

MODERN FIREARMS

Series



Volume 6

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Singapore Technologies Kinetics SAR-21 assault rifle (Singapore)

Caliber: 5.56x45mm NATO

Action: Gas operated, rotating bolt

Overall length: 805 mm

Barrel length: 508 mm

Weight: 3.82 kg without magazine and accessories, 4.44 kg loaded with magazine and 30 rounds of ammunition

Magazine capacity: 30 rounds

Rate of fire: 450-650 rounds per minute

Effective range: about 500 meters

The SAR-21 is the latest development of the Singapore's Chartered Industries company, now known as the Singapore Technologies Kinetics division. This rifle was first displayed on public in 1999, at the DSEi '99 defense exhibition. At the present time the SAR-21 is adopted by the Singapore Armed Forces as the standard assault rifle, and gradually replaces the ageing M16S1 (Singapore-made M16A1 rifle), and CIS previous SAR-80 and SR-88 rifles. It is also offered for export military and law enforcement sales. At the present time it's hard to judge this rifle, but the available reports are quite favorable, stating that the gun is comfortable to carry and fire, accurate, reliable and has low recoil. While SAR-21 is much shorter than the M16 rifle with the barrel of the same length, the SAR-21 has the disadvantage of the right-side only extraction, with no provisions to change it to the left side (unlike most other modern bullpup rifles, like the Steyr AUG, GIAT FAMAS or the IMI Tavor).



SAR-21 assault rifle

Technical

description

The SAR-21 represents some kind of mainstream in the turn-of-the-centuries small arms

technology. It is of bullpup layout, and utilizes the most conventional gas operated, rotating bolt locked action, with detachable box magazine feeding.



SAR-21 - another view

The gas system of the SAR-21 is located above the barrel. The long stroke piston is rigidly attached to the bolt carrier. The M16-style rotating bolt has 7 lugs and locks into the barrel extension. The return spring is partially housed inside the hollow gas piston rod and behind it. The charging handle is located above the gun housing, under the scope / carrying handle unit, and folds forward when not in use. The charging handle does not reciprocate when gun is fired. On the SAR-21 P (Picatinny rail) and SAR-21 RIS (Rail Interface System) versions of the basic design the charging handle is moved to the left side of the gun, leaving the place at the top for the sights / accessory rail.



SAR-21 RIS (Rail Interface System), with reflex-type ("red dot") sight and a detachable vertical foregrip

The housing of the SAR-21 is made from tough, high impact resistant polymer, and consists of barrel section with the barrel / gas system, forearm and sights, upper receiver with the pistol grip and magazine housing, and the lower receiver with the buttplate and the hammer unit inside. All major parts are held together by the push-pins and can be separated for disassembly without any special tools. The upper receiver also incorporates

a special safety system, which protects the shooters' face in the event of the cartridge case rupture or explosion.



SAR-21 field stripped into major subassemblies

The safety switch is located at the front of the enlarged triggerguard and is of the cross-bolt, push-button type. SAR-21 can provide 2 modes of fire, single shots and full automatic fire.

The SAR-21 is fed using proprietary 30-rounds box magazines, made from the translucent plastic.

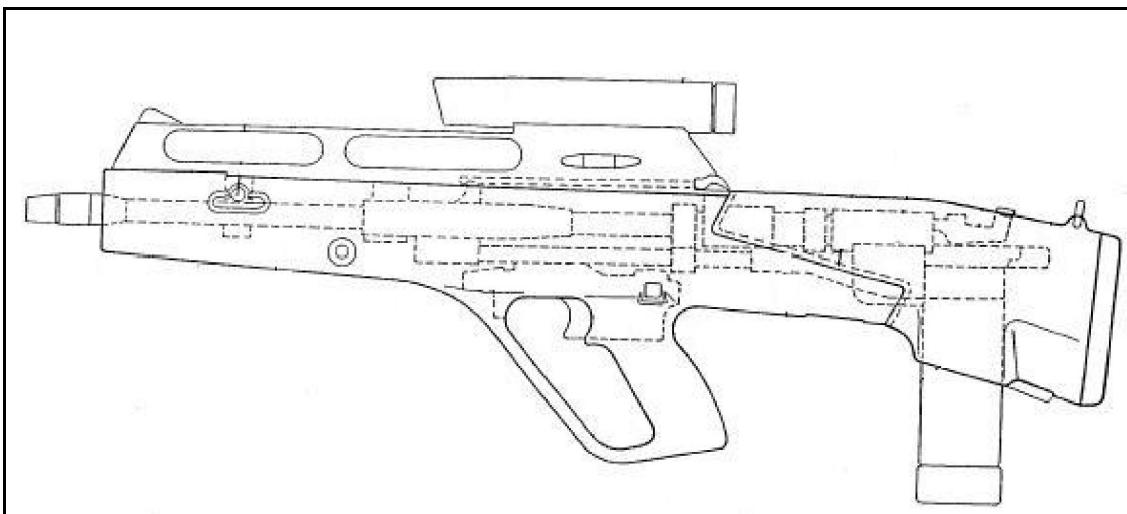
The standard sighting equipment includes an integral 1.5X magnification telescope sight, with the emergency backup open sights formed at the top of the telescope housing. The SAR-21 P and SAR-21 RIS have no integral sights, instead these rifles featured a NATO-standard Picatinny type scope rail at the top of the gun, that can be fitted with wide variety of day and night sighting devices. Another interesting feature of SAR-21 is that it incorporates a laser aiming module (LAM, also sometimes referred as a laser pointer) as a standard feature. The LAM is mounted below the barrel, inside the forearm, and can emit either visible or infrared beams. The LAM switch is built into the forearm of the rifle.

The standard SAR-21 can be fitted with the 40mm underbarrel grenade launchers, either US-made M203 or Singapore-made CIS 40GL. The SAR-21 RIS can sport a wide variety of add-on tactical accessories, including vertical "assault" foregrip, tactical lights etc.

Steyr ACR - Advanced Combar Rifle (Austria)

Caliber: 5.6 mm fleschette
Action: Gas operated, rising breech
Overall length: mm
Barrel length: 540 mm
Weight: 3.23 kg w/o magazine
Rate of fire: rounds per minute
Magazine capacity: 24 rounds

The Advanced Combat Rifle program was started by the US Army in the late 1980s with the main goal to improve the hit probability of average infantry soldier by at least 100 percents above the M16A2 capabilities. During this trials, held in the early 1990s, some new and existing designs from several companies were tested, with more or less success, but no one achieved the 100% improvement in hit probability over the existing M16 rifle, so program was terminated and all participating designs were freezed, which is pity. One of the most interesting participants was a design of the austrian company Steyr-Mannlicher AG.



Steyr ACR layout schematic

The Steyr ACR was built as an attempt to revive the fleschette ammunition concept, first tried in the 1960s during US Army SPIW program. In 1960s, the fleschette concept was a failure. In 1990s, it was much more successful, but not enough to be worth of total rearming to the new infantry weapon system.

Steyr ACR is built around a specially designed cartridge of nominal caliber of 5.56mm. This cartridge has simple, cylindrically shaped plastic case. The fleschette, or dart, is totally enclosed in the case. Fleschette diameter is about 1.5 mm (.06 inch), lenght is

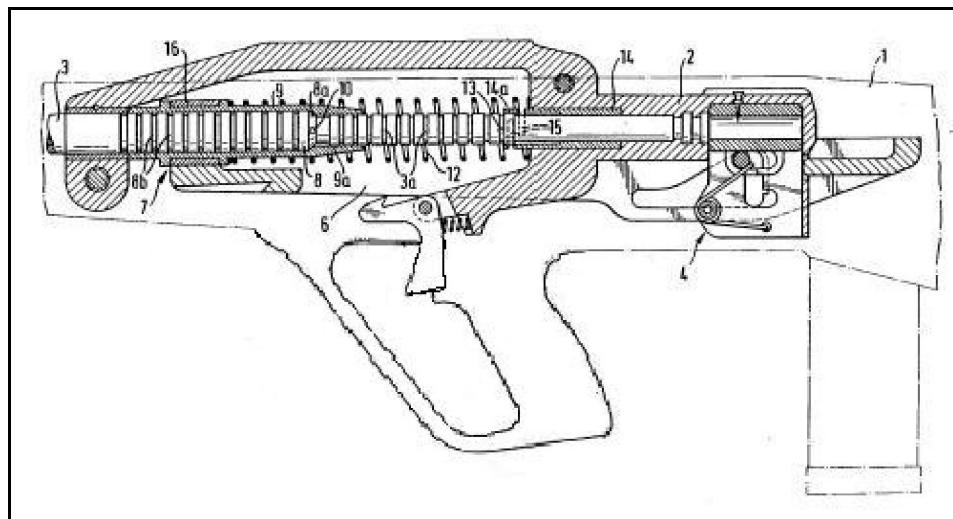
about 41 mm (1.6 inch), weight 0.66 gramm (10 grains). Fleschette is partially enclosed into discarding sabot, and leaves the muzzle at impressive velocity of 1450 meters per second (4750 fps), still retaining velocity of 910 m/s (2980 fps) at the range of 600 meters. The plastic case had no rim or extracting groove, and priming compound is located annually at the inside wall of the case.



