARES (n.d.)

The serial number is usually duplicated on the bolt and/or bolt carrier carrier and the barrel, partly because these components may themselves be subject to legal control, but also to keep the originally manufactured parts together for best fit and function. In addition, serial numbers are often partially or fully stamped on other components of the weapon, including, in rare cases, on individual pins, screws, and springs. Small parts are often marked with only the last few digits of the full serial number (see Image 3.50).

Given that most small arms have interchangeable parts, serial numbers on different parts of a weapon sometimes do not correspond, especially when the weapon has seen extensive use. The weapon may have been initially assembled from a collection of parts of different provenance, or it may contain replacement parts. In the case of AK-type weapons, for example, it is often so easy to interchange parts that a weapon may include components made in a different country, for a wholly different model or variant. Parts may even have been produced decades before or after the host weapon was manufactured. It is also possible that

Image 3.51 Serial number (88-003391) on a German Heckler & Koch HK416D self-loading rifle



Source: N.R. Jenzen-Jones/ARES

Image 3.52 Serial number (BI1229) and year marking (1956) on a Romanian TTC self-loading pistol



Source: N.R. Jenzen-Jones/ARES

markings on various components may not in fact be serial numbers at all: components in some vintage firearms are marked with assembly numbers, for example (ARES, 2017; Ferguson, Jenzen-Jones, and McCollum, 2014).

In some cases, replacement or interchangeable components issued with a weapon (such as spare machine gun barrels, or calibre-change kits for so-called modular weapons) may feature partial or complete serial numbers, which may confuse investigators in the field. Beretta ARX-160 self-loading rifles, for example, sometimes feature multiple barrels marked with the full serial number of the 'parent' weapon. This makes it difficult to determine whether a given barrel is a primary or secondary configuration, and also presents cataloguing and tracing problems. On the other hand, both Heckler & Koch (HK) and FN Herstal (FNH) 'sub-number' additional components, featuring the serial number as marked on the parent weapon followed by either a forward slash (HK) or hyphen (FNH), then a sequential number. Two barrels for hypothetical gun number 12345 might thus be marked '12345/1' or '12345-1' and '12345/2' or '12345-2' (Ferguson, Jenzen-Jones, and McCollum, 2014).

Some criminals and armed groups deliberately attempt to remove serial numbers with the goal of preventing authorities from tracing weapons to their source. It may be possible to recover markings that are ground or filed off (Rowe, 2015).

Image 3.53 Post-production serial number (B-252) on a German Heckler & Koch G36V self-loading rifle



Note: The original serial number has been abraded and a new marking engraved.

