

Automatic Grenade Launchers

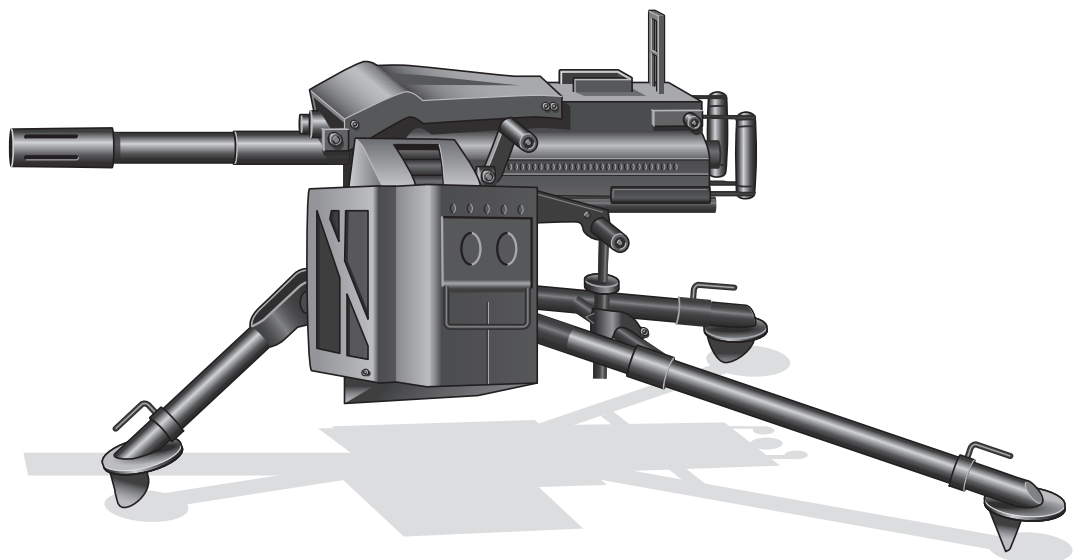
The automatic grenade launcher (AGL) is a self-loading gun that fires a medium-calibre explosive projectile at relatively low velocities and at a relatively slow rate of fully automatic fire.¹ Generally, AGLs are considered to be direct-fire weapons, although they are typically capable of indirect fire. Many AGL systems are belt fed using disintegrating or non-disintegrating belts, while others are fed from detachable box or drum magazines. The projectiles fired from an AGL, while commonly termed ‘grenades’, differ substantially from hand grenades and rifle grenades. AGL systems typically chamber a centrefire cartridge consisting of a primer, propellant, and projectile in much the same way as typical small-calibre ammunition. In fact, when initially introduced into US Navy service in the 1960s, AGLs were referred to as ‘40 mm machine guns’.² Currently they are variously referred to as ‘automatic grenade launchers’, ‘grenade machine guns’ (GMG), and ‘grenade launcher machine guns’.

Although not strictly an AGL, the MK 18 Mod 0 was one of the earliest rapid-fire grenade launcher systems to enter service. Chambered for the low-velocity 40 × 46SR mm cartridge, the MK 18 was developed by the Honeywell Company in the United States as a private initiative with no government contract pending. Design began in 1962 and the first examples of the system were introduced into US Navy service in 1965. The MK 18 was a manually operated system, with the operator using a hand crank to feed and fire cartridges from a

belt and extract fired cartridge cases (Chinn, 1987; Dockery, 2002). MK 18 were issued to troops in Vietnam, where they were employed from a tripod or pintle mount and typically found on various riverine craft (Rottman, 2006). Although reasonably effective, the MK 18 had limited accuracy and range, and was considered a stopgap solution before an automatic system could be introduced.

The most significant development in AGL systems—at least in the West—came with the development of the self-powered, crew-served MK 19 series. The MK 19 series are advanced primer ignition blowback-operated weapons chambered for the 40 × 53SR mm cartridge, employed by infantry and from a wide range of vehicle platforms (US Army, 2003). Although originally designed in 1966, a final redesign in 1976 led to the MK 19 Mod 3, which first entered US Navy service, and then US Army service in 1983. The MK 19 has seen considerable export success and is in service with armed forces around the world. It has also been licence-produced in several countries, including Egypt and Turkey, and close derivatives of the system have been manufactured, such as the South Korean S&T Daewoo³ K4 (Gander, 2002; MKEK, 2013).