Steyr ACR

To fire such uncommon cartridge, Steyr ACR has equally uncommon design. Barrel of nominal caliber of 5.56mm, has a very slow rifling to give initial stabilisation to the fleschette, which is stabilised in flight by its own small fins. Instead of common linear-moving bolt, Steyr ACR have separate chamber (breech block), which can be moved up and down. The whole action is powered by gas drive, which has annual gas piston, located around the barrel. To understand this system i will explain how it works: at first, lets suppose that chamber is empty and rifle is manually cocked for the first shot. In this position the chamber block is its lowest position, aligned with the topmost round in magazine. The gas piston with its operating rod is in its rearmost position and under the pressure of the return spring. When trigger is pressed, the operating rod with gas piston are released and started forward under the pressure of the return spring, which is located around the barrel. This movement, at first, via special rammer, feeds the first round forward from magazine and into the chamber, and then, via shaped cam and breech block spring, rises the breech block with the cartridge into the topmost position. In this position the fixed firing pin passes through the hole in the top of the chamber and penetrates the cartridge wall, igniting the primer composition and firing the round. When projectile (fleschette with sabot) passes the gas port, some of powder gases began to move the gas piston back. This movement, via the operating rod and shaped cam, loweres the breech block with empty case out of alignment with barrel and down to the magazine. When breech comes to stop in the lowest position, a separate rammer feeds next cartridge forward and out of magazine, chambering it. At the same time, the fired case is pushed forward out of the chamber by the next cartridge, and when cleared from the chamber, the spent case simply falls down out of the rifle via the ejection port. The ejection port is located at the bottom of the rifle, ahead of magazine, and this eliminates one of the biggest problems of any bull-pup rifle - a non-ambidextrous (or, in this case - fully ambidextrous) ejection.

If rifle is set to the full auto mode, the firing cycle is repeated as described above. Otherwise, the loaded breech remains in its lowest position, awaiting for the next trigger pull.



*Steyr ACR action drawing from Steyr patent
gas piston in forward position, breech block with chamber in upper position*

This quite comprehensive action was concealed in sleek and comfortable polymer case with AUG-styled pistol grip and large ventilated upper rib with fixed sights. Optical sights also were fitted. Due to extremely high projectile velocity, flight time was very short at any practical ranges, and trajectory was very flat, giving the shooter almost ray-gun performance, which allowed to fire without prior calculations of point of impact - speaking simply, at any practical combat ranges shooter will hit where it aimed, regardless target movements (projectile flight time to the target at 300 meters is about 0.2 seconds). Due to high velocity, Steyr ACR had good killing power and armour piercing capabilities, and due to the low weight of the projectile recoil was low. But it was not enough to double the M16 performance, so, for now, the Steyr ACR remains in prototype or preproduction state and the program is freezed if not abandoned at all.

Steyr Stg.77 AUG assault rifle (Austria)

Caliber: 5.56mm NATO (.223rem)

Action: Gas operated, rotating bolt

Overall length: 805 mm (with standard 508 mm barrel)

Barrel length: 508 mm (also 350 mm SMG, 407 mm Carbine or 621 mm LMG heavy barrel)

Weight: 3.8 kg unloaded (with standard 508 mm barrel)

Magazines: 30 or 42 rounds box magazines

Rate of fire: 650 rounds per minute

Effective range of fire: 450-500 meters with standard assault rifle barrel

The Steyr AUG (Armee Universal Gewehr - Universal Army Rifle) had been in development since the late 1960s, as a replacement for venerable but obsolete Stg.58 (FN FAL) battle rifles for Austrian army. It was developed by the Austrian Steyr-Daimler-Puch company (now the Steyr-Mannlicher AG & Co KG) in close conjunction with Austrian Army. The major design is attributed to the three men - Horst Wesp, Karl Wagner and Karl Möser, who developed most of the rifle features. From the Austrian Office of Military Technology the project was supervised by the Colonel Walter Stoll. The new rifle has been adopted by the Austrian Army in 1977, as the Stg.77 (Assault rifle, model of 1977), and production began in 1978. Since then, the AUG gained serious popularity, being adopted by the armed forces of Australia, Austria, New Zealand, Oman, Malaysia, Saudi Arabia, Ireland and some others. It also was widely purchased by various security and law enforcement agencies worldwide, including the US Coastal Guard. The Steyr AUG can be considered as the most commercially successful bullpup assault rifle to date. Since the 1997, the Steyr-Mannlicher produced an updated version of the AUG,

AUG

A2.



Steyr AUG A1 in standard rifle configuration (military green colour)

In around 2005, Steyr-Mannlicher introduced the most recent version of AUG, the AUG A3. This version is characterized by addition of four Picatinny-type accessory rails - one at the top of the receiver, and three around the barrel, in front of the receiver - at both sides and below it. Therefore there AUG A3 has no standard / integral sighting equipment; instead, any open, telescope or night vision sights can be installed on the upper rail, using appropriate mountings. Lower rail can be used to mount various attachments like tactical front grips, flash-lights, and a specially designed 40mm grenade launcher. Side rails can be used for equipment like laser-aiming devices.



Steyr AUG with M203 40mm grenade launcher

Some said that the AUG rifle was revolutionary in many respects when it first appeared, but this is not true. In fact, the AUG is a clever combination of the various previously known ideas, assembled into one sound, reliable and aesthetically attractive package. Let's look at this a little closer. Bullpup configuration: The Steyr AUG is not a first military bullpup ever devised. In fact, British Enfield EM-2 and Soviet Korobov TKB-408 bullpup assault rifles precede the AUG by some 25-30 years. The French FAMAS bullpup also appeared on the scene at the very same time, as the AUG did. Plastic firearm housing: Another Soviet experimental bullpup design, Korobov TKB-022, had the plastic housing as early as in 1962, and the FAMAS rifle, again, has this same feature at the same time as AUG did. Telescope sight as a standard: The British EM-2 bullpup rifle of late 1940s, as well as the experimental Canadian FN FAL prototypes of early 1950s, also featured a low-magnification telescope sights as their prime sighting equipment. A modular design: First systems, consisting of various firearms based on the same receiver and action (automatic rifle, light machine gun, carbine) were originally developed in 1920s in France by Rossignol and in Soviet Russia by Fedorov. Considering all said above, one must agree that the AUG was a logical development of various well known ideas, and a really successful one.

In general, the AUG is known for good ergonomics, decent accuracy and a good reliability.

Technical description.

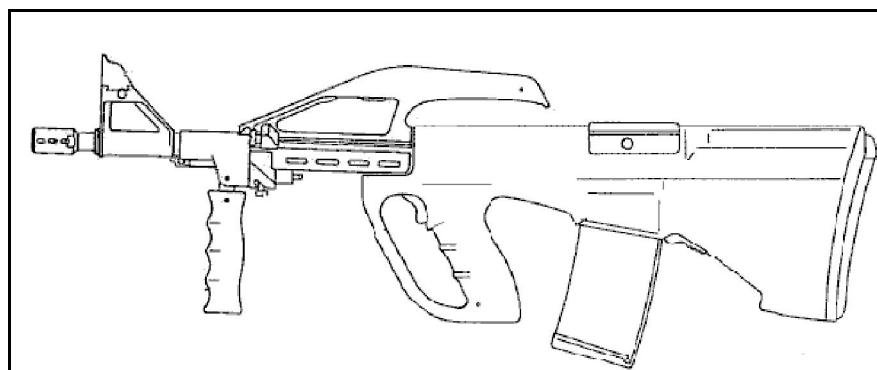
The Steyr AUG is a gas operated, magazine fed, selective fire rifle of bullpup layout.

AUG is built around the aluminium casting receiver, with steel reinforcement inserts. One such insert is used to provide the locking to the removable barrels and the rotating bolt, thus relieving the receiver from most of the firing stress. Other inserts are used as a bearings for the bolt carrier guide rods.



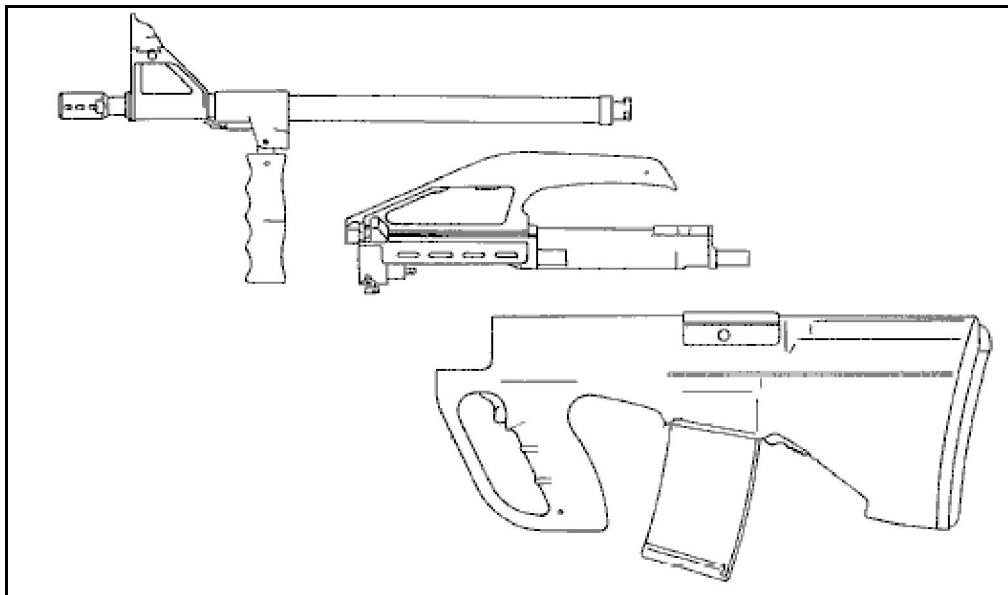
Steyr AUG A1 Carbine (police black colour)

The AUG uses a short piston stroke, gas operated action, with the gas piston mounted inside the compact gas block, which is fixed to the barrel. The gas cylinder is offset to the right from the barrel. Gas piston has its own return spring, contained inside the gas block. The gas system features a three positions gas regulator, which allows for two open positions (for normal and fouled conditions) and one closed position (for launching the rifle grenades). The gas block also contains a barrel fix / release lock and a front grip hinge. Each barrel has eight lugs, that lock into the steel insert in the receiver, and there's four basic barrel patterns for the AUG: standard rifle barrel is 508 mm (~20 in) long. "Compact" or "Submachine gun" barrel is 350 mm (13.8 in) long, "Carbine" barrel is 407 mm (16 in) long, and the heavy / LMG (light machine gun) barrel is 621 mm (24.4 in) long. On each rifle barrels can be exchanged in the matter of seconds. Each barrel is fitted with the flash hider, and the heavy 621 mm barrel also is fitted with lightweight folding bipods. There's no bayonet lug on Austrian service rifles, but it can be installed if required.



