

MODERN FIREARMS Series



Volume 2

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Bofors AK-5 assault rifle (Sweden)

Caliber: 5.56x45mm NATO

Action: Gas operated, rotating bolt

Length: 1008 mm (Stock Extended), 753 mm (Stock Retracted)

Barrel Length: 450 mm

Weight: 3.90 kg

Magazine: 30 rounds box

Rate Of Fire: 650 rounds per minute

Sweden adopted its first 7.62 mm assault rifle in 1963, as the AK-4. It was a license-built version of the Heckler & Koch G3 rifle, which served well until the adoption of the 5.56 mm ammunition in 1984. After extensive trials, which included designs like the Israeli Galil (made under license by FFV of Sweden), the German HK33, the American M16A1, the Swiss SIG SG-540 and some other designs, the Swedish army finally selected the Belgian FN FNC as its next weapon. The basic FN FNC rifle was modified to suit Swedish requirements, the most notable changes being the omission of the 3-round burst mode of fire, an enlarged trigger guard, a thicker forend and improved, corrosion-resistant finish on all metallic parts.



Bofors AK5B - scoped designated marksmen rifle

First deliveries were made from FN circa 1986, and domestic rifles began to enter service a year later, made at Bofors' Karl Gustaf factories. The modified FNC rifle, adopted as the AK-5, is now in service with Swedish armed forces.

The AK5 assault rifle is essentially similar to the Belgian FN FNC rifle, except for several modifications. First, the AK5 has no provision for the 3-round burst mode, and will fire only single shots or full auto. Second, the buttstock and handguards are made longer and more suitable for winter conditions, and the charging handle enlarged for better grip when using arctic mittens. Special surface treatment is used for better protection against the elements.



Bofors AK5D - shortened version with Picatinny rail

The AK5 is manufactured in several modifications, including the basic AK5; the AK5B with 4X telescopic sight (British SUSAT L9A1) and cheek-pad on buttstock, which is issued as a squad-level marksmen rifle; AK5C with Picatinny rail and no open sights; AK5D with the shortened barrel, and integral carrying handle with built-in telescope sight, intended for Commando units and paratroopers; and a grenade-launching version, fitted with American M203 40mm grenade launcher, which is used mostly by Rangers and amphibious forces.



Bofors AK5 - basic version



Bofors AK5 with M203 grenade launcher

Bushmaster M-17s rifle (USA)

Caliber: 5.56x45 mm (.223 Remington)

Action: Gas operated, rotating bolt

Overall length: 760 mm

Barrel length: 546 mm

Weight: 3.72 kg empty

Magazine capacity: Accepts all M16/AR15 magazines, standard capacity 30 rounds

This interesting weapon started its life in around 1982, when a small Australian company Armstech decided to develop a new assault rifle for Australian army trials. Prototype weapons were produced in a very short amount of time, but Australian army eventually selected for adoption an already established foreign weapon, the Austrian-made Steyr AUG. Nevertheless, Armstech kept developing and produced a series of interesting weapons, all in bullpup layout (and some firing caseless ammunition of indigenous design), but neither went past prototype stage. In around 1990 Armstech went belly up, and rights to the rifle that fired conventional ammunition was sold to another Australian company, known as Edenpine. Further development at Edenpine resulted in SAK 30 prototype, but company found that there's no market for such weapon in peaceful Australia. Therefore, in early 1990s Edenpine found an American company, Bushmaster Firearms Inc, which finalized the prototype and put it into production in 1994, just before the infamous "Assault weapons ban". Bushmaster designated new rifle as M17s and produced it in somewhat limited numbers up until 2005, when it was dropped from Bushmaster products line. It must be noted that demise of Bushmaster M17s was caused mostly by general preferences of American gun market, which is rather shy on bullpups; therefore, Bushmaster company decided to concentrate on much better selling rifles, patterned after Ar-15 / M16 or M4.



Bushmaster M-17s rifle, right side view, with installed Red Dot sight

The M17s is a self-loading rifle, and thus cannot be classified as a true "assault rifle". Nevertheless it could make a very good paramilitary or home defense weapon;

it is also good plinker and all-around compact rifle in .223 caliber, combining rifle-length barrel with carbine-style short overall length.