In many ways Soviet development of AGLs paralleled the West’s experience. Concurrent with the development of the earliest self-powered AGL systems in the United States, the Soviet AGS-17 Пламя (Пламя, or ‘flame’) was developed in the late 1960s and first entered military service in 1971.⁴ A 40.8 mm cartridge



MK 19 Mod 3 belt-fed automatic grenade launcher on tripod mount



A Heckler & Koch GMG E automatic grenade launcher with Vinghøg Vingmate FCS mounted on a Softmount Combi mount. © N.R. Jenzen-Jones

had been developed previously, exhibiting similarities with the US 40 mm design; however, the weapon's designers insisted on a smaller cartridge to minimize the recoil of the weapon and make it more viable for infantry carry, emplacement, and employ.⁵ The final result was a blowback-operated weapon chambered for the 30 x 29B mm cartridge (Garavskiy, 2012; USSR Ministry of Defence, 1982). The AGS-17 was lighter than the 12.7 x 108 mm heavy machine gun in Soviet service when it was introduced and the later AGS-30 reduced the weight of the system significantly.

The AGS-30 is chambered for the same 30 x 29B mm cartridge and weighs only 16.5 kg complete with its tripod. The introduction of the AGS-30 also resulted in the development of the GPD-30 30 x 29B mm cartridge, with improved lethality and range over the earlier VOG-17 and VOG-30 series cartridges (KBP Tula, 2013). A more recent improvement programme⁶ has led to the Russian Federation 40 mm 6G27 Balkan AGL, a new design chambered for the 40 mm 7P39 caseless cartridge. The 7P39 cartridge offers increased range and lethality over the earlier 30 mm systems in Russian service. While this weapon has appeared at an arms exhibition in the Russian Federation and some sources have claimed that it is undergoing testing

with the country's armed forces, it has not yet entered service (Boechin, 1999; Popenker, n.d.).

Crew-served AGL systems have been manufactured in several other countries around the world and include the General Dynamics Santa Bárbara Sistemas SB40 LAG (manufactured in Spain) (EN SB, n.d.), the Singapore Technologies Engineering CIS 40AGL and Light Weight AGL (Singapore) (ST Engineering, 2014a; 2014b), the Heckler & Koch GMG (Germany) (Heckler & Koch, n.d.), the Howa Machinery Type 96 (Japan) (JGSDF, n.d.), the Denel Land Systems GLI-40 (South Africa) (Denel Land Systems, 2015), and the Plant Leninska Kuznya UAG-40 (Ukraine) (Leninska Kuznya, 2015).

Man-portable automatic grenade launchers

Most AGLs are crew-served weapons, often employed from fixed or semi-fixed positions, typically at the battalion level, or from vehicles. There are some exceptions, however, including the man-portable Czech Weapons RAG 30 and Chinese QLZ87 systems.

China developed the QLZ87 in the 1980s and intended it to be operated by one soldier.⁷ The QLZ87's comparatively light weight—on a par with a general-purpose machine gun such

as the US M240—and portability make it suitable for deployment at the company level. The QLZ87 is chambered for the Chinese 35 x 32SR mm cartridge and features a tubular design and a direct gas-impingement operating action. The Chinese development team working on the QLZ87 and the 35 x 32SR mm cartridge had determined that a weapon chambered for the US 40 x 53SR mm cartridge would be too heavy and bulky to be employed in the manner the Chinese military envisaged and that the Soviet 30 x 29B mm cartridge was too small to contain an effective high-explosive anti-tank (HEAT) payload. China also produces more conventional, belt-fed AGL systems, including the QLZ04 (chambered for the 35 x 32SR mm cartridge) and the LG3 (chambered for 40 x 53SR mm), with the latter intended for export sales (Yan, 2014).