The drawing of the Steyr AUG prototype (circa 1974). From original patent. Note the open sights instead of the latter built-in telescope sights

Barrel replacement procedure, as noted above, takes only few seconds (assuming that the shooter has the spare barrel handy). To remove the barrel, one must take off the magazine, and clear the rifle by operating the cocking handle. Then, grasp the barrel by the front grip, push the barrel retaining button at the gas block, and rotate the barrel and pull it out of the rifle. To install a new barrel, simply push the barrel down into the front of the receiver all the way and then rotate it until it locks. The rifle now is ready to be loaded and fired.



Same prototype drawing, major components: barrel group, receiver, plastic housing with magazine and trigger group (from top to bottom)

The bolt system consists of the bolt carrier, which has two large hollow guide rods, attached to its forward part. The left rod also serves as a link to the charging handle, and the right rod serves as the action rod, which transmits the impulse from the gas piston to the bolt carrier. The rotating bolt has 7 locking lugs, claw extractor and a plunger-type spring loaded ejector. Standard bolt has its extractor on the right side, to facilitate right-side ejection, but the left-side bolts (with mirrored positions of extractor and ejector) are available for those who need left-side ejection. The two return springs are located behind the bolt carrier, around the two string guide rods, that are located inside the bolt carrier guide rods. The cocking handle is located at the left side of the gun and normally does not reciprocate when gun is fired, but it can be solidly engaged to the bolt group if required by depressing the small button on the charging handle. On the latest AUG A2 variant, the charging handle was made folding up and of slightly different shape. The AUG action features a bolt stop device, that holds the bolt group open after the last round of ammunition from the magazine is fired. To release the bolt after the magazine replacement, one must pull the charging handle.

The hammer unit is made as a separate assembly and almost entirely of plastic (including the hammer itself). Only springs and pins are steel. The hammer unit is located in the butt and is linked to the sliding trigger by the dual trigger bars. The safety is of the cross-bolt,

push-button type and located above the pistol grip. There's no separate fire mode selector on the AUG rifles. Instead, the trigger itself is used to control the mode of fire. Pulling it half the way back will produce single shots, while the full pull will produce automatic fire. The enlarged triggerguard encloses the whole hand and allows the gun to be fired in winter gloves or mittens.



Steyr AUG A2 with Carbine configuration (shorter barrel) and with Picatinny-type rail installed instead of standard telescope sight

The standard sighting equipment of the Steyr AUG rifle is the 1.5X telescope sight, with aiming reticle made as a circle. This circle is so dimensioned so its visible inner diameter is equal to the visible height of the standing man at 300 meters range. The adjustment knobs on the sight are used only for zeroing. The sight housing, which is integral to the receiver on the AUG A1 models, also features an emergency backup iron sights at the top of the telescope sight housing. Some early production AUG rifles of A1 pattern were fitted with receivers that had an integral scope mounts. On the AUG A2 models, the standard scope mount can be quickly removed and replaced by the Picatinny-type mounting rail.



Steyr AUG A3 Carbine with 16inch barrel and optional forward grip / tactical flashlight and telescope sight

The housing of the AUG rifles, integral with the pistol handle and triggerguard, is made from the high impact-resistant polymer, and is usually of green (military) or black (police) colour. The housing has two symmetrical ejection ports, one of which is always covered by the plastic cover. The rubber-coated buttplate is detachable and, when removed, opens the access to the rifle internals, including the hammer unit and the bolt group. The buttplate is held in position by the cross-pin, which also serves as a rear sling swivel attachment point.

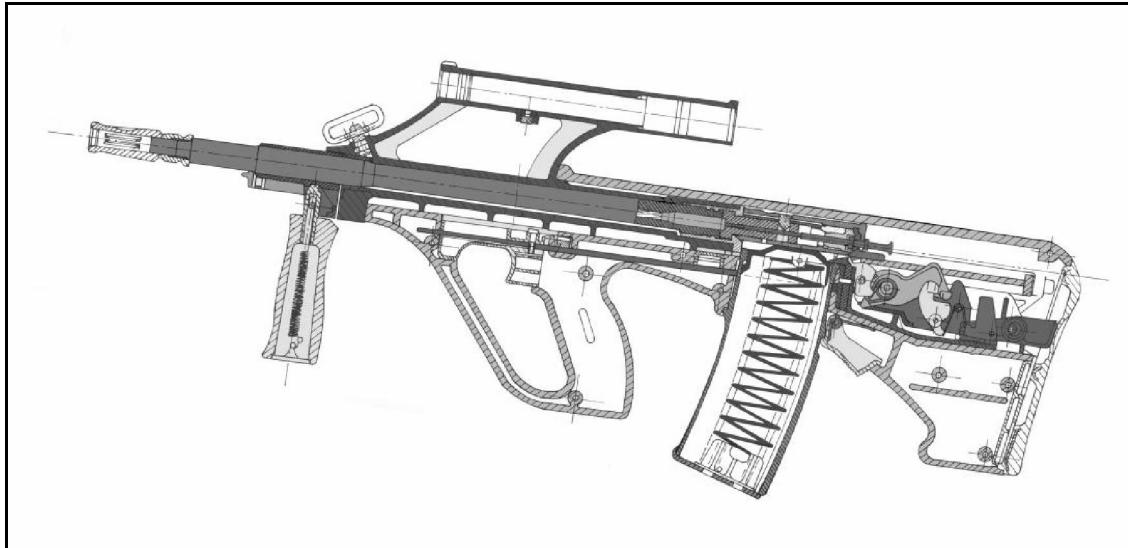


Steyr AUG A3 Carbine with 16inch barrel and special 40mm grenade launcher; grenade launcher sight is attached to the top of removable telescopic rifle sight

The AUG is fed from the detachable box magazines, that hold 30 (standard rifle) or 42 (light machine gun) rounds. The magazines are made from semi-translucent, strong polymer. The magazine release button is located behind the magazine port and is completely ambidextrous (some said that it is equally NOT comfortable for either hand use).



Steyr AUG A3 in Sniper configuration, with heavier and longer 20inch barrel, detachable bipod and long-range telescopic sight



SPO-JGAS 2010

Stgw. 57 / Sig 510 assault rifle (Switzerland)

Caliber: 7.5x55 mm GP11 (Stgw.57) or 7.62x51mm NATO (SIG 510-4)

Action: roller retarded blowback

Overall length: 1105 mm (1016 mm SIG 510-4)

Barrel length: 583 mm (505 mm SIG 510-4)

Weight: 5.56 kg empty (4.25 kg empty SIG 510-4)

Magazine capacity: 24 rds (20 rds SIG 510-4)

Switzerland began to experiment with intermediate cartridges before the World War 2 and, being a neutral country, closely watched the developments made during and after the war. Being entirely satisfied with the power and accuracy of its 7.5 mm GP11 (7.5x55) cartridge, the Swiss army tried to achieve a full power selective-fire rifle. After a couple of false starts, first with the gas-operated Sk-46 self-loading rifle, and secondly with the most unusual AK-53 blow-forward design, the famous SIG company finally produced a weapon which satisfied the Army in 1955.



7.62x51 NATO SIG 510-4 assault rifle, as made for export

This was the 7.5 mm AM-55, a retarded blowback design, developed under the leadership of the Rudolf Amsler. The basic principles of the action were borrowed from German WW2 period Mauser 'Gerät 06H' and Stg.45(M) assault rifles, but with much altering involved. In 1957 the Swiss army adopted the AM-55 as the Schтурmgewehr-57, or Stgw.57 for short. Made between 1957 and 1983, the Stgw.57 represented one of the finest and most expensive automatic rifles ever issued to any army in the world. Chambered for full power 7.5 x 55 GP11 ammunition, the Stgw.57 provides long range accurate shooting in semi-automatic mode, necessary for the typical Swiss mountain country, in combination with significant full auto firepower, thanks to its relatively heavy weight, integral bipod and a shrouded barrel. In the modified form, known as the SIG-510, this design was relatively successful, being sold to various South American countries, most notably Bolivia and Chile, chambered for 7.62 mm NATO ammunition.

The action of the Stgw.57 was derived from the roller-retarded blowback system originated by Mauser engineers in Hitler's Germany. However, the Swiss designers replaced the rollers with the roller-shaped pivoting flaps, interposed between the bolt

head and the bolt body. The receiver is made from stamped steel, with a separate trigger unit housing made integral with the pistol grip frame and trigger guard. The fixed barrel has a perforated steel jacket with two mounting points for an integral bipod – one near the muzzle, and another near the receiver. The front part of the barrel is exposed to act as a rifle grenade launcher. To smooth out the excessive recoil generated in full automatic fire, and especially by rifle grenades, the fixed butt-stock is fitted with a recoil buffer.



