

## US Helicopter Armament Subsystems



UH-60 Blackhawk helicopters equipped with [M60D](#) machine guns near [Najaf, Iraq](#) in May 2005. The [helicopter](#) itself has added much to the modern battlefield, changing land warfare tactics across the board. Transportation, with the ability to rapidly deploy or evacuate forces or casualties has changed huge aspects of post-modern warfare. The helicopter as an armed weapon has also added a whole new dimension to the battlefield.

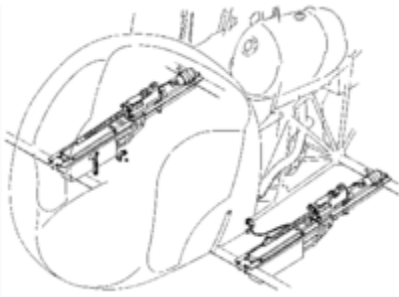
Although one of the first Armies to experiment with helicopters, the [United States Army](#) was slow to fully explore the possibilities of armed helicopters. Experiments between the [Korean War](#) and US involvement in [South East Asia](#) were small and fairly simple. Learning much from these involvements the US decided to look further into the idea of air mobile tactics, and subsequently armed helicopters, though an armed helicopter had been proposed and rejected in the early 1940s. By the time the UTTHCO (Utility Transport Helicopter Company) was deployed to [Vietnam](#) in [1962](#) the US had started experimenting more with the idea of arming helicopters, both for defensive and offensive purposes. UTTHCO was a sort of expeditionary unit, deployed to Vietnam to assist the [South Vietnamese](#) Army and to provide on the ground testing for new air mobile theory. Weapon systems used by UTTHCO were often crude and made from field expedient parts and weapons.

By 1965, the United States had deployed a truly Air Mobile unit, the 1/7th Cavalry, which began to use more standardized armament systems. Throughout US involvement in Vietnam the US Army, US Marine Corp, and US Air Force would develop and utilize a number of armament systems designed for a variety of helicopters, and would pave the way for more dedicated attack helicopters.

With the arrival of dedicated gunship helicopters, such as the [AH-1 Cobra](#) and later the [AH-64 Apache](#), armament subsystems for non-specific types would begin to drop off, with mostly defensive armament packages remaining. Such armament packages, giving decidedly heavy armament to small or primarily transport helicopters have become popular among second and third world countries who lack the funds for dedicated attack helicopters. Most of the systems bear some resemblance to the plethora of US systems that follow in this entry.

### Armament Sub-Systems For Non-Dedicated Gunships

[OH-13 Sioux](#) and [OH-23 Raven](#)



XM1 on the OH-13

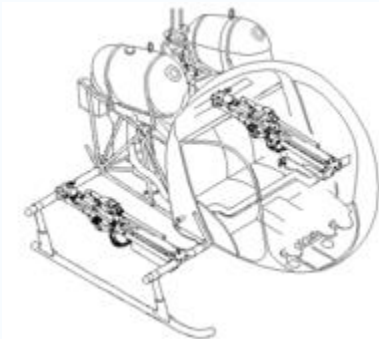
- **XM1/XM1E1**

In service between 1960 and 1972, the XM1 consisted of two [M37C](#) .30-06 machine guns mounted on the landing skids of either the OH-13 or OH-23 helicopter. These weapons were fixed forward, but flexible in elevation, with their ammunition (500 rounds per gun) stored externally. The XM1E1 was the product engineering design.

**NOTE:** What would appear to have been a variant of the XM1 system was used by UTTHCO on their HU-1A's (later [UH-1A](#)) for a short period.

- **M2**

The M2 system was a variation on the XM1, replacing the M37C machine guns with 7.62x51mm [NATO M60C](#) machine guns. The mounts were similar to the XM1, also providing flexible elevation, with 650 rounds per gun stored externally.



M2 on the OH-23



Close up of one of the two mounts for the M2 system

## [CH-21 Shawnee](#)

- **Offensive Armament**

Experiments were done using CH-21s with both fixed forward [M2HB](#) .50 caliber machine guns and forward firing rocket launchers. Neither system was standardized, but both paved the way for similar systems on later helicopter types.

- **Defensive Armament**

UTTHCO deployed with a number of CH-21's, and experimented with field expedient bars mated to the cargo doors, fitted with [M37C](#) .30-06 machine guns and feed from boxes mounted on top of the weapon.

**NOTE:** It would appear that similar mounts were fabricated for use with early UH-1s as well.

## [UH-34/CH-34 Chocktaw/Seahorse](#)

- **TK-1**

A USMC weapon system to provide H-34 helicopters with offensive armament, the TK-1 (Temporary Kit-1) featured two [M60C](#) 7.62x51mm machine guns on each side, fixed forward, with ammunition fed out from boxes inside the aircraft. Helicopters equipped with the TK-1 were sometimes referred to as "Stingers."

- **Defensive Armament**

Both the US Army and the USMC developed pintle mounts for use in the main cargo door, mounting a single infantry type [M60](#) 7.62x51mm machine gun (sometimes referred to as "M60A"), allowing the crew chief to fire the weapon while seated on the opposite side.

## [CH-47 Chinook](#) and [ACH-47A](#) "Guns-a-GoGo"

- **M24**

A defensive armament subsystem, the M24 provides a pintle mount for an [M60D](#) 7.62x51mm machine gun at either left or right front cargo doors on the CH-47. The system feeds from standard 200 round ammunition boxes attached to the weapon.