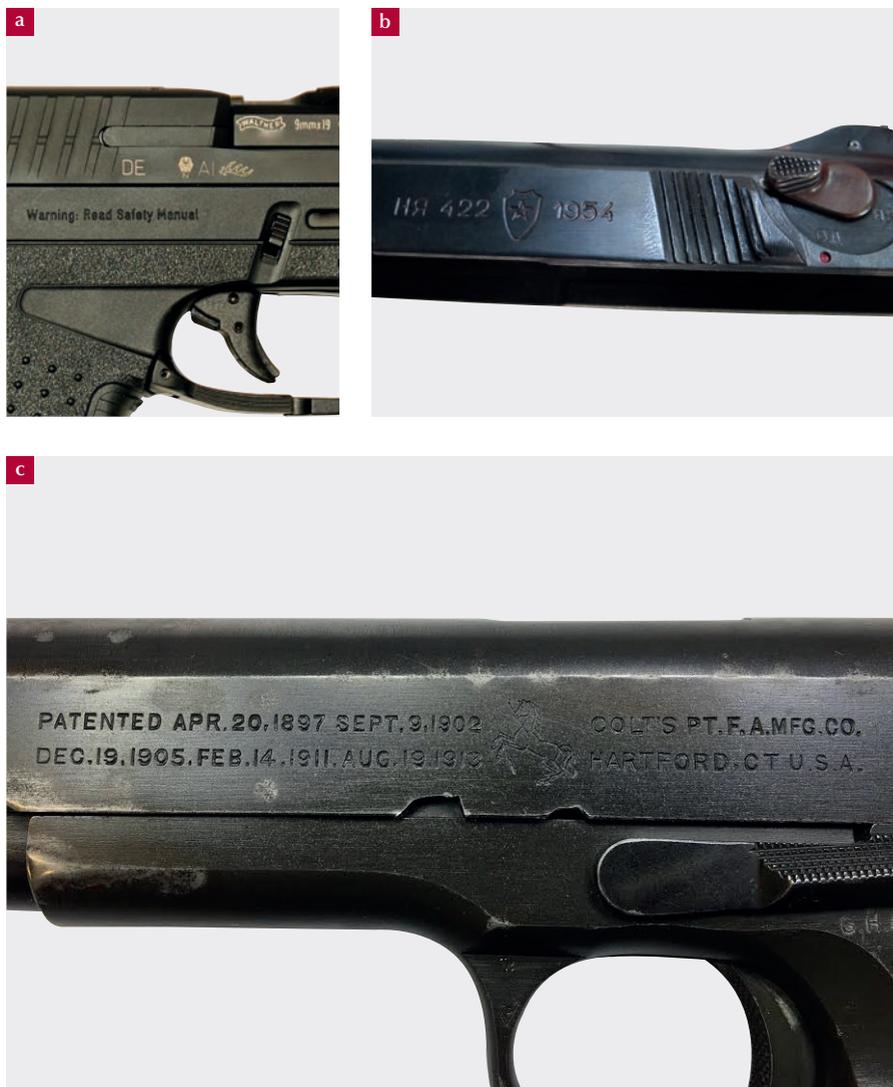
Source: Damien Spleeters

It is also important to note that while removing serial numbers and other key markings may impede a tracing attempt, it does not mean that the firearms cannot be uniquely identified. Experts use different forensic and close inspection techniques to identify a specific weapon, even in the absence of serial numbers.

Marks which appear similar to serial numbers are sometimes applied by importers, assemblers, or other parties after the weapon is manufactured. Military, law enforcement, and armed groups often apply 'rack numbers' (a basic form of registration) to weapons (see 'Import and other markings', below). These numbers are often mistaken for serial numbers or other markings. For these reasons, serial numbers should be interpreted in conjunction with an analysis of the type and make or manufacturer of the weapon in question.

Serial numbers are also frequently useful in identifying the manufacture date of a firearm. Some firearm serial numbers incorporate an alphanumeric code that can be translated into a date (most commonly a year) of manufacture. For example, a Browning Hi Power pistol made in 1969 would have the serial number

Image 3.54 Examples of date markings



Note: (a) German Walther PPS self-loading pistol marked (left to right) DE for Germany; eagle over 'N' for definitive smokeless proof (repeated along with manufacturer and calibre marks on the barrel); date code 'A1' for 08 (proof year 2008); and the deer antler proof mark of the Beschussamt Ulm C.I.P. accredited Proof House. Note also the safety warning. (b) Year marking ('1954') on a Russian Tula APS automatic pistol. Note also the safety/selector markings (ИР, ОА, АБТ) and manufacturer marking (star-in-shield for Tula). (c) Date markings on an American Colt Model 1911A1 self-loading pistol. Various date markings have been stamped into the slide, but none of these markings indicate the year of manufacture of this example.

Sources: Wikimedia Commons/Praiychat; N.R. Jenzen-Jones/ARES; Bear Arms Firearms Reference Collection via ARES

69C1000, denoting the one thousandth Hi Power pistol (indicated by the letter C) produced in 1969 (Browning, n.d.). Not all cases are this straightforward. Often, identifying and deciphering dates in serial numbers requires the assistance of specialists. In other cases, a simple methodology relying on known cumulative production data for a given period can be developed.⁷³

Date markings often reflect the year of manufacture, but this is not always the case, particularly on older military firearms. In some cases, these markings instead indicate:

- the date of factory repair or refurbishment;
- the date of adoption by an armed force;
- the official or unofficial model designation;
- the import date; or
- the patent date.

