



## M60 A1 Patton Battle Tank in Veterans Park in Hays, KS

(Information taken from Wikipedia)

The **M60 Patton** is a [main battle tank](#) (MBT) introduced in December 1960.<sup>[6]</sup> With the [United States Army](#)'s deactivation of their last ([M103](#)) heavy tank battalion in 1963, the M60 became the Army's primary tank<sup>[7]</sup> during the [Cold War](#). Although developed from the [M48 Patton](#), the M60 series was never *officially* classified as a Patton tank, but as a "product-improved descendant" of the Patton series.<sup>[8]</sup> In March 1959, the tank was officially standardized as the **105 mm Gun Full Tracked Combat Tank M60**.

The M60 underwent many updates over its service life. The interior layout, based on the design of the M48, provided ample room for updates and improvements, extending the vehicle's service life for over four decades. It was widely used by the U.S. and its Cold War allies, especially those in [NATO](#), and remains in service throughout the world today, despite having been superseded by the [M1 Abrams](#) in the U.S. military. [Egypt](#) is currently the largest operator with 1,716 upgraded M60A3s, Turkey is second with 866 upgraded units in service, and Israel is third with over 700 units of Israeli variants.

## **Impetus**[\[edit\]](#)

During the [Hungarian Revolution of 1956](#), a Soviet [T-54A](#) medium tank was driven onto the grounds of the British embassy in Budapest by the Hungarians. After a brief examination of this tank's armor and [100 mm gun](#), British officials decided that their [20 pounder](#) was apparently incapable of defeating it. There were also rumors of an even larger [115 mm gun](#) in the works. Hence there was a need to adopt a 105 mm gun, which emerged as the famed [Royal Ordnance L7](#).<sup>[9]</sup> This information made its way to the United States, where the Army had been experimenting with a series of upgrades to their [M48 Patton](#) tanks. These experiments were concerned with improving the armor and the introduction of a variety of autoloader systems, such as that used in the [105 mm gun tank T54](#), and upgraded rangefinders.

The [T95](#) program, launched after the Questionmark III conference in June 1954, was the intended replacement to the M48. It featured a host of innovative and experimental components such as its 90 mm [smoothbore](#) T208 cannon rigidly affixed to its turret, and its new [powertrain](#) and suspension. The burden of developing them however slowed the overall program to a crawl. General Taylor approved of a new tank development program in August 1957. This incorporated many ARCOVE recommendations and foresaw the eventual replacement of the light, medium, and heavy tanks with two types: the airborne reconnaissance/assault vehicle, and the [main battle tank](#) (MBT). The MBT was to combine the firepower and protection sufficient for the assault role with the mobility to perform as a medium tank.<sup>[10]</sup> A tank of the T95 series, armed with a smoothbore cannon and powered by a compression ignition engine, was envisaged by the Army Staff as the bearer of the role of future MBT.<sup>[11]</sup>

The course of this tank program was the source of widespread debate. The Bureau of Budget (BOB) believed that the Army was not progressing with sufficient speed in its tank modernization program and recommended the immediate replacement of the M48A2. Correctly predicting that the BOB would not approve the procurement of the M48A2 after the fiscal year of 1959, the Deputy Chief of Staff, Logistics (DCSLOG) proposed a tank based on the M48A2 featuring improved firepower and the AVDS-1790 engine. The alternative was to introduce a tank from the T95 series, but it remained highly experimental with its compression ignition engine not as developed as the AVDS-1790. An influential group of senior officers, by May 1958, concluded that the T95 had only marginal advantages over the M48A2. They proposed that the most important improvements, better firepower and fuel economy, could be achieved by mounting a compression ignition engine and a more powerful gun on the M48A2.<sup>[11]</sup>

## **Choice of components**[\[edit\]](#)

The main gun was chosen after a comparative firing test on the Aberdeen Proving Grounds. Participating in the test were six guns: the 90 mm M41 (armament of the M48A2 although tested with

the new T300E53 HEAT round), the 90 mm T208E9 (a smoothbore weapon firing T320E62 APFSDS), the 105 mm X15E8 (a British gun developed from the 20 pdr), the 105 mm T254 (an American gun firing the same APDS ammunition as that of the British), the 120 mm T123E6 (a lightened variant of the M58), and the 120 mm M58 (armament of the M103). The 120 mm T123E6 was preferred by the Ordnance Department because its ammunition, the same as that for the M58 gun, was already at an advanced state of development.<sup>[12]</sup> The T123E6 however had a slow rate of fire as, unlike the M58 on the M103, there would be only be one loader servicing it.<sup>[13]</sup> This led to the weapon having a max rate of fire of 4 rpm vs. the T254's 7 rpm.<sup>[14]</sup> The factors evaluated were accuracy, lethality of a hit, rate of fire and penetration performance. Based on these tests, the 105 mm T254E2 was selected and standardized as the M68. Until American-made tubes could be obtained with comparable accuracy, British tubes were to be used.<sup>[13]</sup>

Composite armor made with fused silica glass was intended on the turret and the hull. This composite armor provides protection against HEAT, HEP, and HE rounds. However, repaired castings suffered a loss of kinetic energy protection.<sup>[15]</sup> This led to the front of the hull taking the shape of a flat wedge, instead of the M48's elliptical front, as it simplified the installation of this armor.<sup>[11]</sup> Limitations in manufacturing capacity and the added cost however led to this special armor being dropped and all M60 series tanks were protected with conventional steel armor.<sup>[16]</sup>

## Initial versions<sup>[edit]</sup>

M60A1 tank of the U.S. Army maneuvers through a narrow German village street while participating in the multi-national military training exercise, [REFORGER](#) '82.