Bushmaster M-17s rifle, left side view

The M17s rifle is gas operated weapon that uses short-stroke gas piston, located above the barrel. Locking is achieved by rotary bolt with seven lugs; bolt is hosted in massive Ar-18-style bolt carrier, which rides on dual guide rods.

The charging handle is somewhat unusual as it forms the rear part of the integral carrying handle, and therefore it is fully ambidextrous. The cocking handle slot on the top of receiver is covered by sliding dust cover. The receiver of weapon is a composite affair, consisting of extruded aluminum upper part and polymer lower part. Upper part houses barrel, gas system and bolt group. Lower receiver is made integral with pistol grip and houses trigger unit and magazine housing. Upper and lower receivers are connected by two push-out cross-pins.

Ejection port is made on the right side of the weapon only, and there's no provisions for left-hand ejection. Nevertheless, weapon is more or less ambidextrous in regard to controls, as push-button safety (located at the front of triggerguard) and magazine release buttons are made ambidextrous too. M17s will accept all M16 / Ar-15 type magazines. The top of the carrying handle is fitted with Weaver-style accessory rail which will accept any compatible scope mounts, and also hosts a rudimentary backup open sight.

CETME A, B, modelo 58, C Assault Rifles (Spain)

Data for CETME mod. B / Mod. 58 rifle

Caliber: 7.62x51 mm reduced power load; also 7.62x51mm NATO

Action: delayed blowback

Overall length: 1015 mm

Barrel length: 450 mm

Weight: 4.4 kg

Rate of fire: 550 - 600 rounds per minute

Magazine capacity: 20 or 30 rounds

The Spanish state company CETME (Centro de Estudios Tecnicos de Materiales Especiales - Special Materials Technical Studies Center, now known as Empresa Nacional Santa Barbara) was founded in 1949 to develop various small arms for Spanish army. At about the same time it employed the German arms designer Ludwig Vorgrimler, who worked for the famous Mauser Werke in Germany before and during the World War 2. The Vorgrimler was the designer of the experimental German assault rifle, known as "Gerat 06" or Stg.45(M). This rifle was not manufactured in any quantities, but its design served as a basis for further development at the CETME, and more important, at the another German company, Heckler & Koch, which obtained a license for the Vorgrimler / CETME rifle design circa 1957. This deal later resulted in the famous family of the H&K weapons, like the G3 and HK33 assault rifles, HK21 and HK23 machine guns, MP5 submachine guns and numerous other small arms that achieved a worldwide popularity. All those weapons are built using the delayed blowback system of operation, designed by Vorgrimler and his men at the Mauser in 1945 and refined by CETME.



Early CETME assault rifle prototype chambered for experimental 7.92x40mm cartridge

The initial assault rifle development at the CETME was conducted around proprietary intermediate cartridge, known as 7.92x40mm CETME. This cartridge featured a long and streamlined bullet, made from aluminum. The overall design was found adequate, but cartridge was rejected in favor of the 7.62x51mm round with lighter bullet and a reduced powder charge. Improved rifle entered serial production in 1956 and was adopted by the Spanish army in 1957. In 1958 CETME introduced a slightly improved design, known as Modelo B or Model 58. This rifle was intended to fire 7.62x51mm reduced loads but also could fire the standard 7.62mm NATO, if the bolt group and the return spring are replaced with the appropriate set of parts.

In 1964, CETME introduced the Modelo C, which also was adopted by Spanish Army, Navy and Air Force. This rifle was intended to fire only standard, full power 7.62x51mm NATO ammunition. Its key improvements were 4-position diopter sights (instead of the earlier leaf type open sights), wooden handguards instead of earlier steel ones, bipod was made as a separate part and, most important, the chamber was fluted to improve extraction and avoid torn rims and cartridge case failures in harsh environment conditions. Production of the modelo C rifle was ceased in 1976, and in 1980s it had been gradually replaced by its 5.56mm derivative, CETME Modelo L assault rifle.