For example, different models and variants of the Colt M1911 pistol feature both a model number that represents a year of military adoption (1911) and several dates in which the manufacturer received patents (for example 1897, 1902, 1905, etc.) (see Image 3.54c) (Lisker, 2018). Dates may appear numerically in two- or four-digit form ('85' or '1985'), or as an alphabetical or alphanumeric code, in which case dating the weapon is often difficult or impossible without the manufacturer's cooperation or authoritative reference material. The location of date markings also varies. Some are placed in a separate location from other markings, while others are applied next to the serial number, or are an actual component of the serial number.

Selector, sight, and safety markings

Markings on fire selectors, safety 'catches', and sights also provide clues regarding the origin and model of some firearms. For example, many semi-automatic models of a given weapon can be quickly distinguished from their selective-fire counterparts by examining the fire selector. Lettering or symbols used to mark fire selector and safety positions and sight increments, particularly the default setting on many weapons (often called the 'zero' or 'battle sight' position), are sometimes indicative of a specific country of origin, or make or manufacturer.

73 For an example of such a methodology and how it can be applied to arms tracing, see Jenzen-Jones and Elliott (2015).

Image 3.55 Examples of safety/selector markings



Note: (a) Markings (S, 1, A) on a Belgian FN Herstal SCAR-L self-loading rifle. (b) Pictographic markings on a German Heckler & Koch MP7 SMG. (c) Markings (D, E) on an East German MPI-KM self-loading rifle. (d) Markings (SAFE, SEMI, AUTO) on a British LANTAC LA-M4 self-loading rifle.

Sources: ARES (n.d.); N.R. Jenzen-Jones/ARES

Selector markings consist of some combination of words, letters, numbers, or symbols representing different settings for firearms. These settings are ‘safety’, ‘semi-automatic’, ‘automatic’, and sometimes ‘burst fire’.⁷⁴ The use of English is common, and some variation on either the US ‘safe, semi-automatic, automatic’ (sometimes acronymized as ‘S,S,A’ or ‘S,1,A’; see Images 3.55a, d), or the British ‘automatic, repetition, safe’ (‘A,R,S’), is often encountered. Markings may directly represent English words, foreign language words (for example ‘E’ and ‘D’ for

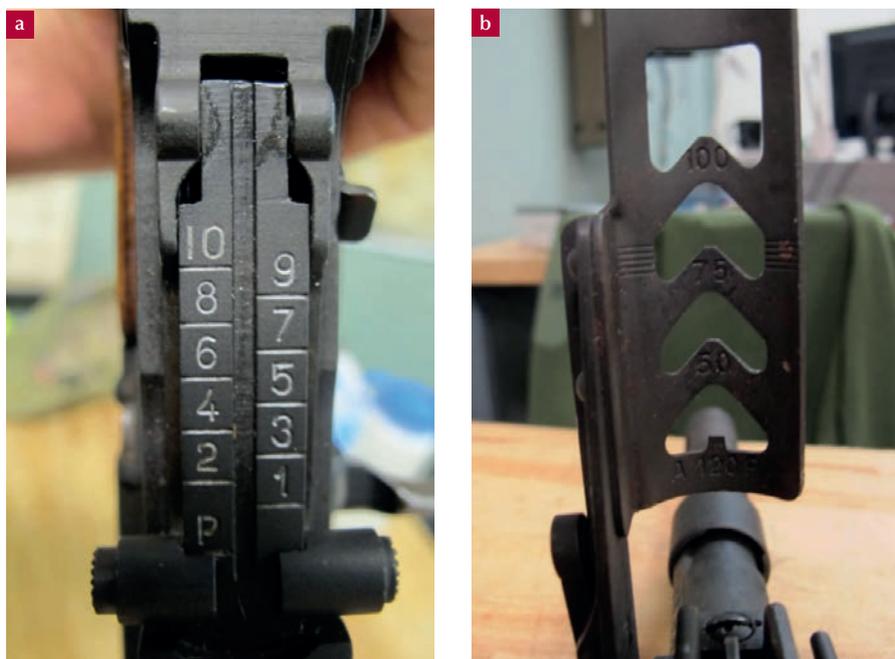
⁷⁴ The term ‘burst fire’ refers to a firing cycle that restricts an automatic weapon to firing a fixed number of rounds (typically two or three) for each press of the trigger (ARES, 2017).