**NOTE:** The US Army has recently begun to phase out the [M60D](#) in favor of the new [M240H](#), but it is unknown whether the necessity of a new cradle for the weapon will result in the system being redesignated. The mount is otherwise the same.

- **XM32**

A defensive armament subsystem, the XM32 provides pintle mounts for either [M60D](#) 7.62x51mm machine guns or [M2HB](#) .50 caliber machine guns at both cargo door positions and at both rear emergency hatches of the CH-47 helicopter, with weapons feeding from standard ammunition boxes. This system was developed specifically for the ACH-47 helicopter.

- **XM33**

A defensive armament subsystem, the XM33 provides a mount for either an [M60D](#) 7.62x51mm or an [M2HB](#) .50 caliber machine gun on the rear cargo ramp of the CH-47 helicopter. This system was developed specifically for the ACH-47 helicopter, with the weapon feeding from standard ammunition boxes.

- **XM34**

An offensive armament subsystem developed for the ACH-47 helicopter, the XM34 provides two [M24A1](#) 20mm cannons with ammunition boxes on sponsons at the front of the aircraft fixed forward.

**NOTE:** These sponsons were also fitted with aircraft style hardpoints that allowed the mounting of [XM159B/XM159C](#) 19-Tube 2.75" rocket launchers or [M18/M18A1](#) 7.62x51mm gun pods.

- **M41**

A defensive armament subsystem, the M41 provides a mount for an [M60D](#) 7.62x51mm machine gun on the rear cargo ramp of the CH-47 helicopter. The system feeds from standard 200 round ammunition boxes attached to the weapon.

**NOTE:** The US Army has recently begun to phase out the [M60D](#) in favor of the new [M240H](#), but it is unknown whether the necessity of a new cradle for the weapon will result in the system being redesignated. The mount is otherwise the same.

## [OH-6 Cayuse](#) and [OH-58 Kiowa](#)

- **XM8**

The XM8 system provides a mount for one [M129](#) 40mm grenade launcher for either the OH-6 or OH-58 light observation helicopters. The system is provided with an XM70/E1 sight and 150 rounds of ammunition. The XM8's mount is interchangeable with the M27 system. See [XM8 armament subsystem](#) for more.

- **M27/M27E1**

The M27 system provides a mount for one [M134](#) 7.62x51mm machine gun (Minigun) for either the OH-6 or OH-58 light observation helicopters. The system is provided with an XM70/E1 sight and a MAU-56/A delinking feeder with 2000 rounds of ammunition. The original M27 featured a bulky aerodynamic fairing covering the gun and mount, which was disposed of because of the increased weight on the M27E1. The M27's mount is interchangeable with the XM8 system.

## [UH-1 Iroquois](#)

- **XM156/M156**

Not technically an armament subsystem, the XM156/M156 universal mount provided mounting supports and racks for a number of systems used on the UH-1 series of helicopters.

- **XM3/XM3E1/M3**

The M3, sometimes referred to as "Aerial Rocket Artillery" or ARA, consisted of two 2.75" [24-Tube rocket launchers](#), one on either side of the aircraft, along with a Mk 8 sight. The launchers fired in pairs, one from each side to prevent the aircraft from becoming off balance. The original XM3s used system specific mounts, but later M3 systems were attached using the XM156/M156 universal mount.

**NOTE:** The XM3 was also tested on the CH-34/UH-34 helicopter, but with the switch to the UH-1, this was dropped.

- **XM5/M5**

The XM5/M5 system consists of a nose turret for a single [M75](#) 40mm grenade launcher. The mount was fully flexible and controlled by the pilot via a hand controlled sight electronically linked to the turret. The system either provided 150 or 300 rounds of ammunition.

- **XM6/M6/M6E3**

The XM6/M6 system was one of the first systems to make use of the XM156/M156 universal mount, providing two [M60C](#) 7.62x51mm machine guns on either side of the helicopter. This system would later be expanded upon, but initially gave the UH-1 increased firepower and an improved offensive system over the skid mounts originally used. The M6E3 coupled the four guns with four [MA-2/A](#) 2.75" 2-Tube rocket launchers on each side of the aircraft, giving an even greater punch.

- **XM9**

A variant of the XM6/M6 system, the XM9 substitutes the four [M60C](#) 7.62x51mm machine guns with two [M75](#) grenade launchers, one on either side of the aircraft

- **XM16/M16**

A variation on the principle of the M6E3, the XM16/M16 system mated the previous M6 with either two [M157](#) or two [M158](#) 2.75" 7-Tube rocket launchers.

- **XM21/M21**

A further variation on what had essentially become a basic system, the XM21/M21 subsystem replaced the XM16/M16's four [M60Cs](#) with two [M134](#) 7.62x51mm Miniguns.

- **M23**

The M23 system provides door pintles at either main cabin doors for an [M60D](#) 7.62x51mm machine gun, with the weapon feeding from either a standard ammunition box or a larger purpose built box connected the mount. The M23 is specifically designed for long fuselage UH-1s (UH-1D/H/N)



M23 Armament Subsystem



M23 Armament Subsystem on the UH-1D

- **XM29 and the Sagami Mount**

The XM29 was an experimental door pintle for the main cabin doors of short fuselage UH-1s (at the time the UH-1B/C), for an [M60D](#) 7.62x51mm machine gun. Far more common on such helicopter and on the last of the short fuselage UH-1s, the UH-1F/P/M specifically, was the Sagami Mount, a skeleton frame mount that swung out from a fixed position at the rear of the cabin. This mount was designed for the M60D, but in certain instances, primarily by the US Navy Seawolves, dual [M60s](#), [M2HB](#) machine guns or [M134](#) Miniguns were fitted.