7.5mm SIG Stgw.57 assault rifle as used by Swiss army, right side, with bipod attached to forward position

The safety / fire mode selector is located at the left side of the trigger unit. Stgw.57 is fitted with large, T-shaped charging handle and with the folding “winter trigger”, which, when unfolded, extends down below the trigger guard, enabling the rifle to be used in arctic mittens. Since the Stgw.57 was designed with the so-called straight-line layout, the raised sights are mounted on high, folding bases, with the rear sight being micrometer-adjustable from 100 to 650 metres. The Stgw.57 also could be fitted with the special Kern 4X telescope sight. Stgw.57 is fed from curved box magazines, made from steel and containing 24 rounds. The small forend is made from plastic and the gun is fitted with a side-folding carrying handle. Other accessories include the sling, the bayonet, and a special small-capacity magazine for blank grenade-launching cartridges. Export military versions of the Stgw.57, known as SIG SG-510, were made in 4 basic modifications, of which only one was made in any significant quantities, the SG-510-4. This was chambered in 7.62 x 51 NATO, had a shorter barrel, and non-folding aperture sights. The forend and buttstock were made from wood. Other versions included the SG-510-1 (exactly the same rifle as the Stgw.57), the SG-510-2 (a lightweight modification of the Stgw.57, also in 7.5 mm), and the more compact SG-510-3, chambered for the Soviet 7.62 x 39 cartridge (produced in late 1950s for assault rifle trials in Finland). Civilian semi-automatic only versions of the Stgw.57 were designated as PE-57 (in 7.5 mm GP11) and SIG AMT (a semi-auto version of SG-510-4 in 7.62 mm NATO).



7.5mm SIG Stgw.57 assault rifle as used by Swiss army, left side, with folded bipod attached to rearward position



Semi-experimental 7.62x39 SIG 510-3 assault rifle as made for Finnish army assault rifle trials in late 1950s



7.62x51 NATO SIG AMT semi-automatic rifle, as made for civilian sales

Stoner 63 weapon system: rifle and carbine (USA)

	Stoner 63A rifle (XM22)	Stoner 63A carbine (XM23)
Caliber	5.56x45mm M193	
Action	gas operated, rotating bolt	
Overall length	1022 mm	911 mm (679mm w. folded butt)
Barrel length	508 mm	400 mm
Weight, empty	3.72 kg	3.67 kg
Rate of fire	750 - 900 rounds per minute	740 - 800 rounds per minute
Magazine capacity	30 rounds	

Eugene Stoner, one of designers of M16 rifle, left ArmaLite in about 1961 and joined the Cadillac Gage Corp. There he began development of an entirely new weapon system. It was probably the first truly modular system, that consisted of about fifteen subassemblies which could be assembled in any configuration, from an assault rifle and short carbine up to a lightweight or even a general purpose machine gun. First prototypes, chambered for 7.62x51mm NATO ammunition, appeared in 1962, known as Stoner 62. Just a year later Stoner turned out a new system, chambered for 5.56x45 M193 US service round, and known as Stoner 63. This system, developed and promoted until the early 1970s, was extensively tested by the US military as the XM22 (Stoner 63A rifle), XM23 (Stoner 63A carbine), and the XM207 (light machine gun with belt feed). The only military application of the Stoner 63 system, however, was the Mk.23 model 0 belt-fed light machine gun configuration, used in limited numbers by US Navy Special Forces and Marine Corps in Vietnam. In general the Stoner system, while having the advantages of modularity and interchangeability of parts and thus great flexibility in tactical use, is too heavy as a rifle, and too expensive and somewhat over-complicated in general. It is also somewhat dirt-sensitive and requires much attention and maintenance. Overall, some 3,500 to 4,000 Stoner 63 weapon kits were produced between 1962 and 1971.



5.56mm Stoner 63A rifle, with detachable bipod

The Stoner 63 is more than just a single firearm; it is a modular kit, which contains about 15 sub-assemblies. Different combinations of those sub-assemblies (barrels, feed units, trigger units, sight units) allow the assembly of various firearms on the single receiver unit.



7.62mm Stoner 62 weapons in light machine gun (top) and rifle (bottom) configurations

The stamped steel receiver contains an universal bolt group, with a multi-lug rotating bolt and a long stroke gas piston with gas tube. The receiver also has several sets of mounting points for attachment of all other sub-assemblies and the quick-detachable barrel. In rifle and carbine configuration, the receiver is so orientated that the gas system lies above the barrel and the feed unit mounting points are below the receiver. In all machine gun configurations, either belt or magazine fed, the receiver is turned “upside down”, with the gas system being below the barrel, and the feed unit being above the receiver. In rifle / carbine configuration the Stoner 63 system utilizes a hammer-fired trigger unit, integral with the pistol grip and triggerguard. This trigger unit allows for single shots and full auto fire, and the gun is fired from a closed bolt only. In machine gun configuration, the trigger unit has no hammer; instead, its sear interoperates with the cut in the gas piston rod, allowing only full automatic fire, and only from an open bolt. The magazine feed unit can accommodate proprietary curved box magazines for 30 rounds, and can be used both in rifle and machine gun configurations. The belt feed unit could be used only in machine gun configurations. Different rear sight units were available for various configurations, with the front sights being mounted on quick detachable barrels.



5.56mm Stoner 63A rifle, with detachable bipod

On earlier Stoner 63 system weapons, the charging handle was located on the right side of the bolt carrier; the safety and fire selector were combined in one control, located on the left side of the trigger unit. On the modified Stoner 63A system, the charging handle was attached to the gas piston rod, and projected from the top in rifle / carbine configuration, or from the bottom in MG / LMG configurations; the safety was made as separate lever at the front of the trigger guard, with the fire mode selector still located on the side of the trigger unit, above the pistol grip. The Stoner 63 system featured a variety of easily detachable fixed or folding buttstocks. The latter were available in a side-folding plastic variety, or in an under-folding stamped steel type, similar to the Kalashnikov AKS / AKMS.



5.56mm Stoner 63 weapons, in rifle (top) and light machine gun configurations



5.56mm Stoner 63 carbine

Aug. 3, 1965

E. M. STONER
CONVERTIBLE GUN

3,198,076

Filed March 22, 1963

6 Sheets-Sheet 1

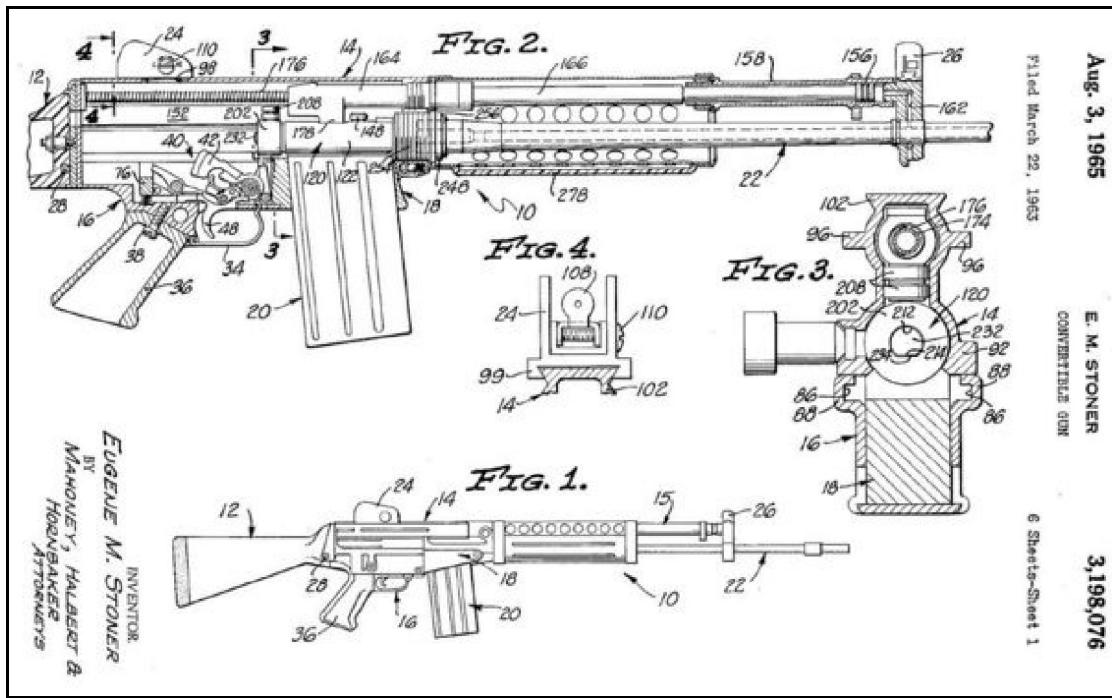


Diagram from original US patent, granted to Eugene Stoner for design of Stoner 62 / 63 weapon system

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T65, T86 and T91 assault rifle (Taiwan)

	T65 rifle	T86 carbine
Caliber	5,56x45 mm NATO	
Overall length	990 mm	880 / 800 mm
Barrel length	508 mm	375 mm
Weight	3,17 kg empty	?
Rate of fire	700-800 rounds per minute	?
Magazine capacity	20 or 30 rounds	

T65 assault rifle was developed at Taiwan state arsenal to replace obsolete 7,62mm M14 rifles of US origin. The T65 rifle closely resembles US-made M16A1 rifle and is probably made on US-supplied machinery, although the Taiwanese rifle has some differences in design and appearance. Reports on original T65 rifle suggested that it performed not satisfactory, so it was improved and became T65K2 (also sometimes referred to as T68). Later on, a T86 carbine was developed - it is very similar externally to US-made M4 carbine although it has piston-type gas action of T65. The last weapon in this line-up is T91 carbine, which can be described as T86 with carrying handle replaced by Picatinny-type accessory rail.



T65K2 assault rifle

T65 assault rifle is gas operated, selective fired weapon. It uses M16-type two-part aluminum receiver and similar rotating bolt action, although gas system is different - it has short-stroke gas piston, located above the barrel and concealed within handguards. The T65 rifles replaced carrying handle of M16 pattern with rear sight block; otherwise it was similar to M16A1. Starting from T65K2 Taiwanese designers returned the carrying handle (removable on T91 carbine). T65 uses magazines compatible with M16 rifles.