'Einzelfeuer' and 'Dauerfeuer' on some German weapons, as shown in Image 3.55c) or, as in the case of some Chinese Type 56 rifles, transliterated words ('L' and 'D' for 'Liàn' and 'Dán') (Andrew, 2015; McCollum, Stott and Vickers, 2018). Pictographic fire selector/safety markings are increasingly common (see Image 3.55b).

Some weapons may have special sights for launching rifle grenades, which are often referred to as auxiliary folding leaf sights, or simply 'leaf sights' (Image 3.56b). Markings on these sights are often informative and should be recorded, when possible.

Although selector markings may be altered, and sights may be replaced entirely, experience in the field suggests that this is rarely done. However, as in all aspects, care must be taken to assess all physical features and markings, both individually and together.

Image 3.56 Examples of sight markings



Note: (a) Rear sight markings on the adjustable rear sight of a Romanian Pistol Mitralieră md. 1963 self-loading rifle. A 'P' appears in place of zero, in bottom left position. (b) Markings on a folding rifle grenade leaf sight on a French MAS Modèle 1936-51 bolt-action rifle.

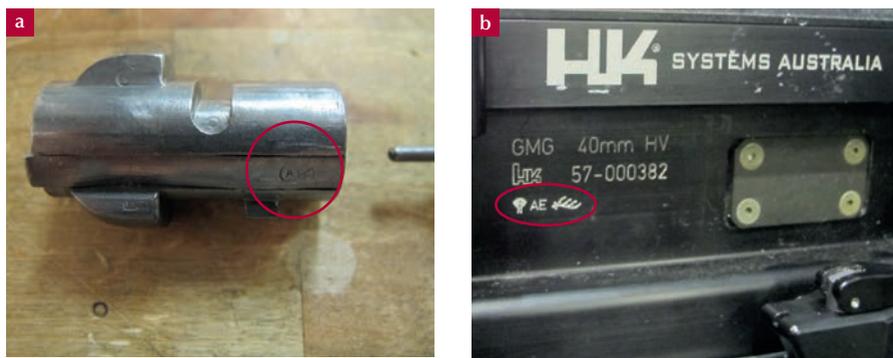
Source: N.R. Jenzen-Jones/ARES

Proof, inspection, and acceptance marks

Proof marks and inspection marks are applied to firearms and parts to show that they comply with safety standards and meet national expectations regarding quality (see Image 3.57).⁷⁵ Not all countries require a weapon to undergo proof; it is not a legal requirement for sale in the United States, for example. Today, proof marks from one country are often recognized by other countries and therefore firearms are less likely to be proofed by multiple government agencies. Where multiple sets of marks from different jurisdictions are present, however, the marks provide useful historical information about the firearm in question (McCollum, 2014b; Wirnsberger, 1985).

Proof marks can be used to trace weapons or components to certain countries, and may also assist in narrowing down a production timeframe. Markings that include a date code allow for precise dating, but changes to the form and method of application of other marks may also provide clues regarding the manufacture date. For example, slight variations in symbols, letters, and placement may indicate the period in which a weapon was proofed. In some cases, especially with marks applied by certain manufacturers in the United States, proof marks can

Image 3.57 Examples of proof and inspection markings



Note: (a) Proof marks on the bolt head of a Russian Mosin-Nagant Model 1891/30 bolt-action rifle. (b) Proof and inspection marks on a German Heckler & Koch grenade machine gun.