CETME modelo C rifle (semi-automatic only "Sporter" version shown)

All 7.62mm CETME rifles are built around Vorgrimlers' roller delayed blowback system. This system employs a two parts bolt with two rollers. The front bolt part (bolt head) is relatively light and has a bolt face with extractor on it. It also has a hollow cavity at the rear, in which an inclined forward end of the rear part of the bolt (bolt body) is inserted. The system features two rollers, inserted from the sides into the bolt head and rested on the inclined forward end of the bolt body. When gun is fired, the pressure began to move the cartridge back against the bolt face. The rollers, which are extended into the recesses in the barrel extension, began to move inward into the bolt head, due to inclined shape of the recesses. This movement translates into the faster rearward movement of the heavier bolt body, so, at the initial moments of shot, when pressure in the chamber is still high, bolt face moves relatively slow. When pressure drops to a reasonable level, rollers disengage the barrel extension completely and from this moment on the bolt head and the bolt body move backward at the same speed, extracting and ejecting spent case and chambering a fresh cartridge on the way back.



CETME modelo A assault rifle, chambered for 7.62x51mm reduced load cartridge

All CETME rifles are firing from the closed bolt. The trigger mechanism is hammer fired, and in military versions is capable in semi-automatic and fully automatic modes of fire. On the early models the safety / fire mode selector switch was located above the trigger at the right side of the gun. From the model C the safety / selector switch was relocated to the left side of the gun. The receiver is made from steel sheet stampings, as well as the trigger group housing, which is hinged to the receiver just behind the magazine housing. Early models (prior to Modelo C) were issued with integral folding metallic bipods and open leaf-type rear sights. The Modelo C rifles were issued with wooden handguards and a separate detachable bipods. The rear sights were replaced by the 4 positions diopter sights, marked for 100 - 400 meters range. All rifles featured a wooden buttstock and a folding carrying handle above the receiver. The flash hider of the Modelo C rifles was shaped to accept and launch NATO-standard rifle grenades. Most rifles were issued with magazines of 20 rounds capacity and made of steel, but 30 rounds magazines also were available.



Stg.45(M) - German predecessor to CETME rifles, made at the Mauser Werke in 1945



CETME modelo B / mod. 58 with 30 rounds magazine

CETME mod. L and LC (Spain)

Caliber: 5.56x45 mm NATO (.223 rem)

Action: Delayed blowback

Overall length: 925 mm (860/665 mm mod. LC)

Barrel length: 400 mm (320 mm mod. LC)

Weight: 3.4 kg empty (3.22 kg Mod. LC)

Rate of fire: 600 - 750 rounds per minute

Magazine capacity: 12 or 30 rounds

The Mod. L rifle had been developed by Spanish CETME company (now Santa Barbara SA) as a further derivative of the previous Mod. 58 and Mod. B rifles. These rifles, in turn, have their roots in WW2 German assault rifle Stg.45, developed by Mauser. After the WW2, some Mauser men moved to the Spain and started to work for CETME, where they developed the Mod. B battle rifle, chambered for 7.62mm NATO cartridge. This rifle later was licensed by Heckler&Koch and became the famous G3, but CETME also continued the development. In the mid-1960s men at CETME began to work at smaller-caliber version of the basic rifle, initially called Mod. E. Development was completed in 1980, when first prototype of the Mod. L, chambered for 5.56mm cartridge appeared. Production of the Assault Rifle Mod. L and carbine Mod. LC began in 1984, and it was adopted by Spanish army. In 1999 this rifle was declared obsolete by adoption of the H&K G36E assault rifle.



CETME Mod. L assault rifle

Like the previous models, CETME Mod. L is a delayed blowback operated, selective fire assault rifle. It has two-piece bolt with two rollers, which are used to accelerate bolt body and to slow bolt head and to hold the cartridge case in chamber until the pressure will drop. The chamber walls are fluted to help the extraction. Overall design is somewhat similar to H&K 33 rifles, but Mod. L is easily distinguishable by larger triggerguard and different (from HK designs) plastic pistol grip and handguards. Sights on Mod. L also are different from HK pattern and rear sight is a simple flip-up "L" shaped leaf with two apertures for 200 and 400 meters. Magazine port also is different from HK pattern and is designed to accept M16-type magazines. Carbine Mod. LC differs from the Mod. L by having shorter barrel and telescoping metallic buttstock.