T65 assault rifle

SPO-JGAS 2010

Tavor TAR-21 assault rifle (Israel)

	TAR 21	TAR C21 / CTAR 21	TAR M21 / MTAR 21
Caliber:	5,56x45 NATO		
Action	Gas operated, rotating bolt		
Overall length	720 mm	640 mm	590 mm
Barrel length	460 mm	380 mm	330 mm
Weight	3,27 kg empty	3,18 kg empty	2,95 kg empty
Magazine capacity	30 rounds		
Rate of fire	750 - 900 rounds per minute	750 - 900 rounds per minute	750 - 900 rounds per minute

The development of the new assault rifle, that should eventually replace in service the ageing M16A1, CAR-15 and IMI Galil assault rifles, began in Israel in the 1991. The new rifle was developed by the Israel Military Industries (IMI, now privatized as IWI - Israeli Weapons Industries Ltd) company, in close cooperation with the Israeli Defense Forces (IDF). This new rifle received the name of "Tavor" and the designation of TAR-21 (Tavor Assault Rifle, for 21st century). The new rifle first appeared on public in the 1998, and it had been tested by the IDF during 1999-2002. Initial issue of Tavor rifles to IDF showed some teething problems, but by now the Tavor is already in widespread use by IDF, and it seems that many earlier problems are worked out. It is also in limited use with Special Operation forces of India and Georgia.



Tavor TAR-21 partially disassembled

In general, the TAR-21 represents the mainstream of the present assault rifle developments. It shares all the "modern" features, already tried and proved successful by previous designs, like the bullpup layout, polymer housing, optical sights as a prime sighting equipment, modular design with several different configurations (from very short submachine gun and up to standard assault rifle and a para-sniper accurized rifle with heavy barrel). So far it seen not much real action, and it is hard to judge if it is really a success, and only time will show that.



Tavor TAR-21 assault rifle (standard version)

The IWI also developed and manufactures a civilian, semi-automatic only version of the Tavor rifle, which looks much like the Tavor Micro rifle but with longer barrel. This version has already been exported to several European countries and Canada.



Tavor TAR-21 assault rifle (standard version), fitted with 40mm M203 grenade launcher and grenade launching sight

The Tavor TAR-21 is a gas operated, selective fire, magazine fed assault rifle of bullpup configuration. It is available in several configurations, which differ in the barrel lengths and accessories. The basic configuration is the TAR-21 assault rifle with the 460mm (18.1 in) barrel. Next are the compact assault rifle, called CTAR-21, with the barrel 380 mm (15 in) long, and the micro assault rifle, with the barrel of only 330 mm (13 in) long, called MTAR-21. The latter rifle also featured a redesigned front part of the housing, with charging handle placed further back on receiver, for a more comfortable hold of the short weapon. Micro-Tavor also can be converted to 9mm pistol ammunition (9x19) with installation of the caliber conversion kit, which includes a new barrel, bolt group and a magazine adapter.



Tavor CTAR 21 assault rifle (compact version)

TAR-21 utilizes a now-common long piston stroke, rotating bolt action, with the gas piston rigidly attached to the bolt carrier. Gas cylinder is located above the barrel and is completely enclosed by the gun housing. The rotating bolt is similar to one found in the M16 rifle and has seven lugs. The ejection ports are made on both sides of the weapon, and the right or the left side ejection can be selected by installing the bolt with the ejector mounted on the right or on the left, respectively (and, of course, this change requires the gun to be partially disassembled). The bolt carrier rides on the single guide rod, with the return spring unit located above it, behind and inside the hollow gas piston rod. The charging handle is located at the front left side of the gun and does not reciprocate when gun is fired. The charging handle slots are cut on the both sides of the gun housing, so it can be installed on either side of the weapon, as required. The trigger unit is more or less conventional, with the ambidextrous fire mode selector / safety switch located above the pistol grip.

The TAR-21 has no separate receiver. Instead, all parts are mounted within the high impact-resistant plastic housing, reinforced with steel inserts where appropriate. The access to all the internal parts is controlled by the hinged buttplate, which can be swung down for internal inspection and disassembly.

Early production TAR-21 rifles had no open sights, but this has been fixed with introduction of the folded front and rear sights on current production models. Tavor rifles are fitted with the standard Picatinny-type accessory rail on the top of the gun. Early guns had Israeli-made ITL MARS as standard sight, which is a complicated and expensive reflex-type sight with the built-in laser pointer. For the night time operations the MARS could be complemented with the ITL Mini N/SEAS compact night vision device. Current manufacture Tavor rifles (except for Sniper version) are usually fitted with less expensive Meprolight red-dot sight. Sniper versions usually are fitted with Trijicon ACOG optical sight with 4X magnification. The TAR-21 utilizes the STANAG-compliant, M16 type magazines, with standard capacity of 30 rounds. TAR-21 in its basic configuration can be fitted with 40mm M203 underbarrel grenade launcher.



Tavor MTAR 21 assault rifle (micro version)



Civilian (semi-automatic only) version of the Tavor. Note the different shape of the butt, handguard and the trigger guard, basically similar to that of the Micro-Tavor.



Tavor STAR 21 (designated marksman) rifle

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TRW LMR - Low Maintenance Rifle (USA)

Caliber: 5.56x45mm M193
Action: Gas operated, locked by rollers
Overall length: 870 mm
Barrel length: 493 mm
Weight: 3.63 kg loaded
Rate of fire: 450 rounds per minute
Magazine capacity: 20 or 30 rounds

The Low Maintenance Rifle project was initiated by US Army as a result of field experiences, gained through Vietnam war. The standard issue M16 rifle was found to be very sensitive for improper maintenance, and it was decided to look for an infantry rifle, which could work with much less attention paid to routine maintenance, cleaning and lubrication. The one possible niche for such weapons was the "insurgency weapon" for various pro-US (or anti-communist) movements in the third world countries. Development of the LMR project was handled to the US company Thompson-Ramo-Wooldridge (TRW) Inc, and work commenced in 1971. Several prototype rifles were built between 1971 and 1973, when US Army decided to stop funding for LMR, as the Vietnam war was over, and M16A1 rifle was considered to be mature enough. It must be noted that at least one LMR prototype was built for 5.6mm XM216 ammunition that fired sabotaged sub-caliber flechette projectile. However, most of LMR rifles were built for then-standard 5.56x45 M193 ammunition. Required "low maintenance" was achieved by using new and improved corrosion-resistant coatings for all metallic parts, as well as thin layers of dry lubricants applied to all moving parts. The number of parts was also decreased, compared to the M16 rifle. TRW LMR was simple in use and could be disassembled and re-assembled without any tools.



TRW LMR (Low Maintenance Rifle) in its final shape, right side, with attached M6 bayonet

TRW LMR is a gas-operated weapon that uses a long-stroke gas piston, located at the right side of the barrel. The gas port is located near the muzzle, and the gas block serves as a base for the front sight. The barrel is enclosed in a tubular metallic handguard with oval cooling slots. TRW fired only in full automatic mode, and from open bolt. Locking is achieved by a pair of rollers, that engage respective cuts in the barrel extension when in battery.

Unlike most other roller-locked designs, LMR bolt had rollers at the top and the bottom, not at left and right. Charging handle was attached to the gas piston rod, and when turned down, locked the bolt in forward position for added safety. Trigger unit and pistol grip were borrowed from US M60 machine gun; manual safety was located at the left side of pistol grip. Magazine (of standard M16 pattern) was inserted horizontally from the left; empty cases were ejected to the right through the ejection port, which has dust cover that opens and closes automatically as gun is fired. Since the LMR was built into so called 'straight' or 'inline' layout, open sight were put onto high bases. front sight was of post type, rear sight was a flip-up diopter with two apertures. LMR combat capabilities could be further enhanced with addition of light, removable bipod and M6 bayonet, which was attached at the top of gas cylinder, to the right of the barrel axis.



TRW LMR (Low Maintenance Rifle) in its final shape, left side, with 30-round magazine attached

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Type 03 / QBZ-03 assault rifle (China)

Caliber: 5.8x42 mm

Action: Gas operated, rotating bolt

Overall length: 950 mm (725mm with butt folded)

Barrel length: n/a

Weight: 3.5 kg

Rate of fire: ~650 rounds per minute

Magazine capacity: 30 rounds

Type 03 (QBZ-03) assault rifle is most recent development of Chinese state arms factories. For various but unpublished reasons the bullpup Type 95 / QBZ-95 assault rifle was apparently found not entirely satisfactory in PLA service. Therefore it was decided to develop a new 5.8mm assault rifle of conventional layout, which will provide necessary competition and backup to its older bullpup brother. In some respects this new weapon, known as QBZ-03 (Type 03 / 2003), is reminiscent to the experimental Type 87 rifle, which was developed in mid-1980s for testing of the new 5.8x42mm DAP-87 cartridge. It is not yet known if Type 03 rifle will enter widespread service with PLA troops to replace or complement Type 95 rifle.



Type 87 experimental assault rifle, a predecessor to Type 03



Type 03 (QBZ-03) assault rifle, with bayonet attached

Type 03 (QBZ-03) assault rifle is gas operated, selective fired weapon, which fires 5.8mm cartridge of indigenous design. Basic action of the Type 03 rifle is based on the older 7.62x39 Type 81 assault rifle, with similar rotating bolt locking and short-stroke gas piston. The gas block, which is integral to the front sight base, contains a 2-position gas regulator. Muzzle of the barrel contains a combination flash-hider which also serves as a grenade launcher for rifle grenades. Receiver is made from stamped steel, and unlike earlier designs consists of two parts, upper and lower, which are connected by two push-pins. Upper receiver hosts the barrel and entire bolt group; lower receiver hosts the magazine port, trigger unit, pistol grip and folding shoulder stock. Small safety / fire selector switch is located on the left side of the lower receiver, above the pistol grip. Skeletonized shoulder stock is made from polymer and folds forward and to the right to save the length. Standard sights are of open type, with hooded front post and flip-up type diopter rear. Additionally, every Type 03 rifle has a proprietary scope rail on the top of the receiver, which will accept a variety of day and night scopes.