Source: N.R. Jenzen-Jones/ARES

⁷⁵ These inspections often consist of firing special proof cartridges, which generate substantially increased peak chamber pressure, to ensure that a barrel and bolt will sustain repeated firings under conditions of normal use. Proof marks are generally underwritten by government entities in countries with a history of proofing, including many in Europe (Wirnsberger, 1985).

Image 3.58 Inspection marking on an M16 barrel



Note: The 'C' indicates the barrel was produced by Colt, 'MP' shows the barrel underwent a magnetic particle inspection, '5.56 NATO' indicates the barrel calibre, and '1/7' indicates the twist rate of the barrel's rifling.

Source: Bear Arms Firearms Reference Collection via ARES

even indicate the manufacturer or factory of production. Some proof marks are self-explanatory, but interpreting others requires the assistance of a specialist.⁷⁶

Inspection marks are often confused with proof marks, and indeed some are applied by a proof house.⁷⁷ However, most inspection marks are applied at the factory where the weapon is manufactured, and relate to standards of fit, finish, and overall quality (hence 'inspection'). Each inspector is typically assigned a coded mark, which allows for the identification of the factory and responsible inspector of any weapons with quality or safety issues. Inspection marks are sometimes useful in identifying or confirming the manufacture date of components that are either detached or part of a rebuilt weapon. They are also occasionally used to identify weapons with obscured or obliterated make or model marks, serial numbers, etc.

Military organizations may subject their arms to tests that result in additional inspection markings, such as the 'MP' found on US military small arms barrels.⁷⁸ This indicates the barrel underwent magnetic particle inspection, a test of the barrel's integrity distinct from—and additional to—the traditional proof test (see Image 3.58) (ARDC, 1968).

Finally, acceptance marks and ownership marks are sometimes found on individual small arms and denote official government ownership of the item. The

⁷⁶ See, for example, Wirnsberger (1985).

⁷⁷ Examples include the coded inspector's marks used at the Belgian proof house in Liège (Wirnsberger, 1985).

⁷⁸ These tests are now also performed on some commercial barrels.

Image 3.59 Examples of government property and arsenal markings



Note: (a) Government property markings on American Hydra-Matic M16A1. Note also the make/manufacturer, country of origin, calibre, and serial number markings. (b) Arsenal mark on an Iraqi Tabuk self-loading rifle.

Sources: N.R. Jenzen-Jones/ARES; C.J. Chivers/*The New York Times*

US military, for example, initially used an image of a flaming bomb, which was the symbol of the Ordnance Department. This symbol was eventually replaced by the straightforward ‘PROPERTY OF U.S. GOVT.’ (see Image 3.59a).

Import and other markings

Many other types of markings are applied to small arms and light weapons, in various locations. They are applied by manufacturers, importers, end users, and other parties in the chain of custody.

Import markings are applied by exporters or importers, usually to comply with legislation in the destination country. US regulations for marking imported firearms are among the most influential. Because of the United States’ position as the largest commercial market for modern small arms, many manufacturers have aligned their marking practices to US standards (Jenzen-Jones and McCollum, 2016). The US government requires that the following elements be conspicuously marked on any firearms imported into the United States (ATF, 2016):⁷⁹

- Serial number
- Name of manufacturer
- Country of origin
- Model designation
- Calibre or gauge
- Name of importer
- City and state of importer

⁷⁹ Specifically, ‘conspicuously engraved, cast or stamped (impressed)’ (ATF, 2016).