Fire control systems and airburst munitions

For many militaries the focus is now on acquiring comparatively lightweight weapons with advanced fire control systems (FCSs), often combined with an airburst munitions (ABM) capability. The introduction of advanced FCSs provides for increased first-round hit probability. This eliminates the need to 'walk' fire onto a target, which allows the weapons' operators to maintain the element of surprise, engage multiple targets rapidly, and reduce ammunition consumption (which, in turn, results in longer mission endurance or reduced carry load). Additionally, the increased accuracy provided by these systems can greatly reduce the chances of collateral damage. If an FCS is combined with an ABM capability, system operators will be able to engage targets in defilade.⁸ Accurate first-round hit capability becomes of particular importance when firing shaped-charge munitions (such as high-explosive dual-purpose projectiles) against hardened targets or armoured fighting vehicles (Jenzen-Jones, 2014).

ABM work by using information provided by the FCS to program the munition to detonate precisely above or next to a target, making it possible for a direct-fire weapon⁹ such as an

AGL to engage targets in defilade. Targets are thought to be protected by cover in up to 75 per cent of engagements, making the military value of ABM very significant, despite the distinct increase in munition and weapon system complexity and cost (Errante, Lipsit, and Moran, 2006; Williams, 2010).

ABM projectiles are programmed either in the barrel of the weapon via contacts or induction, or by use of radio frequency (RF) or infrared (IR) signals in order to impart fuze mode, time delay, and other necessary details to the munition. While programming the projectiles in the barrel of the weapon removes the slim likelihood of jamming or electronic interference causing a problem, IR and RF systems have the distinct benefit of being able to be fitted to any existing AGL. The first successfully fielded ABM for an AGL was the Nammo MK 285 Programmable Pre-fragmented High Explosive (PPHE),¹⁰ developed at Nammo Raufoss in Norway as part of the MK 47 Mod 0 Advanced Lightweight Grenade Launcher (ALGL)¹¹ system (Jenzen-Jones, 2014).

The MK 47 Mod 0, now manufactured and marketed by General Dynamics Armament and Technical Products, is delivered with the Raytheon AN/PVG-1 Lightweight Video Sight (LVS) and is optimized for the MK 285 PPHE round. The MK 47 is a lightweight, short-recoil-operated, locked-breech weapon that fires from the closed-bolt position, which allows a more accurate first round to be fired. The US military and the Israel Defence Forces have fielded limited numbers of MK 47 systems, with approximately 1,500 in US service. These are almost entirely used by US Special Operations Command (USSOCOM) units, including both Army and Navy components. MK 47 systems are significantly more expensive than legacy weapons. In Australia, the total system price for the MK47 with LVS was thought to be about AUD 100,000 (USD 104,200) as of late 2012 (Jenzen-Jones, 2014).