- **XM30**

An experimental system, the XM30 provided fully flexible mounts using the XM156/M156 universal mounts for two [XM140](#) 30mm cannons, with 600 rounds of ammunition per gun.

- **XM31**

Another attempt to up the firepower from existing systems, the XM31 provided two [M24A1](#) 20mm cannons in pods fitted to XM156/M156 universal mounts each with 600 rounds of ammunition, and flexible in elevation only.

- **XM50**

XM50 is a designation for the combination of the XM5/M5 and the XM21/M21 armament subsystems, a common configuration used by US forces in South East Asia.

- **XM59/M59**

A variation on the M23, the XM59/M59 was modified to accept either an [XM213/M213](#) .50 caliber machine gun or an [XM175](#) 40mm grenade launcher in addition to being able to mount the [M60](#).

- **XM93/XM93E1**



This armament subsystem provides door mounts for long fuselage UH-1s (UH-1D/H/N) for two [M134](#) 7.62x51mm Miniguns. The USAF also used this system on their short fuselage UH-1F/P helicopters. These weapons are equipped with chutes connected to their ejection ports that directs spent cases and links away from the aircraft. The XM93E1 is a variation on the system that allows both guns to be trained forward and remotely fired by the pilot via an electronically linked sight.

**NOTE:** The USAF was the primary user of this system and often combined it with two [7-Tube](#) 2.75" rocket launchers of varying types on two independent support rack and pylon assemblies.

- **TK-2**

A variant of the TK-1 for the CH-34/UH-34 helicopter, the TK-2 (Temporary Kit-2) was developed by the USMC for their UH-1E helicopter. The system provides the same four [M60C](#) 7.62x51mm machine guns as the TK-1, but adds two independent support rack and pylon assemblies to the system, for mounting an acceptable aircraft style armament. Typically these mounts were used for [7-Tube](#) 2.75" rocket launchers of varying types, but were also seen tested with [XM18/M18](#) Minigun pods (USAF SUU-11/A).

- **XM11, XM22/M22, and the Maxwell System**

Both of these armament systems were designed to allow the UH-1 to fire the [AGM-22](#) missile. The XM11 provided an XM70 sight and support racks for 6 missiles, three on each side of the aircraft. The support racks were similar to those used on the original XM3/M3 rocket launchers. The M22 was an improvement providing a more specific sight, the XM58, and using the XM156 universal mount. The M22 also provided for a total of 6 missiles, three on each side of the aircraft. It is important to note as well that that the XM11 was designed to fire standard SS.11 missiles, while the XM22/M22 system was designed around the US upgraded AGM-22.

The Maxwell System was a hybrid system designed by Warrant Office Robert Maxwell as a field modification. Maxwell's unit had been sent both the M3 and XM11 systems, and he noticed that often aircraft with the M3 system only firing half or less of their total rocket load. By removing one or two banks of rockets (and reducing the total carried to 12 or 18 total rockets versus 24) and adding a single launching mount for an [AGM-22](#) missile he effectively gave the aircraft both suppression and point attack capabilities.

- **XM26**

With the development of the [BGM-71 TOW](#) missile Hughes had been given the contract to develop a launching system for the UH-1. By 1968 development had shifted over to development of a system for the AH-56 helicopter which was eventually canceled. The XM26 provided two 3-Tube launchers on either side of the aircraft, as well as, the necessary sighting equipment. While the XM26 was more of a test platform, the two prototypes were deployed operationally as an emergency measure in South Vietnam to counter the Easter Invasion in 1972.

## [UH-60 Black Hawk](#)

- **M144**

The M144 is a defensive subsystem that provides mounts and cradles at the two windows between the pilot doors and the main cabin doors on the UH-60 series of helicopters, each mounting a single [M60D](#) 7.62x51mm machine gun.

**NOTE:** The US Army has recently begun to phase out the [M60D](#) in favor of the new [M240H](#), but it is unknown whether the necessity of a new cradle for the weapon will result in the system being redesignated. The mount is otherwise the same.

## Armament Sub-Systems For Dedicated Gunships

### [AH-1 Cobra](#)

- **XM35/M35**

An armament subsystem providing a single [M195](#) 20mm cannon on the port inboard pylon of the AH-1G. 950 rounds of ammunition were stored in boxes faired to the side of the aircraft. The system was primarily pilot controlled, but featured dual controls to be either pilot or gunner controlled. For this purpose the pilot was provided with a M73 sight.

- **XM65/M65**

The Cobra Missile System is a functional development of the XM26 and the TOW missile system developed for the failed AH-56 helicopter. Originally designed for the AH-1Q and AH-1S Cobras, the AH-1F Modernized Cobra was also rebuilt to use the system. The original iteration of the system comprises of launchers allowing for four [BGM-71 TOW](#) missiles per aircraft pylon to be carried, and a **TSU** or **Telescopic Sight Unit**, to allow for targeting and guidance of the missile. The TSU has been upgraded with the **LAAT (Laser-Augmented Airborne TOW)**, a day/night range finder, and **C-NITE (Cobra-Night Imaging Thermal Equipment)**, a thermal imager/FLIR system specifically for the AH-1S and AH-1F Cobra helicopters.