In 1957, plans were laid in the US for a universal or all purpose tank.<sup>[19]</sup> Fulfilling this requirement with an interim tank resulted in the M60 series,<sup>[17]</sup> which largely resembles the M48 it was based on, but has significant differences. The M60 mounted a 105 mm M68 main gun with the [bore evacuator](#) mounted towards the middle of the tube, compared with the M48's 90 mm M41, which mounted the bore evacuator towards the end of the tube right after its T-shaped muzzle brake. It also had a hull with a straight front slope whereas the M48's hull was rounded, had three support rollers per side to the M48's five, and had road wheels constructed from aluminum rather than steel, although the M48 wheels were often used as spare parts.

The improved design incorporated a [Continental](#) V-12 750 hp (560 kW) [air-cooled](#), [AVDS-1790-2 diesel engine](#), extending operational range to over 300 miles (480 km) while reducing both refueling and servicing. Power was transmitted through a CD-850-6 [cross drive transmission](#), a combined transmission, differential, steering, and braking unit.

The hull of the M60, like its predecessor the M48, could be cast as a single piece or by welding smaller castings. The turret was similar to the M48A2's and was made as a single piece casting although it was modified to accept the new larger diameter cupola and the M116 mount for the 105 mm gun.<sup>[18]</sup> The hull was divided into three compartments, with the driver in front, fighting

compartment in the middle and engine at the rear.<sup>[19]</sup> The driver looked through three M27 day periscopes, one of which could be replaced by an M24 infrared night vision periscope.<sup>[19]</sup>

The M60 was the last U.S. main battle tank to utilize homogeneous steel armor for protection. It was also the last to feature an escape hatch under the hull. (The escape hatch was provided for the driver, whose top-side hatch could easily be blocked by the main gun. Access between the driver's compartment and the turret fighting compartment was also restricted, requiring that the turret be traversed to the rear).<sup>[citation needed]</sup>

Originally designated the XM60, the new vehicle was put into production in 1959, standardized as the 105 mm Gun Full Tracked Combat Tank M60 on 16 March 1959,<sup>[20]</sup> and entered service in 1960.<sup>[21]</sup> There was a proposal in April 1959 to change the nomenclature to 105 mm gun main battle tank M60; this was however rejected due to a conflict with the Federal Cataloging Agency Policy.<sup>[20]</sup> Over 15,000 M60s (all variants) were built.<sup>[citation needed]</sup>

## **M60A1 series**<sup>[edit]</sup>

Approved in March 21, 1960 was the initial program that led to the M60A1.<sup>[22]</sup> This new variant was first produced in October 1962<sup>[23]</sup> and stayed in production until 1980, featured a larger, better-shaped turret and improvements to the armor protection and shock absorbers.<sup>[citation needed]</sup>

While the M60 continued to use the turret based on the M48A2's, T95E7 style turrets were not abandoned. Work continued on an elongated turret based on its design. The turret, even without the siliceous cored armor, provided improved ballistic protection. Additional space for the turret crew was also made available by mounting the cannon 5" forward.<sup>[22]</sup> In addition to the added protection offered by this turret on production M60A1s, the upper [glacis](#) armor was increased from 3.67 inches to 4.29 inches at 65 degrees while the sides over the crew compartment went from 1.9 inches to 2.9 inches at their apex.<sup>[23]</sup> This brought the frontal armor up to the same 10" line of sight armor standard of the [M103 heavy tank](#).<sup>[24]</sup> Shock absorbers were installed in the first two and last road wheel arms. The uncomfortable wire mesh seats were replaced by padded seats. The brake and accelerator pedal were rearranged for more efficient and comfortable operation while the steering wheel was replaced by a T bar steering control.<sup>[25]</sup> The engine and power train were upgraded by the addition of the Continental AVDS-1790-2A and the CD-850-6A. The new engine lowered fuel consumption and smoke emissions. Combination day-IR periscopes were introduced, the M32 for the gunner and the M36 for the commander although the commander's periscope could be substituted with the M34 for binocular vision without IR.<sup>[26]</sup>

As development of a new main battle tank stalled with problems and cost escalating quickly, the M60A1 was forced to serve longer than originally intended with production lasting over 20 years. In that time span numerous product improvement programs were put forward. The first of which was TLAC, for Top Loading Air Cleaner. This reduced dirt and dust ingestion, which increased engine

life. Its top loading configuration also made it easier to service.<sup>[27]</sup> Next came the AOS meaning Add-On Stabilization that was introduced in late 1972.<sup>[27]</sup> As its name implies, this was an add on stabilizer kit made to fit with minimum modifications to the existing hydraulic gun control system. It was made up of several components: the rate sensor package, a control selector box, the electronics package, a shut-off valve, the traverse servo-valve assembly, the elevation servo-valve assembly, the handle shaping assembly, an hydraulic filter, and an antibacklash cylinder. At short to medium ranges, hit probabilities better than 50% from a moving M60A1 were obtained in Aberdeen test results while without a stabilizer it was essentially zero. M60A1(AOS) was the designation received by M60s equipped with the TLAC, AOS and the new T142 steel track, which had replaceable rubber pads and improved service life.<sup>[28]</sup>

In 1975, the M60A1(RISE) meaning Reliability Improved Selected Equipment was introduced. Its [AVDS-1790-2C diesel engine](#) featured several changes in order to improve service life and reliability: new top-loading air cleaners; stronger cylinders; improved starter, fuel injection lines, and nozzles; and better turbosuperchargers. A new 650 ampere oil cooled alternator, a solid state regulator and new wiring harness with more accessible disconnect were also incorporated into its electrical system.<sup>[28]</sup> The M60A1(RISE)(PASSIVE), which debuted in 1977, featured passive night vision sights for gunner and commander, a new night vision device for the driver and a deep water fording kit.<sup>[29]</sup>