Type 03 (QBZ-03) assault rifle, partially disassembled

Type 56 assault rifle (PR China)

Caliber: 7.62x39 mm
Action: Gas operated, rotating bolt
Overall length: 874 mm
Barrel length: 414 mm
Weight: 3.80 kg
Magazine capacity: 30 rounds
Rate of fire: 650 rounds per minute

During the early post-WW2 period, the newly established Peoples Republic of China was a close "friend" to the Soviet Union, so it was natural for the much less advanced country to adopt the weapons of a more advanced ally. In 1956, the Chinese military adopted two Soviet designs, both carrying the same Type 56 designation, and both being chambered for Soviet 7.62 x 39 ammunition. One was the semi-automatic Simonov SKS carbine, the other was the Kalashnikov AK-47 assault rifle. Both weapons were made in large numbers and used by the PLA (Peoples Liberation Army of China), as well as exported into various countries. The original Type 56 assault rifle was an almost exact copy of the Soviet AK-47, with its milled receiver. Later on, Chinese designers switched to AKM-type stamped receivers, under the same Type 56 designation. The only notable differences were the markings in Chinese instead of Russian, and the folding non-detachable spike-shaped bayonets, which replaced the original detachable knife-bayonets of Soviet origin.



Type 56 assault rifle with machined (milled) receiver

During early 1980s PLA adopted a new assault rifle of domestic origin, known as Type 81, which gradually replaced Type 56 rifles in front-line service. Despite of that fact, Type 56 rifles are still manufactured by Chinese state arms factories in a variety of versions, for export purposes. NORINCO corporation also sells "civilian" versions of the Type 56 rifles, semi-automatic only and in several calibers, including 7.62x39 M43 and 5.56x45 / .223 Remington.

Another interesting note is that Chinese designers produced a compact version of the Type 56 rifle, known as Type 56C. It is apparently still in service with PLA, despite the fact that its full-size "brothers" have long been retired from general PLA service.



Type 56C compact assault rifle, with side-folding stock, short barrel and 20-round magazine

Type 56 is a gas operated, selective fire weapon. The receiver is machined from steel in early versions, the two lugged bolt locks into receiver walls. Later models, however, were made with stamped-steel AKM-type receivers, but retained the same Type 56 designation. The Type 56 has AK-47-style controls with a reciprocating charging handle and a massive safety / fire selector lever on the right side of the receiver. The furniture is made from wood, and a compact version with an underfolding metal buttstock is also available (designation is Type 56-1). Alternatively, a version with side-folding buttstock is produced as Type 56-2. The only visible difference from the Soviet AK-47 is a permanently attached spike bayonet, which folds under the barrel when not in use. Some sources said that quality of those guns was worse than of Soviet original ones. Most notably, at least some Type 56 rifles lacked the chrome plating in the barrel and gas system area, and thus were much less resistant to corrosion.



Type 56 assault rifle with stamped steel receiver



Type 56-1 assault rifle with bottom-folding stock and bayonet in opened (combat) position



Type 56-2 assault rifle with side-folding stock; note that bayonet is discarded along with its integral mounting



Type 56-1S semi-automatic rifle in 5.56x45 / .223 Remington caliber (export-only "civilian" version)

Type 63 (68) assault rifle (PR China)

Caliber: 7.62x39 mm
Action: Gas operated, rotating bolt
Overall length: 1029 mm
Barrel length: 521 mm
Weight: 3.49 kg
rate of fire: 750 rounds per minute
Magazine capacity: 20 rounds detachable box magazines

Following significant ideological disagreements between PRC and USSR during 1960s, China decided to develop its own small arms, based on the earlier licensed designs. The first domestically designed and mass produced assault rifle was the Type 63 (sometimes also erroneously referred to as Type 68 rifle). As its name implies, was initially adopted by PLA in 1963. It is interesting development because it represents a mix of features taken from other designs, mostly from the Type 56 assault rifle (Kalashnikov AK) and the Type 56 carbine (Simonov SKS). It is believed that Chinese factories produced well over 1 million of Type 63 rifles before a more advanced design, the Type 81 assault rifle, was adopted to replace it.



Type 63 assault rifle with 20-rounds magazine

The Type 63 / 68 rifle is a gas operated, selective fire weapon. It shares the stock design and receiver outline with the SKS, but instead of a tilting bolt it has an AK-47-type rotating bolt with dual locking lugs. The gas system is somewhat original being not entirely the same as the SKS or the AK-47, and has a dual-position gas regulator. This rifle is fed from detachable box magazines of various capacities, which are externally similar to, but not compatible with, AK-47 magazines. The Type 63 rifles feature a bolt hold open device, also borrowed from the Simonov SKS, which holds the bolt open after the last shot had been fired. The bolt carrier also has the charging clip guides machined into its forward part, so the rifle can be reloaded with the magazine in place, using 10-round SKS stripper clips. Selective fire capability is controlled by the single safety / fire mode selector lever, located at the front of the trigger guard. All rifles are fitted with a wooden stock and a non-detachable, spike-shaped, down-folding bayonet.

Type 81 assault rifle (People Republic of China)

Caliber: 7.62x39 mm M43

Action: Gas operated, rotating bolt

Overall length: 955 mm (730 mm with butt folded for Type 81-1)

Barrel length: 445 mm

Weight: 3.5 kg

Rate of fire: 650 rounds per minute

Magazine capacity: 30 rounds

Type 81 assault rifle appeared in the early 1980s. This is a further development of the Type 63 / Type 68 rifles, and it is easily distinguished by the separate pistol grip, handguards and buttstock instead of the SKS-style wooden stock found on earlier types. The Type 81 was more than a single assault rifle – it was a family of infantry firearms, much like the Soviet Kalashnikov AK / RPK family. Type 81 weapons were made as an assault rifle with a fixed butt, an assault rifle with a folding butt for paratroopers (Type 81-1), and a heavy barreled Type 81 Squad Automatic weapon / light machine gun, fitted with a bipod and issued with 75-round drum magazines instead of the typical 30-round boxes. Despite being externally somewhat similar to the AK-47, it is significantly different from it, with its most easily distinguishable feature being an exposed muzzle part of the barrel, with the foresight moved back. This was done to be able to fire rifle grenades from the barrel. Type 81 rifles replaced some obsolescent Type 56 assault rifles and carbines, as well as Type 63 / Type 68 rifles, in most PLA units, and saw some action in border clashes between China and Vietnam during the late 1980s. This rifle was also exported through the NORINCO state company into several neighboring countries. During the late 1980s and early 1990s the Type 81, under designation of Type 87, served as a development platform for the next generation of PLA small arms, being used as a test-bed for 5.8 x 42 ammunition.



7.62x39 Type 81-1 assault rifle, folding butt version, left side

The Type 81 is a gas operated, magazine fed, automatic rifle. It uses a short-stroke gas piston, located above the barrel, and a two-position gas regulator, along with a gas cut-off valve for launching rifle grenades. The gas system, as well as the bolt group with the AK-47 type rotating bolt, is reminiscent of those of Type 63 rifles.

Type 81 rifles also retain the bolt hold-open device, which catches the bolt in the open position after the last round has been fired from magazine. The fire selector – safety switch is located at the left side of the receiver, just above the pistol grip, and can be easily operated with the right hand thumb. The late production Type 81S rifles have a separate SKS-type safety switch just behind the trigger. The open sights are marked from 100 to 500 metres, with the front sight being mounted just ahead of the gas block, leaving the front portion of the barrel free for the rifle grenade launcher. Ammunition is fed from Type 56 (Kalashnikov) 30-round magazines, or from 75-round drums intended for the Type 81 light machine gun.



Type 81S (late production export version with fixed butt) assault rifle (top) and Type 81MGS light machine gun (bottom)



5.8x42 Type 87-I experimental assault rifle, used to develop and test 5.8mm DBP87 cartridge for QBZ-95 rifle

At the first glance, the Type 81 assault rifle looks much like the Kalashnikov AKM, but, on closer inspection, there are some significant external differences, most notably in the receiver cover shape and front sight location. There is also a significant gap between the trigger guard and the magazine on Type 81 rifles, while on AK-47 type rifles the

magazine is adjacent to the front of the trigger guard. On Type 81 rifles the obsolete spike-shaped non-detachable bayonet, preferred by the PLA before, is also replaced with the more "modern" detachable knife-bayonet. Most probably this was required to leave the significant portion of the muzzle area of the barrel unobstructed, which is required for launching of rifle grenades.

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Valmet M82 rifle (Finland)

Caliber: 5.56x45 mm / .223 Remington

Action: Gas operated, rotating bolt

Overall length: 710 mm

Barrel length: 420 mm

Weight: 3.3 kg

Magazine capacity: 30 rounds

Rate of fire: 650 rounds / min (experimental prototypes only)

The bullpup Valmet M82 was an attempt to create a compact weapon for Finnish paratroopers without using a clumsy folding buttstock. This was probably one of the first attempts to convert an existing "traditional" rifle into a bullpup layout. Like most such later attempts, it was not successful. The Finnish army, after some testing, rejected it for some unspecified reasons (some unofficial sources said that M82 tended to hit the paratroopers in the teeth with its front sight during a hard parachute landing). Later Valmet produced small batch (about 2,000) of M82 rifles in 5.56 mm (.223 Remington), and sold them on the export market, mostly in the USA.



Valmet Model 82 rifle, left side view

To save time and money, Finnish engineers decided to keep the well-proven Valmet Rk.76/AKM action, receiver and barrel, and save on overall length by putting it into a bullpup housing. Early prototypes featured wooden stocks, while latter models had a polymer housing which enclosed the receiver. The pistol grip with the trigger was moved to the front of the magazine port, so a long link was introduced between the trigger and hammer unit in the receiver. The safety / fire mode selector switch was kept in the same place on the receiver, placing it far behind the new pistol grip and trigger.

The sights were mounted on relatively high posts and set to the left from the weapon axis. There were no provisions for left hand ejection, so the M82 could not be fired from the left shoulder.