## U.S. M60 Machine gun Technical Summary



<b>Caliber:</b>	<a href="#">7.62 × 51 mm NATO</a>
<b>Firearm action:</b>	<a href="#">Gas-operated</a> , <a href="#">open bolt</a>
<b>Barrel length:</b>	560 mm (22 in)
<b>Overall length:</b>	1,077 mm (42.4 in)
<b>Effective range:</b>	1,100 m (1,202 yd)
<b>Maximum range:</b>	3,725 m (4,075 yd)
<b>Cyclic <a href="#">rate of fire</a>:</b>	~550 round/min
<b>Sustained <a href="#">ROF</a>:</b>	100 round/min
<b><a href="#">Muzzle velocity</a>:</b>	853 m/s (2,800 ft/s)
<b>Weight, unloaded:</b>	10.5 kg (23.1 lb)
<b>Manufacturer:</b>	Saco Defense, U.S. Ordnance

The **M60** (also seen 'M-60', formally **Machine Gun, 7.62mm, M60**) is a family of [American belt-fed machine guns](#) firing the [7.62 × 51 mm NATO cartridge](#).

In the [U.S. military](#), the M60 has largely been replaced by various versions of the [M240](#) as a [medium machine gun](#), and by the [M249 SAW](#) as a [squad automatic weapon](#). However, it remains in use in every branch, as well as some other countries (another major user was [Australia](#)); it continues to be manufactured into the 21st century.

The M60 can be used in both offensive and defensive configurations. In the offense, it provides a higher [rate of fire](#), greater effective range, and uses a larger [caliber](#) round than the standard-issue U.S. [service rifle](#), the [M16](#) family. In defensive use, the long range, close defensive, and [final protective fires](#) delivered by the M60 form an integral part of a unit's battle plan.

The M60 is effective up to 1,100 meters when firing at an area target and mounted on a [tripod](#); up to 800 meters when firing at an area target using the integral [bipod](#); up to 600 meters when firing at a point target; and up to 200 meters when firing at a moving point target. [United States Marine Corps doctrine](#) holds that the M60 and other weapons in its class are capable of [suppressive fire](#) on area targets out to 1,500 meters if the gunner is sufficiently skilled.

The M60 is generally used as [crew-served weapon](#), which means that it is usually operated by more than one soldier, in this case two — the gunner and an assistant. The gun's significant weight makes it difficult to carry and operate by a single soldier. In the modern United States Army Infantry, each soldier will typically carry the much lighter and smaller M16 rifle, while the entire squad will be served by a single, shared M60. The gunner carries the weapon while the assistant carries a spare [barrel](#) and extra [ammunition](#) in linked [belts](#). The basic ammunition load carried by the crew is 600 to 900

rounds, which at the maximum rate of fire allows for approximately two minutes of continuous firing. In many U.S. units that used the M60 as a [squad automatic weapon](#) in [Vietnam](#), every soldier in the rifle squad would carry at least 200 linked rounds of ammunition for the M60, a spare barrel, or both, in addition to his own weapon and equipment.

The designation is normally written without dashes (e.g. *M60*); however, 'M-60' can commonly be found even in government sources. M60 references either the first major version, or some member of the family. Other major versions are the **M60E1** (an improved version that did not enter production), the **M60E2** (a [co-axial](#) tank machine gun used on the M48A5 and later model M60 tanks), the **M60E3** (a lightweight version) and the **M60E4** (another improved version, designated **Mk 43 Mod 0** by the [U.S. Navy](#)). The M60C was used on fix mounts on aircraft, and the M60D was primarily used as a door gun on helicopters. The M60E2 and M60D are used on the [Type 88 K1](#) in co-axial and [pintle](#)-mounted configurations, respectively. There are many smaller variations among each type, between makers of the firearm, and over time.

## History



A 19th Special Forces Group soldier mans an M60 machine gun on a HMMWV in [Afghanistan](#), in March 2004

The M60 machine gun began development in the late 1940s as a program for a new, lighter 7.62 mm machine gun. The design included features that had been successful on earlier designs, as well as improvements of its own. The gun first became widely known during the [Vietnam War](#) period and has appeared in numerous television shows and movies (perhaps the most well-known of these are the [Rambo](#) movies starring [Sylvester Stallone](#)). It was partially replaced by the M249 Squad Automatic Weapon starting in the 1980s in certain jobs, and was gradually replaced in the late 20th Century by the M240 machine gun (a variant of the [FN MAG](#)), which was adopted by the U.S. military from 1977, and entered service in the 1980s for vehicles and 1990s for infantry. The M240 is several pounds heavier than the M60, but it is highly regarded for its high reliability despite having a very complex gas system.

In Australia, the M60 was replaced by the [F-89](#), a [FN Minimi](#).

It drew on many common concepts in firearms manufacture, such as stamped sheet metal construction as on the [Chauchat](#) (the most produced machine gun of [WWI](#)), belt feed (as on the [Browning M1919](#)), a modified mechanism for belt feed from the [MG42](#), fast barrel replacement (such as on the [Czechoslovakian ZB 1930](#)), and a [pistol grip](#) and [stock](#). The M60's gas-operated is unique, and drew on technical advances of the period, but like most firearms drew on older designs. Its gas system drew in particular on the [Lewis Gun](#)'s gas system [\[1\]](#). It is commonly said to have drawn on the German [FG42](#)'s gas system, though its likely this is the result of confusion with the T52 and T44, which were developed from the FG42, but were defeated by what would become the M60 in the trials

for the new machine gun in the 1950s. The gas system was simpler than other gas systems, and likewise easier to clean.

The M60 was adopted by the [U.S. Army](#) officially in 1957, and is still in use (as of 2006). Its reputation varies widely, and often depends upon which version a person gained experience with, and when.