Image 3.60 Import markings on a Polish kbk AKM self-loading rifle imported into the United States

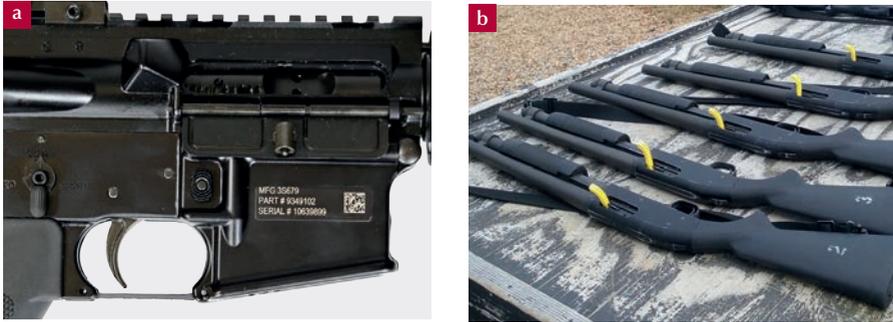


Note: The markings are located below the serial number ('KW10184') and incorrectly identify the rifle model as an 'AK47'.
Source: N.R. Jenzen-Jones/ARES

Many national laws and multilateral instruments require that manufacturers of small arms adhere to stringent marking practices at the time a weapon is produced. Import marks are often applied in a different fashion to original markings, sometimes resulting in tell-tale bright metal markings. Image 3.60 shows the markings on a rifle destined for a US importer (Jenzen-Jones and McCollum, 2016).

Military arms may feature unit markings, or 'rack numbers', generally assigned for inventory control and auditing purposes. Traditionally these markings were inscribed into the weapon, and may easily be mistaken for serial numbers at first glance. Today, many unit markings are often much easier to distinguish from serial numbers. They are often printed on barcode stickers or QR-style decals (see Image 3.61a). Some markings are simply painted on to the butt-stock (Image 3.61b).

Image 3.61 Examples of inventory markings



Note: (a) Inventory markings and QR code on a US military M4A1 self-loading rifle. (b) Painted 'rack number' markings on US Navy Mossberg 500 series pump-action shotguns.
Sources: US Army; Brendan Mooney

Other markings sometimes found on firearms include safety warnings and patent markings, which may prove useful identifiers (Image 3.62).⁸⁰ When documenting arms, a thorough visual inspection should be conducted to ensure that such markings are not overlooked.

Feed devices

Feed devices are often found in the field or at crime scenes, either attached to a weapon or in isolation. Feed devices, in this context, include removable magazines, drums, belts (and individual belt links), and chargers (stripper clips). These items should be examined for markings, such as those seen in Images 3.63–3.65. It is important to record whether feed devices were found loaded into a weapon, alongside it, or in isolation. If feed devices are loaded, the cartridges should be documented if possible.⁸¹

Image 3.62 Patent markings on German Heckler & Koch USP

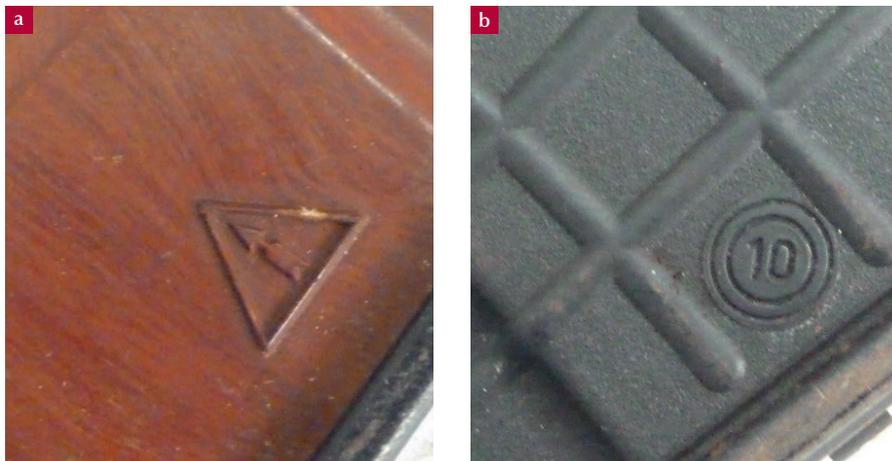


Source: N.R. Jenzen-Jones/ARES

⁸⁰ See an example of a safety warning in Image 3.54a.