Valmet Model 82 rifle, partially disassembled



Valmet Model 82 rifle in .223 Remington, with 10-round magazine, right side view

Valmet Rk. 62 / 76 / 95 (Finland)

The data shown for Rk.62 only.

Caliber: 7.62x39 mm or 5.56x45mm NATO (export versions only)

Action: Gas operated, rotating bolt

Overall length: 914 mm

Barrel length: 420 mm

Weight: 4.3 kg without magazine (3.5 kg Rk.76 with stamped receiver)

Magazine capacity: 30 rds

In the 1950's the Finnish military recognised the need for the new military assault rifle. Instead of "invention of the wheel", finns decided to adopt and modify some of existing designs, and the proven "gun of the big neighbour", the famous Soviet AK-47 was almost a natural choice, since the Finland had fairly good relations with the USSR since WW2. Finland bought the license for original AK-47 design (with milled receiver), and first prototypes of the future Finnish assault rifle, named Rk.60, were submitted for military testings in 1960. The Rk.60, being internally almost a copy of the AK-47, showed some external differences. It had tubular metallic buttstock, plastic handguard that did not cover the gas tube, plastic pistol grip. The Rk.60 lacked the triggerguard and has three prong flash hider at the muzzle. The original sights were replaced with hooded post front sight atop of the gas chamber, the tangent rear sight was replaced by an aperture sight, mounted at the rear of the receiver cover. Both front and night sights had folding "night sights", with the white dots.



Valmet / Sako Rk.95 (folding buttstock) in 7.62x39mm

After the testing and following modifications, that include new, slightly redesigned handguards and restoration of the triggerguard, the rifle was adopted as the Rk.62, and, until now, is in Finnish military service.

During the following years, the state-owned Valmet company, the manufacturer of the Rk.62, designed some further modifications, some of which were adopted for Finnish military service and acquired by Finnish Army, and some being manufactured for export only. The export versions were manufactured in original 7.62x39mm chamberings or in .223 Remington (5.56mm NATO), select-fire or semi-auto only. Some semi-auto variants, named Valmet 78, were manufactured in 7.62x51mm (.308Win).

Of the military wersions, most interesting are Rk.76 and Rk.95TP. The Rk.76 is a modification of the original Rk.62, but with the stamped steel receiver instead of the milled one. This dramatically decreased the weight of the gun. Other changes were four different types of the buttstocks available: the 76W featured wooden fixed buttstock, the 76P fetatured plastic fixed buttstock, 76T featured tubular fixed buttstock (like the Rk.62) and 76TP featured tubular side-folding buttstok. Another change from Rk.62 was handguard, that was more Ak-47-style than of Rk.62.



Valmet M76F (folding buttstock) in 5.56mm NATO (.223Rem)

The Rk.95TP is the latest variation of the Finnish military rifles. It featured old-style milled receiver, but new, side-folding skeleton-type buttstock (Galil type), new muzzle flash hider and new handguards. The triggerguard is enlarged to enable shooting in gloves during the cold Finnish winters. It should be noted that Rk.95TP is referred as Sako Rk.75, not the Valmet Rk.95, because the Sako company (involved in production of the Rk.62 and further modifications almost from the start) was merged with the Valmet company under the name Sako. The Rk.95TP was received by Finnish Army in small quantities (only one batch manufactured). The semi-auto version of the Rk.95 is used for civilian training and practical shooting (under IPSC rules), as well as sold for export. The Rk.95 may be equipped with Finnish-made Reflex sound suppressor.

In general, all Sako / Valmet Rk.62 family weapons are first class quality firearms that designed to withstand extreme environmental conditions of the Nordic Europe. It is also should be noted that early Israeli made Galil assaul rifles were made on macinery and by documentation, bought from Valmet.

Vektor CR-21 assault rifle (South Africa)

Caliber: 5.56x45mm
Overall length: 760 mm
Barrel length: 460 mm
Weight: 3,8 kg loaded
Magazine capacity: 20 or 35 rounds
Rate of fire: 650-700 rounds per minute
Effective range: 500 meters

The CR-21 assault rifle (CR-21 stands for Compact Rifle for 21st century) was developed by the Vektor, a small arms division of the DENEL corporation of South Africa. The rifle was first displayed on public in 1997, and is intended to replace in service with South African National Defense Forces (SANDF) the "old fashioned" Vektor R4 and R5 assault rifles (license-built Galil ARM and SAR rifles of Israeli origin). The Vektor designers selected an interesting way to produce a new rifle. They simply stripped the R4 rifles out of all furniture, and the remaining receiver with the barrel and all action inside enclosed into the futuristic-looking bullpup housing, made of modern plastics. This decision saved a lot of time and money, otherwise required to develop and produce a new action, and also allowed to remanufacture existing stocks of the "old" R4 rifles into the "new" CR-21 bullpup rifles. On the other hand, the use of existing action of "traditional" origin imposed some design limitations. For example, CR-21 has no provisions for the left-hand spent cases ejection, since this will require a serious redesign of the original R4 receivers and bolt groups. The fire mode selector also remained on its "original" place and is not comfortable to operate when gun is shouldered. But, in general, this is not an unique decision - for example, Russia developed some Kalashnikov-based bullpup rifles, which also have no left side ejection, and, furthermore, some bullpup rifles, designed from the scratch, also limited to the right-hand use only - for example, British L85A1 or Singaporean SAR-21.



CR-21



CR-21 with the 40mm Vektor grenade launcher



CR-21 disassembled into major components



CR-21 IX optical sight with aiming reticle shown at left

Vepr assault rifle (Ukraine)

Caliber: 5.45x39 mm
Action: Gas operated, rotating bolt
Overall length: 702 mm
Barrel length: 415 mm
Weight: 3.45 kg empty
Rate of fire: 600-650 rounds per minute
Magazine capacity: 30 rounds

The Vepr ("wild boar" - Ukrainian language) has been announced in 2003 as a new Ukrainian-designed assault rifle. Ukraine is a former Soviet republic and since dissolution of USSR its armed forces used Soviet-era small arms, including the Kalashnikov AKM and AK-74 assault rifles. The Vepr has been advertised as a major improvement over AK-74, but, in fact, it is no more than yet another conversion of standard AK-74 into bullpup layout. The standard AK-74 is stripped from its furniture, and the buttplate is fitted directly to the receiver; polymer cheek rest is fitted to the receiver cover, and pistol grip is fitted ahead of the magazine; the cocking handle is moved to the left side of the forearm, but the safety/fire selector lever remained in the same position, now well behind the pistol grip and almost out of reach when gun is shouldered. Vepr is fitted with adjustable open sights and a standard side mount for day or night scopes. Relatively large red dot scope of Ukrainian manufacture is fitted as a standard. Latest version of the Vepr also feature an integral 40mm underbarrel grenade launcher, with dual trigger arrangement (front trigger controls launcher, rear trigger controls the rifle).



It is yet to be seen if the Vepr will be procured and issued to Ukrainian forces in any numbers, but the claims of "clear superiority to AK-74" from Vepr manufacturers seem to be rather optimistic, to say the least.



PS: there were plenty of conversions of Kalashnikov rifles to bullpup layout before the Vepr, like Russian OC-14 Groza, Finnish Valmet M82, Chinese Type 86 or South African CR-21. None of these had any success so far.

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VHS assault rifle (Croatia)

	VHS-D	VHS-K
Caliber:	5.56x45 mm NATO	
Action	Gas operated, rotating bolt	
Overall length	760 mm	660 mm
Barrel length	500 mm	400 mm
Weight:	3.0 kg	2.8 kg
Rate of fire	750 rounds per minute	
Magazine capacity	30 rounds	

The VHS assault rifle was developed by Croatian arms factory HS Product. The first prototype of the VHS rifle was first announced in 2005. It was externally quite similar to the Israeli Tavor TAR-21 rifle, and was said to feature patented 'gas recoil cushion' system, in which hot powder gases were taken from the bore to gradually slow down the bolt opening (similar system was developed decades ago for Soviet AM-23 aircraft cannon). It must be said, however, that final versions of the VHS rifle, which by now (end of 2008) are undergoing field trials with Croatian army, do not have this feature, and instead use a conventional return spring. The external looks of the rifle also have changed so now VHS looks not dissimilar to the French FAMAS G2 rifle. The future of the VHS is not yet clear, but it is said that it will go into full production in 2009.



VHS-D (standard) assault rifle

The VHS assault rifle is gas operated weapon that uses direct impingement gas system. Barrel locking is achieved by more or less traditional rotating bolt. The gun body is made from impact resistant polymer, and the gun is designed in the bullpup layout.

The ejection port is on the right side of the gun only, so firing it from the left shoulder can be problematic to say the least. The charging handle is located at the top of the gun housing, and can be swung to either side to provide ambidextrous handling. The safety / fire selector is located within the trigger guard, in the front of the trigger, and is rotated around the vertical axis. When it is turned toward the trigger, the gun is safe. When safety / selector is turned to the left side, it provides full automatic fire, when it is turned to the right side, it provides semi-automatic fire (single shots). Iron sights are built into the large integral carrying handle, which also has several strong points for attachment of the Picatinny rails.



VHS-K (compact) assault rifle

Additional accessory rails can be attached to the forend of the rifle. On the full-size VHS-D rifles, the barrels are fitted with rifle grenade discharging adapters and bayonet lugs; compact VHS-K rifles have neither. Feed is from NATO-standard (M16-type) magazines.