The M60 continued to be used as a door gun on U.S. Army helicopters into the 2000s, as the main 7.62 mm machine gun by some U.S. [special operations forces](#) into the late 1990s, and by [U.S. Navy SEALs](#) into the 2000s. As of 2005, it is used by the [Coast Guard](#), Navy, and a number of reserve forces, though it is gradually being phased out in favor of the [M240](#) 7.62 mm medium machine gun. The weapon can still be found in use in the U.S. Army and special operations forces in other roles. The use as a Army helicopter door gun will soon be tapering off, as an improved M240 version has finally been adopted for this role in the later half of first 2000 decade.

Use of the M60 is tapering off over a long period, as the weapons in service slowly wear out (and then new weapons are bought) or when a new weapon is obtained for a given job. Also, subgroups that continue to use them may obtain funding to keep models in service. One unit might have received new M240s, only to give their M60s to a reserve unit, sometimes replacing an even older weapon. It also remains in use in other countries in a variety of roles. The M240 itself has been slated for eventual replacement under a program for a new lightweight 7.62 mm machine gun under Joint Service Small Arms Program (JSSAP).

## Design



A M60 machine gun aboard a Navy patrol craft. The [USS Constellation \(CV-64\)](#) is visible out in the distance; July 2002



M60 machine gun fired during a small arms familiarization exercise aboard [USS Blue Ridge \(LCC-19\)](#); November 2004



A Gunner's Mate 3rd Class in the process of preventative maintenance and cleaning on a M60 machine on the USS Constellation (CV 64); December 2002



[UH-60 Blackhawk](#) helicopters equipped with M60D machine guns near [Najaf, Iraq](#)

The M60 is a [gas-operated](#), [air-cooled](#), belt-fed, [automatic](#) machine gun that fires from the open-bolt position and is chambered for the [7.62 mm NATO](#) cartridge. Ammunition is usually fed into the weapon from a 100-round [bandolier](#) containing a disintegrating, metallic split-link belt. As with all such weapons, it can be fired from the shoulder, hip, or underarm position. However, to achieve the maximum effective range, it is recommended that a bipod-steadied position or a tripod-mounted position be used and fired in bursts of 3–5 rounds. The weapon is heavy and difficult to aim when firing without support, though the weight helps reducing the felt recoil. The straight-line layout allowed the operating rod and buffer to run directly back into the buttstock and reduce the overall length of the weapon. The large grip also allowed the weapon to be conveniently carried at the hip. The gun can be stripped using a live round of ammunition as a tool.

The M60 is often used with its own integrated bipod or with the [M122 tripod](#).

### **Design performance and criticisms**

When tested in the field, the M60 was fairly effective, but in the jungles of [Southeast Asia](#) in which it was soon used, the initial versions displayed several potential problems when used on the ground. Some say that the most common complaint about the machine gun was its weight, but all belt-fed weapons of this type are rather heavy. The M60 was among the lightest 7.62 mm machine guns of the era, and lighter than the M240 that is slowly supplanting it.

From units in Vietnam, the single most common complaint was that the M60 was comparatively unreliable and prone to jamming and other malfunctions, especially when it was dirty (fine sand and dust in the mechanism could bring the M60 to a halt). This was a major factor in the [Israeli Defense Force](#) declining to adopt the M60. The weapon was also more difficult to clean and maintain than the M1918 [Browning Automatic Rifle](#) (BAR). The weapon in normal conditions would often fire thousands of rounds without a serious jam; however, it is the ability to operate in the field which is important. For



those who maintained the weapon properly, it was effective enough; it remained in use on aircraft, ships, and special forces after being supplanted among regular infantry by the M249 and M240. The safety was awkward to operate and worked the "wrong way" for soldiers who were trained with the M16 rifle and M1911A1 pistol — that is, it required an upward movement of the thumb on the safety catch to make the gun ready to fire, rather than a downward movement as with the other weapons.

The M60 sometimes (depending on the version) tore rims off of fired cartridge cases during the extraction cycle, resulting in failure to remove the empty case, causing a jam that could take many minutes to clear. The barrel latch mechanism (a swinging lever) had a tendency to catch on the gunner's equipment and accidentally unlatch, causing the barrel to fall out of the gun. The lever was replaced with a pushbutton mechanism that was less likely to be accidentally released, but many of the swinging-lever latches are still on guns in inventory, forty years after this problem was discovered. The grip/trigger housing assembly is held in place with a rather fragile leaf spring clip instead of the captive pins used in other designs. The spring clip has been known to be prone to breakage since the first trials at Aberdeen Proving Ground. Duct tape and cable ties have been seen on M60s in the field, placed there by their crews in case the spring clip breaks.

Several critical parts of early production M60s, such as the [receiver](#) cover and feed tray, were made from very thin sheet metal stampings and prone to bending or breaking; sturdier parts were eventually available in the early 1970s. Early M60s also had driving spring guides and operating rods that were too thin and gas pistons that were too narrow behind the piston head (part of an attempt to save weight), leading to problems with breakage. Metallurgical problems also played a part, (blamed by some on low-bid contractors), but after 1970 a slightly heavier part was designed and slowly put into the supply chain.

Another criticism with some versions of the M60 is that the barrel, removable as with most machine gun barrels, had the bipod attached to it, instead of being attached to the gas chamber or barrel shield. This had some advantages but made replacement barrels heavier.