⁸¹ See Chapter 4 for information on recording small-calibre ammunition characteristics.

Image 3.63 Manufacturer markings on magazines



Note: (a) IZHMAISH and (b) Arsenal JSCo markings on Russian and Bulgarian AK-pattern 7.62 × 39 mm magazines, respectively.

Source: Holger Anders

Image 3.64 Partial serial number stamped on the bottom of a Romanian TTC 7.62 × 25 mm magazine



Source: N.R. Jenzen-Jones/ARES

Image 3.65 Different manufacturer markings on three detachable box magazines for the Danish Hovea m/49 SMG



Note: These magazines show different construction techniques, metal finishes, and fonts used for the marking '36'.

Source: N.R. Jenzen-Jones/ARES

Packaging and documentation

Many small arms are observed in the field with packaging and, less frequently, documentation. There are two types of packaging: outer packaging and inner packaging. Outer packaging most often consists of wooden shipping crates. Inner packaging includes weapon cases, plastic packaging, moulded foams, and some form of paper. Packaging can provide valuable clues as to the origin, place of production, age, type, and destination of the arms in question. It may also reveal information regarding ports of transit, dates of transfer, and other important details (see Images 3.66, 3.67).

Some packaging is marked in a misleading or covert fashion. Crates of weapons exported from North Korea, for example, are often intentionally mislabelled with phrases such as 'Parts of rock drill' and 'Parts of tractor' (Jenzen-Jones and Noakes, forthcoming; see Image 3.68).

Image 3.66 Markings on an external packaging



Note: While the model(s) contained within are not listed on this face of the shipping crate, there is a lot of very valuable information contained in the image.

Source: Confidential/ARES

Image 3.67 Packaging crate from Belgian weapons documented in Libya

Source: Confidential/ARES

Image 3.68 Markings on a crate delivered to Qaddafi-era Libya from North Korea

Note: Markings in the top right-hand image indicate that the crate contained 'Parts of bulldozer', when in fact contained a 122 mm high-explosive fragmentation (HE-FRAG) artillery rocket. Small arms are also sometimes packaged in a similar fashion.

Source: Confidential/ARES

Documentation can be one of the best sources of information about individual weapons and arms flows (see Chapters 8 and 9). Documentation on exports, imports, and in-country transfers often sheds more light on the scale, nature, and timing of shipments than the arms themselves. These documents often include contract dates, order quantities, ports of transfer, and the country of origin (see Image 3.69). Such documents may also contain the names and signatures of individuals involved in arms transfers—key evidence in certain types of investigations. Documents are often found inside packaging, but are also sometimes encountered in other locations, such as when filed in armouries or depots. Wherever possible, the authenticity of the documents should be confirmed by comparing them to verified originals of the same types of documents.

Ancillaries and accessories

Small arms are often found with ancillaries and accessories. Ancillaries are items commonly provided with a weapon, including slings, cleaning kits, and oil bottles. Accessories, which are sometimes called ‘auxiliary’ items or ‘attachments’, are devices that increase the effectiveness or usefulness of a weapon but, generally speaking, are not essential for its basic, intended use (Grzybowski, Marsh, and Schroeder, 2012, p. 245). Some accessories, such as under-barrel grenade launchers, are themselves weapons. Other examples include:

- sound suppressors;⁸²
- optical sights (‘optics’);
- fore-grips; and
- flashlights.

Accessories are increasingly found outside military and law enforcement spheres due to the proliferation of—and apparent prestige afforded by—the rails on which many accessories are mounted.