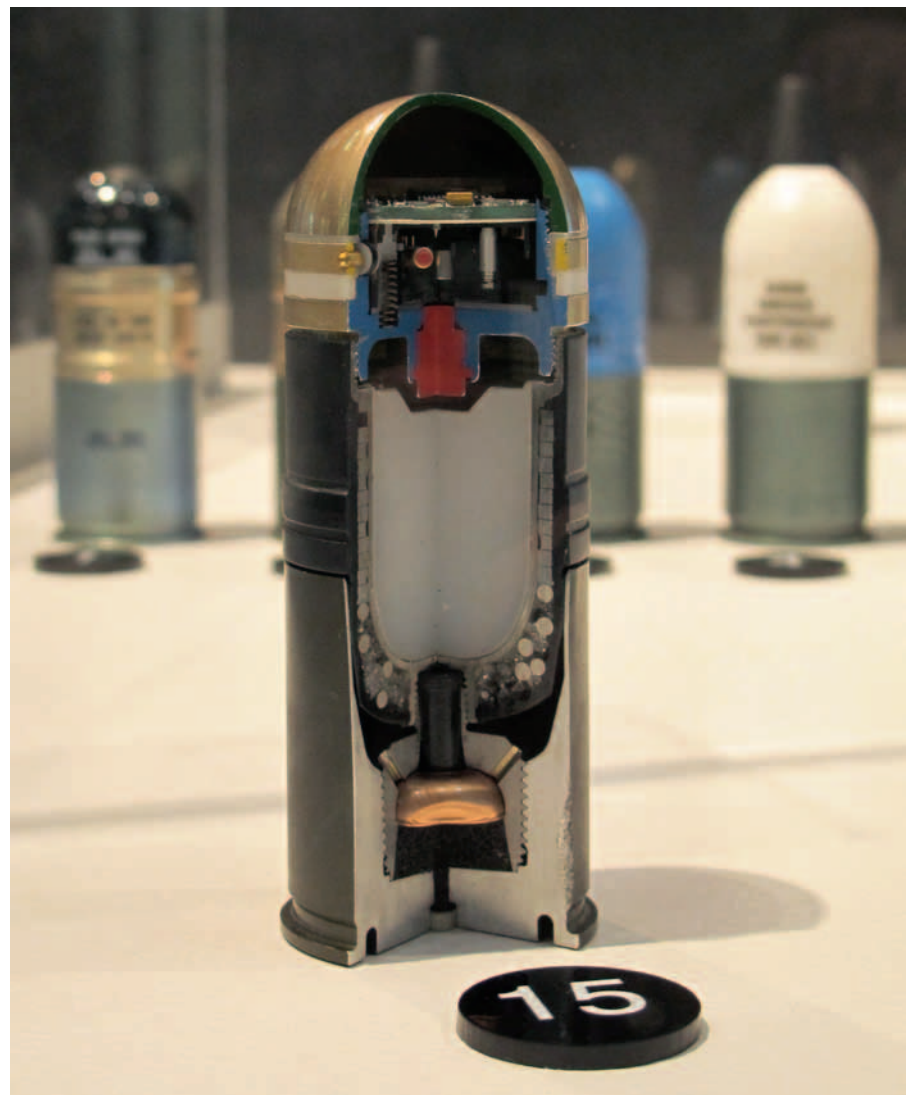
AGL systems are common in military inventories worldwide and have been documented in service with numerous non-state armed groups.

These include groups in Chad, Libya, Somalia, South Sudan, Syria, Sudan, and Ukraine, as well as numerous other countries (Ferguson and Jenzen-Jones, 2014; Yan, 2014). ■

Notes

- 1 Several other self-loading grenade launchers that are capable only of semi-automatic fire have been developed, but are beyond the scope of this report. Notable examples include the Chinese QLBo6, South African PAW-20, US XM25 CDTE, and Czech SAG-30.
- 2 More properly, 'Gun, Machine, 40MM (Grenade)'.
- 3 Now S&T Motiv.
- 4 There is some evidence to suggest that Soviet designers had experimented with AGL systems in the late 1930s (Garavskiy, 2012).
- 5 An airborne version of the weapon, designed for helicopter mounts, was also developed.

- 6 It appears that this was a 1990s programme following on from one initiated in 1980 that resulted in the experimental TKB-0134 Kozlik (Козлик, or 'goat') (Boechin, 1999).
- 7 In its 'light' configuration, with a six-round drum magazine and integral bipod. The QLZ87 is also employed in a 'heavy' configuration with a 15-round drum magazine and tripod (Yan, 2014).
- 8 Protected by cover.
- 9 In contrast to indirect fire support weapons, such as mortars, which typically engage targets outside the operators' line-of-sight. While AGL systems are sometimes employed in the indirect fire role, they are typically used as direct fire weapons.
- 10 The MK 285 PPHE cartridge is a good example of how modern arms and munitions development often works, with Nammo Raufoss acting as the system integrator, integrating a cartridge case designed by Nico Pyrotechnik (Germany), a projectile designed by Diehl Defence (Germany), and a fuze designed by Bofors Carl Gustaf in Sweden and manufactured by Micro Technology Hérémence (MTH)



Nammo MK 285 Programmable Pre-fragmented High Explosive (PPHE) 40 x 53SR mm airburst munition. © N.R. Jenzen-Jones

in Switzerland. Nico Pyrotechnik, Bofors Carl Gustaf, and MTH have now been bought out by different companies (Jenzen-Jones, 2014; Lambrecht, 2006).

- 11 Also known commercially as the STRIKER 40, and previously marketed by Bofors Carl Gustaf in Europe as the CG40.

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