U.S. Marines especially disliked the M60 and many Marine units held onto their BARs until 1967-68 officially, and longer than that unofficially. The M60E3 variant was designed in the mid-1980s for the U.S. Marine Corps, with a reduction in weight to 18.9 lb (8.61 kg) and a slight improvement in reliability. However, users complained about the quickly-overheating barrel, which had been a problem with the original M60. This problem was aggravated in the M60E3, as the lighter barrel required changing every 100 rounds instead of every 200. However, the M60E3's barrel has a wire and plastic handle near the breech end and can theoretically be changed safely without the use of heat-resistant mittens.

In 1991, the Belgian-designed [FN MAG](#) machine gun, designated the [M240](#) in U.S. service, was adopted by the Marines as the M240G as a replacement for M60s used by infantry, though the M240 had already been used as a co-axial and pintle-mounted machine gun since the 1980s by the USMC. The M240 was first adopted in 1977 by the Army as a co-axial machine gun. The Army adopted the M240B for infantry in the mid-90s, and other branches of the military adopted various versions at different points in time. As of 2006, the M60 continues to be fielded to some degree by all branches of the U.S. military, in addition to Reserve and National Guard units. This includes front line service with some U.S. special forces and as a helicopter door gun. The Navy also continues to use various versions in a variety of jobs. It is scheduled to be replaced as in the door gun role by the new M240H. As mentioned, remaining M60s and the M240 are both planned to be replaced by a new lightweight 7.62 mm machine gun.



A soldier of [173rd Airborne Brigade](#) mans a M60 on [Hill 875](#) in November 1967

## Ammunition

The M60 family of weapons are capable of firing many different kinds of [ammunition](#). Most common among them are the M61 [Armor piercing](#), the M62 [Tracer](#), the M80 Ball, the M63 Dummy, and the M82 [Blank](#); the new [tungsten](#) cored M993 [Armor piercing](#) ammunition can be used with the M60 as well, though it did not enter the inventory until long after the M60 was withdrawn from service in active-duty units. When firing blanks, the M13 or **M13A1 Blank Firing Adapter** (BFA) is necessary in order to get the weapon to cycle "full auto" with blanks. All of these ammunition types are delivered to the gun via NATO standard M13 disintegrating metallic split-link belt. The standard combat ammunition mix for the M60 consists of a four ball (M80) [cartridges](#) and one tracer (M62). The four to one ratio theoretically allows the gunner to accurately "walk" the fire into the enemy. A skilled machine gunner also knows that tracer bullets do not always fly quite the same trajectory as ball, and weapon's sights must be used — particularly at ranges in excess of 800 meters, where [7.62 x 51 mm NATO](#) tracer bullets usually burn out and are no longer visible (which is a problem with all weapons in this caliber; smaller-caliber tracer bullets, such as the [5.56 x 45 mm NATO](#) used in the M249 SAW, hold even less tracer compound and differ greatly in weight from ordinary bullets. As a consequence, their trajectories are radically different from non-tracer bullets, and burn out at a mere 300 meters).

## Main ammunition types

- M61 Armor-piercing
- M62 Tracer
- M80 Ball
- M82 Blank (used with M13A1 blank-firing attachment)
- M63 Dummy

All types are used with the [M13 link](#), a metal link for disintegrating ammunition belts.

The M13A1 blank-firing attachment allows the gas system to still function with the blanks. It can be commonly seen on M60s during exercises and training. A small colored flag on the attachment allows the device to be seen at some distance.

## Variants





A [UH-60 Blackhawk](#) door gunner mans a M60D machine gun during a mission in northern [Iraq](#) in note the spade grips

Many different variants of the M60 have been developed over the years. Most of the revisions have been aimed at rectifying problems with earlier designs; however, two versions (the M60C and the M60D) are modified for use primarily in aircraft.

### Variant summary

- **T161** — the M60's developmental designation before it was type-classified in the 1950s.
- **M60** — the basic model, type-classified in 1957.
- **M60E1** — an improved version that did not enter production.
- **M60E2** — used in vehicles as a co-axial machine gun; electrically-fired.
- **M60B** — used in helicopters in the 1960s and 1970s; unmounted.
- **M60C** — used in fixed mounts in aircraft in the 1960s and 1970s; electrically-fired.
- **M60D** — replaced the M60B; a pintle-mounted version used especially in armament subsystem for helicopters, but also some other roles.
- **M60E3** — an updated, lightweight version adopted in the 1980s.
- **M60E4 (Mk 43 Mod 0/1)** — an improved model of the 1990s that looks similar to the E3, but has many improvements. It has subvariants of its own, and is also used by the U.S. Navy (as the Mk 43 Mod 0/1). The Mk 43 Mod 1 is a specialized version with additions such as extra rails for mounting accessories.

### M60

The initial version was officially adopted by the U.S. Army in the late 1950s, though at this time it was only intended for the infantry. It was known as the T161 before it was adopted (specifically the T161E3), and was chosen over the competing T52 during testing in 1950s. They both used a similar feed and were both gas-operated, but the T161 was easier to produce and its different internals performed better. The model that won the competition was the T161E3.

The model was type-classified in 1957, and entered production. It saw its first heavy use in the 1960s. The basic design has undergone some smaller changes, and has been produced by different manufacturers.

## M60E1

The M60E1 was the first major variant of the original M60. It did not go into full-scale production, though many of its features were included into the later E3 and E4 variants. Some of its features were also incorporated into the existing M60 production. This mainly changed how the gas cylinder, the barrel, and the bipod were connected; in the first iteration. The M60 and the M60E1 are two different versions. Opinions are varied on whether the M60E1 was officially adopted or not.