Walther MKb.42(W) machine carbine / assault rifle (Germany)

Caliber: 7.92 x 33 (7.92 mm Kurz)

Action: Gas operated, rotating bolt

Overall length: 931 mm

Barrel length: 401 mm

Weight: 4.4 kg empty

Rate of fire: 600 rounds per minute

Magazine capacity: 30 rounds

In 1939 HWaA (Hitler's army Weapons command) issued a contract for the development of a "Maschinenkarabiner", or machine carbine (MKb for short), chambered for the new 7.92x33 Kurz cartridge, to the company C. G. Haenel Waffen und Fahrradfabrik. In 1940 another company joined in the development of this new type of small arm; the famous German arms manufacturing company Carl Walther, known for its fine and popular pistols. Walther had already been engaged in the development of intermediate-cartridge firearms since 1936, when it produced self-loading carbines for an experimental 7 x 39 cartridge. Later, Walther developed several automatic designs in "full-size" 7.92 x 57, and one of these experimental prototypes, the 7.92 mm A-115, served as a starting point for its 7.92 mm Kurz rifle. Walther began to develop its own Maschinenkarabiner as a private venture, but in 1941 received official approval from HWaA for further development in competition with Haenel, the first MKb.42(W) rifles being delivered to the army in the second half of 1942.



In late 1942, the first small batches of both Haenel and Walther weapons, designated MKb.42(H) and MKb.42(W) respectively, were sent to the Eastern front, for trials against Soviet troops. Initial results were promising, with the Haenel rifles being generally preferred due to their better reliability. The Walther design, which showed better single-shot accuracy, was rejected as unsuitable on the grounds of its questionable annular gas

piston system. No further development in this field was apparently taken by the Walther organization, which was already very busy delivering its P.38 pistols to the German army.

The MKb.42(W) is a gas-operated, magazine fed weapon. The gas system has an annular gas piston, located around the barrel, inside the stamped annular handguards. A rotating bolt of somewhat complicated design locks to the barrel via two lugs. The hammer-fired trigger unit allows single shots or fully automatic fire, and the MKb.42(W) is fed using the same 30-round magazines as its rival, the MKb.42(H). The MKb.42(W) fires from a closed bolt.

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XM8 Lightweight Assault Rifle (USA)

Caliber: 5.56x45 mm NATO

Action: Gas operated, rotating bolt

Overall length: 838 mm in basic configuration, butt extended

Barrel length: 318 mm in basic configuration; also 229 mm in Compact and 508 mm in Sharpshoter and SAW versions

Weight: 2.659 kg empty in basic configuration

Rate of fire: ~ 750 rounds per minute

Magazine capacity: 30 rounds (STANAG) or 100-rounds double drum in Automatic Rifle/SAW role

The development of the XM8 Lightweight Assault Rifle was initiated by US Army in the 2002, when contract was issued to the Alliant Techsystems Co of USA to study possibilities of development of kinetic energy part of the XM29 OICW weapon into separate lightweight assault rifle, which could, in the case of success, replace the aging M16A2 rifles and M4A1 carbines in US military service. XM8 is being developed by the Heckler-Koch USA, a subsidiary of famous German Heckler-Koch company. According to the present plans, the XM8 should enter full production circa 2005, if not earlier, several years before the XM29 OICW. The XM8 (M8 after its official adoption) should become a standard next generation US forces assault rifle. It will fire all standard 5.56mm NATO ammunition, and, to further decrease the load on the future infantrymen, a new type of 5.56mm ammunition is now being developed. This new ammunition will have composite cases, with brass bases and polymer walls, which will reduce weight of the complete ammunition, while maintaining compatibility with all 5.56mm NATO weapons. Along with 20% weight reduction in the XM8 (compared to the current issue M4A1 carbine), this will be a welcome move for any infantryman, already overloaded by protective, communications and other battle equipment.



Author of this website is posing with XM8 at the ShotShow-2004, Las Vegas, USA

The XM8 will be almost similar to the "KE" (kinetic energy) part of the XM29 OICW system, being different mostly in having a telescoped plastic buttstock of adjustable length, and a detachable carrying handle with the sight rail.



XM8 rifle in basic infantry configuration, as displayed in January, 2004, at the ShotShow-04 in USA

As of mid-2004, XM8 now is undergoing wide-scale testing in several units of US Army, and is receiving a positive feedback.



XM8 rifle in "automatic rifle" (light machine gun) configuration. Note longer barrel and folded bipods under the forearm

XM8 status update (September 2005): Following several complains about non-competitive procurement of the XM8 system from Heckler-Koch USA, US Army first opened the bidding for contract to other companies, and then, in the July 2005, suddenly suspended the entire OICW Increment 1 program to re-think the entire set of requirements for the possible replacement of current M16 rifles and M4 carbines. These requirements will be re-reviewed as Joint Services effort. At the present time, it seems that development of HK XM8 is suspended; it may be resumed if XM8 suit the new US Joint Service Requirements for a new assault rifle system; or, it may not. We will watch this process closely and update this article when new information will be available.

Technical description.

The XM8 is a derivative of the Heckler-Koch G36 assault rifle, and thus it is almost similar to that rifle in design and functioning. XM8 features a short piston stroke, gas operated action, with rotating bolt locking. Barrels are quick detachable, and planned to be available in several sizes, ranging from 229 mm (9.5 inch) for Compact/PDW version, 318mm (12.5 inch) in Basic version, and two 508mm (20in) barrels, one for Sharpshooter/Sniper version, and heavier one (along with bipod) for Squad Automatic Rifle role. The entire construction is modular and built around the polymer receiver with bolt group; Magazine housings could be easily swapped for compatibility with various types of magazines; various buttstocks could be installed in a second for various roles (standard buttstock is a telescoped 5 position adjustable one). Top of the receiver is fitted with proprietary sight rail, which can accept illuminated red-dot (collimator) sight, or any other type of sighting equipment. Detachable forend will be available in various sizes, and could be replaced with XM320 40mm grenade launcher (the improved HK AG36).



XM8 rifle in Compact (SMG / PDW) configuration, with shortened barrel

Ambidextrous fire controls are mounted on the trigger unit, integral with pistol grip and triggerguard, and in basic configuration are planned to deliver single shots and full auto fire. The G36-type ambidextrous charging handle is located at the top of the receiver, below the removable carrying handle.



XM8 rifle in "sharpshooter" (parasniper) configuration. While sight looks similar to red-dot, mounted on other variants, it is of 3.5X magnification; spare magazine is clamped to the right side of the magazine inserted into the rifle

Z-M Weapons LR-300 assault rifle / Para USA Tactical Target Rifle (USA)

Specifications for Z-M Weapons LR-300 rifles

	LR-300-SR	LR-300-14.5	LR-300-ML
Caliber	5.56x45 mm / .223 Remington		
Action	Gas operated, rotating bolt, direct impingement		
Overall length	946 mm / 37.25"	896 mm / 35.25"	820 mm / 32.25"
Barrel length	419 mm / 16.5"	368 mm / 14.5"	293 mm / 11.5"
Weighth	2.95 kg / 6.5 lbs	2.72 kg / 6.0 lbs	2.54 kg / 5.6 lbs
Rate of fire	--	--	950 rounds per minute
Magazine capacity	30 rounds		

Specifications for Para USA Tactical Target Rifle

Caliber	5.56x45 mm / .223 Remington
Action	Gas operated, rotating bolt, direct impingement
Overall length, stock open (folded)	838 mm (667 mm) / 33" (26.25")
Barrel length	419 mm / 16.5"
Weighth	3.45 kg / 7.6 lbs
Magazine capacity	30 rounds

The LR-300 rifle was manufactured by the small US-based company Z-M Weapons between 2000 and 2007, when all rights for the design were sold to the Para USA, the US-based subsidiary of the Canadian pistol maker Para-Ordnance Ltd. The reworked LR-300 rifle will be sold in USA as Para Tactical Target Rifle, with first sales scheduled to "early 2009".



Z-M Weapons LR-300-ML assault rifle, early (circa 2001) version

Original LR-300 (LR stands for Long Range) rifles were designed by Alan Zitta as an upgrade to the well known and popular M16 / AR-15 rifle. In fact, LR-300 and Para TTR both use standard AR-15-type lower receivers; only upper receivers are different and contain patented modified gas system. The key reason for the modification was to provide AR-15-type weapon with capability to mount side-folding stock rather than partially collapsible M4 carbine-type stock. Z-M Weapons intended its rifles mostly for military and law enforcement personnel, by offering LR-300-ML weapons with short barrels and select-fire capability. Civilian (semi-automatic only) versions also were offered to general public, but at prices well above the average price of AR-15-type rifle. It is not known yet if the new Para Tactical Target Rifles will also be offered in military (select-fire) version or not; current Para USA advertising suggests that only semi-automatic weapons (and upper receiver conversion kits) will be offered, at least initially.



Z-M Weapons LR-300-SR semi-automatic rifle, late production version (circa 2006)

The LR-300 rifle is gas operated, and utilizes modified Stoner-type direct gas impingement system. In this modified system, the gas key is extended forward to form the tube, that protrudes forward from the receiver and into the handguard. The protruding part of the gas key tube is used to host the bolt return spring, which is placed between the front receiver wall and the collar at the front of the gas key tube. The gas tube, which runs rearward from the gas block / front sight base, is strengthened as its rear end floats freely to enter the extended gas key tube when bolt group is in the battery. That way, at least some of the hot gases from inside the gas carrier are expelled outside the receiver and into the inner handguard area, through the extended gas key tube, once it has left the gas tube during the bolt group recoil movement. Additional benefit of this system is that it allows the bolt carrier to be made twice as short compared to the standard AR-15-type bolt carrier.



Para USA Tactical Target Rifle, with buttstock open

In turn, this results in the fact that there's no need for the recoil buffer tube, which is normally protruding backward from the AR-15-type lower receiver. Because of this feature, most LR-300 rifles are fitted with side-folding shoulder stocks, either skeletonized non-adjustable ones made from metal or polymer ones, adjustable for length of pull. Otherwise the LR-300 is similar to the AR-15-type weapons and has similar trigger / safety arrangements, magazine housing and bolt stop device.



Para USA Tactical Target Rifle, with buttstock collapsed

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