Ancillaries and accessories sometimes provide clues as to the origins of the weapons to which they are attached. Some of these items are also indicators of state or government support. Accessories generally have their own markings, similar to those found on arms (see Image 3.70). These markings should be carefully documented.

82 Sound suppressors are distinct from muzzle attachments by virtue of being typically readily detachable and not usually supplied with a firearm.

Image 3.69 Delivery documentation (packing list) for Russian AK-103-2 self-loading rifles delivered to Libya

1003002 5

УПАКОВОЧНЫЙ ЛИСТ
PACKING LIST №34/1/IZ/ 1745

Экспортёр
Exporter: ФГУП "Рособоронэкспорт"
FSUE "Rosoboronekspert"

Экспортёр
Contract No. 27/2004/P/343406131003 of 19.04.2004

Заказ-наряд №
Order-parjad No. P/343406131003-411443 of 06.09.2004

Грузополучатель
Consignee: ДЕПАРТАМЕНТ ЗАКУПОК ТРИПОЛИ, ЛИВИЯ
PROCUREMENT DEPARTMENT TRIPOLI, LIBYA

Лист 1 из 1
Sheet 1 of 1

Марки и номера Marks and numbers	Наименование товара Description of goods	Ед. изм. Unit of measurement	Количество товара Quantity	Масса, кг брутто/ нетто Mass, kg gross/net	Вид груз. мест Type of packages	Номер места Package Nos
1.	7,62 мм автомат Калашникова АК-103-2 (индекс 6145.C6-02) 7,62-mm Kalashnikov assault rifle AK-103-2 (index 6145.C6-02) No. 041368039 051372027 041379933 051374881 051362370 051387826 051364678 051383287 051366720 051382218 051373429 051384479	796 шт. pcs	12	90/59	812 ящик case	b/ c/ d
	Магазин под патрон 7,62x39 Magazine to 7,62x39 cartridge	-.-	48			
	Штык-нож в сборе Knife- bayonet assembly	-.-	12			
	Шомпол Cleaning rod	-.-	12			
	Принадлежность в пенале (пенала в сборе, протирка, отвертка, выколотка, ёрш в сборе) Accessory in the container (container assembly, pull-through, screwdriver, drift, brush assembly)	-.-	12			
	Ремень для ношения стрелкового оружия Sling for carrying small arms	-.-	12			
	Масленка Oiler	-.-	12			

Marking:
EXPORT
Contract No 27/2004/P/343406131003
Port of loading: Oktyabrsk, CIS Port
Port of destination: Tripoli Libya
Supplier: FSUE "Rosoboronekspert"
Customer: Procurement Department Tripoli Libya
Shipment Lot No: 1/IZ
Case No: 1745/5003/5003
Gross weight /net weight, 90/59 kg
Goods contract index: 343406131003-01

PACKING LIST №34/1/IZ /b (434 - Consignee's country code, approved in Russia, 1 - number of the item acc to the Appendix No 1 to the Contract, 1 - No of the Exporter's shipment Lot, IZ - indication of the manufacturer b - packages No of the manufacturer Lot)
Shipment Lot No: 1/IZ (1 - No of the Exporter's shipment Lot IZ - indication of the manufacturer), Concern "Izhmash" JSC
Case No: b/c/d (b - packages No of the manufacturer Lot, c - total quantity of the packages in the manufacturer Lot, d - total quantity of this manufacturer's packages which have been delivered to the Consignee, taking into account this Lot of the manufacturer's equipment)

Подпись
Signature: [Signature]
Дата
Date: 05 04 05

Source: Jenzen-Jones (2016c)

Image 3.70 Markings on a German Heckler & Koch AG SA 80 (L17A2) 40 × 46 SR mm under-barrel grenade launcher attached to an L85 series self-loading rifle



Source: N.R. Jenzen-Jones/ARES

— Authors: N.R. Jenzen-Jones with Jonathan Ferguson