One of the more noticeable changes on the M60E1 is that the bipod attachment point was moved to the gas tube rather than the barrel (like on the later M60E3). It did not, however, have a forward pistol grip, as was added on the E3.

## M60E2

The M60E2 is used on [armored fighting vehicles](#), such as the [M48A5](#), later [M60 Patton](#) versions and the [K1 Type 88](#). It lacks many of the external components of the standard M60, including stock and grips. The M60E2 was electrically-fired, but had a manual trigger as a backup, as well as a metal loop at the back for [charging](#). The gas tube below the barrel was extended to the full length of the weapon to vent the gas outside the vehicle. This version achieved a mean time between failures of 1,669 during testing in the 1970s, less than the [FN MAG](#), which was adopted in 1977 as a co-axial vehicle gun, and designated the M240.

The M60E2 is used on the [South Korea's K1 Type 88](#) tank as a [co-axial weapon](#), along with a M60D on a pintle mount.



M60E2, intended for co-axial use. Note gas tube extension and no grip

## M60B

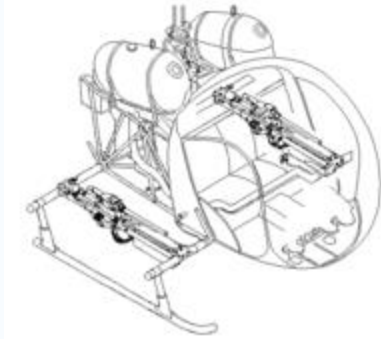
The M60B was a short-lived version designed to be fired from helicopters, with limited deployment made in the 1960s and 1970s. It was not mounted, just held, and was soon replaced by the pintle-mounted M60D. The 'B' model differed most noticeably in that it had no bipod and featured a different rear stock than the regular model. It still had a pistol grip (as opposed to spade grips). The M60B's advantage over pintle-mounted variants was that it had a wider and much less restricted field of fire.

## M60C



The M60C machine gun

The M60C is a variant of the standard M60 for aircraft-mounting, such as in [helicopter armament subsystems](#). It lacks things like the bipod, pistol grip, and [iron sights](#). The main difference between the standard M60 and the "C" variant is the electronic control system and the hydraulic swivel system used. It could be fired from the cockpit by the pilot or co-pilot. It is an electronically-controlled, hydraulic-powered, air-cooled, gas-operated, belt-fed weapon system. It used the M2, M6, and M16 armament subsystems and was mounted on the [OH-13 Sioux](#), the [OH-23 Raven](#), the [UH-1B Huey](#), and the [OV-10 Bronco](#). M60C production was on the order of several hundred.



M60C was used as part of M2 armament system on the OH-23 Raven



Close-up of one of the two mounts for the M2 system on the OH-23, showing the mounted M60C

## M60D



The M60D on the M23 Armament Subsystem

The M60D is a mounted version of the standard M60. It can be mounted on boats, vehicles and as a pintle-mounted door gun in helicopters. When used in aircraft, it differs from the M60C in that it is not controlled by the pilot — rather, it is mounted in a door and operated by a member of the crew. Like the rest of the M60 family, it is an air-cooled, gas-operated, belt-fed weapon. Unlike other models, however, the M60D normally has spade grips and an aircraft ring-type sight or similar, as well as an improved ammunition feed system. A canvas bag is also affixed to the gun to control ejected casings and links, preventing them from being sucked into the rotor blades or into an engine intake. The M60D was equipped on the UH-1B Huey (using the M23, XM29, M59, and the Sagami mounts), the [CH-47 Chinook](#) (using the M24 and M41 mounts) in both door and ramp locations, the ACH-47A

"Guns-A-Go-Go" variant of the Chinook (using the XM32 and XM33 mounts), and on the [UH-60 Black Hawk](#) (using the M144 mount).

See also: [US Helicopter Armament Subsystems](#)



M23 Armament Subsystem (with M60D)



M23 Armament Subsystem on the [UH-1D](#)

### M60E3



A sailor fires a M60E3 machine gun during a live-fire exercise at the [Mobile Inshore Underwater Warfare Site](#) (MIUW) at [Guantanamo Bay, Cuba](#).

The M60E3 was fielded circa 1986 in an attempt to remedy problems with earlier versions of the M60 for infantry use. It is a lightweight, "improved" version intended to reduce the load carried by the gunner. Unlike its predecessors, the M60E3 has several updated modern features. It has a bipod (attached to the receiver) for improved stability, ambidextrous safety, universal sling attachments, a carrying handle on the barrel, and a simplified gas system. However, these features also caused almost as many problems for the weapon as they fixed. There were different types of barrels used, but the lightweight barrel was not as safe for sustained fire at 200 rounds per minute as heavier types. However, some personnel claim to have witnessed successful prolonged firing of the weapon. The [stellite](#) superalloy barrel liner makes it possible, but the excessive heat generated by this process can quickly make the gun unusable. There were two main barrels, a lightweight barrel and another

heavier type — the former for when lighter weight was desired, and the latter for situations where more sustained fire was required.

The reduced-weight components also reduced the durability of the weapon, making it more prone to rapid wear and parts breakage than the original. Most [infantry](#) units in the U.S. Army and Marine Corps have now switched over to the [M240](#) as their [general-purpose machine gun](#), which is more reliable (particularly when dirty) and seems to be well-liked by the troops for its ruggedness, despite the fact that it weighs five or six pounds more than the M60E3.

### **M60E4 and Mk 43 Mod 0/1**



A mounted Mk 43 Mod 0 (M60E4) (later model) is crewed by a soldier of NMCB-15, on a convoy in Iraq in May 2003.

This firearm is the latest generation of the M60 family and incorporates a number of improvements over other versions. Externally, it looks like somewhat like the M60E3, but it has other internal changes improvements. It features a different forward grip and is also a more reliable weapon than the other M60s. The M60E4/Mk 43 has higher pull for the belt, and is highly configurable. It is available in a variety of configurations, and it is also possible to convert some older models to this standard. The M60E4 and Mk 43 were primarily developed in the 1990s. First the E4, and soon after the Mk 43 — these early Mk 43 had some distinct differences from the E4 (such as a duckbill flash hider), though by the 2000s these distinctions seemed to have ended.

This version also has another designation under the Navy, Mk 43 Mod 0. The Mk 43 Mod 0 was developed for the U.S. Navy SEALs to replace their existing stock of M60E3 machine guns fitted with shorter "assault barrels". These weapons are identical to standard M60E4s, with the exception of the barrel length, and can be used either as suppressive fire or direct fire weapons, at least in terms of theory and training. The Mk 43 Mod 1 adds significantly more rail attachment points to the weapon's receiver cover and handguard.

The M60E4 and Mk 43 versions are roughly similar, although they are only part of the same family. While it might be fair to say that the Mk 43 are a type of M60E4, there are technical differences between any given M60E4 model. Early Mk 43s have certain differences over M60E4 from the same period, the most obvious being the duck-bill flash hider and different handguard. Current Mk 43s do not have these differences however, and the U.S. Ordnance website states in their FAQ, as of 2005, that the *"M60E4 and the Mk43 are the same weapon system"*.



The M60E4 was pitted against the (then called) M240E4 in Army trials during the 1990s for new medium machine gun for the infantry, in a competition to replace the decades-old M60s. The M240E4 won, and was then classified as the [M240B](#). This led to 1,000 existing M240 being sent to Fabrique Nationale for an overhaul and a special kit that modified them for use on ground (such as a stock, a rail, etc.). Afterwards, procurement contracts were let in the late 1990s for all-new M240B models. However, a new feature was added: a hydraulic buffer system to reduce the felt recoil similar to the M60 was incorporated. While the M240B had been more reliable in the tests, it was a few pounds heavier than the M60E4, and there is a program underway for a new lightweight medium machine gun in the early 2000s.

The M60E4 is not just another version, but a whole update to the series, that is also available in many of the previous configurations, such as a co-axial weapon. Kits are also offered to convert older models to the E4 standard.

- **M60E4** (Light machine gun):
  - **Short barrel — weight:** 10.2 kg (22.5 lb); **length:** 958 mm (37.7 in)
  - **Long barrel — weight:** 10.5 kg (23.1 lb); **length:** 1,077 mm (42.4 in)
  - **Assault barrel — weight:** 9.9 kg (21.3 lb); **length:** 940 mm (37.0 in)
  - **Width:** 120 mm (4.8 in)
- **M60E4** (Mounted):
  - **Length:** 1,105 mm (43.5 in)
  - **Width:** 149 mm (5.9 in)
  - **Weight:** 10.7 kg (22.7 lb)
- **M60E4** (Co-axial):
  - **Length:** 1074 mm (42.3 in)
  - **Width:** 120 mm (4.8 in)
  - **Weight:** 9.6 kg (21.2 lb)

## Civilian versions

A number of [semi-automatic](#) versions for the civilian market have been produced in the United States. The internals must be extensively modified to make it essentially impossible to convert them to fully-automatic weapons. If the design is approved by the U.S. [Bureau of Alcohol, Tobacco, Firearms and Explosives](#) (BATFE), they are treated as belt-fed semi-automatic rifles; however, individual state and local regulations still apply.

The U.S. Ordnance company is the current maker authorized by Saco to produce [mil-spec](#) M60s and M60 parts. However, U.S. Ordnance put its civilian semi-auto sales on hold until 2006 because its production capacity is required for government orders. The company charges \$8000 for a new semi-automatic M60.

Various makes of older fully-automatic versions are on the market as well, but there are many legal requirements to be met before purchasing them, and they cost upwards of U.S. \$20,000–30,000. This is largely due to the restriction on the production of fully-automatic firearms in the U.S. for the general civilian market since 1986. The combination of banning production and importation has led many to think its illegal to own a machine gun, when, in fact, provided the various smaller legalities are met, it is legal to own and use a fully-automatic M60 machine gun in the U.S.A.

## See also

- [M240](#)
- [M2 machine gun](#)
- [List of firearms](#)
- [List of modern weapons](#)
- [List of individual weapons of the U.S. Armed Forces](#)
- [List of crew-served weapons of the U.S. Armed Forces](#)
- [AA-52](#)
- [Rambo](#) (Rambo uses this weapon in *First Blood* and *Rambo: First Blood Part II*.)

## References

- [Federation of American Scientists: the M60](#)
- [Global Security: the M60E3](#)
- [Modern Firearms & Ammunition: the M60](#)
- Department of the Army Field Manual No. 3-22.68
- [U.S. Army TACOM — Rock Island](#)
- MCWP 3-15.1 United States Marine Corps: "Machine Guns and Machine Gun Gunnery"
- [Navy SEALs](#)
- [M60E4](#)

## External links

- [US Ordnance Website](#) (Current maker of M60s)
- [Nazarian`s Gun`s Recognition Guide](#)
- [Military Factory Small Arms](#)