Colt CAR-15 / XM-177 Commando (USA)

Data for current production Colt mod 933 Commando

Caliber: 5.56x45 mm (.223 Remington)

Action: Gas operated, rotating bolt

Overall length: 680 - 762 mm

Barrel length: 292 mm

Weight: 2.44 kg empty

Rate of fire: 750 rounds per minute

Magazine capacity: 30 rounds (or any other M16 type magazine)

The first carbine version of the M16 assault rifle appeared under the name of CAR-15 in 1965, and was intended for US Special Forces who fought in Vietnam. The original M16 was simply shortened by cutting the half of the length of the barrel (from original 20 inches to 10 inches) and by shortening the buttstock by another 3 inches. The butt was plastic and retractable, the handguards were of triangular shape and the flash hider was of original three-prong type. Based on the original CAR-15, Colt quickly developed the CAR-15 Air Force Survival Rifle, intended, as a name implied, to serve to downed airplane and helicopter pilots. This version had tubular handguards and metallic tubular buttstock, and for some reasons the pistol grip was shortened.



Colt Commando (model 733, note M16A2-style brass deflector and forward assist)

Initial combat experience with CAR-15 brought up some problems. First, the carbine was too loud, deafening the firing soldier quite quickly. Second, the muzzle flash was also terrific, blinding the shooter at night and giving away the position of the shooter to the enemies. Colt partially solved this problem by installing a new, longer flash suppressor. This version, known as the Colt model 609 Commando, also carried new handguards of tubular shape. This model was officially adopted by US Army as XM-177E1. This version had M16A1-style receiver with forward assist button. In the mid-1967 Colt slightly upgraded the Commando by lengthening the barrel up to 11.5 inches (292 mm), and this version was adopted as XM-177E2.

Later, with the introduction of the M16A2 and M16A3 (flat-top) models, Colt also changed the design of its Commando line, adding three-burst options and flat-top receivers with Weaver-style rails.

Current Colt Commando carbines (Colt still called these Submachine-guns) are based on either M16A2 or M16A3 receivers, and had 11.5 inch (292 mm) barrels with M16A2-style flash suppressors, and available in either 3-round bursts or full-auto versions. Colt Commando carbines are used by various US Special Forces and by some foreign forces, including Israeli ISAYERET.



Colt XM-177E1

From the technical point of view, the Colt Commando is similar to contemporary M16 rifle, having same light alloy, two parts receiver, direct gas operated, rotating bolt action, with non-reciprocating charging handle at the rear of the receiver. The telescoping buttstock is made from metallic tube. Due to recoil spring, located inside the butt, the Commando cannot be equipped with side- or underfolding stock without some redesigning. Currently Colt Commando assault carbines are issued with standard M16-type 30 round magazines, but any other M16-compatible magazine can be used, including the 100-rounds Beta-C dual drums.

Colt M4 and M4A1 carbine / assault rifle (USA)

Caliber: 5.56mm NATO

Action: Gas operated, rotating bolt

Overall length: 838 mm (stock extended); 757 mm (stock fully collapsed)

Barrel length: 370 mm

Weight: 2.52 kg without magazine; 3.0 kg with magazine loaded with 30 rounds

Rate of fire: 700 - 950 rounds per minute

Maximum effective range: 360 m

The Colt company developed various carbine versions of the basic AR-15 / M16 rifle since 1970s. These carbines were intended for all markets - military, law enforcement, civilian. US Military (and some other armies, most notably - Israeli Self-Defense Forces) had adopted the Colt CAR-15 Commando and XM-177 carbines during the 1970s and 1980s. But early in 1990s the old idea of replacing the pistols in the hands of the troops with some more effective, shoulder fired weapon, rise again in the heads of the US Military. In fact, this idea can be dated back to the US M1 Carbine of 1941, but good ideas never die. So, in the 1994, US Army adopted the Colt Model 720 selective-fire carbine (basically, a shortened M16A2 rifle), as the US M4 Carbine.



THOR Global Defense Group TR-15 carbine, manufactured along the lines of US GI M4, but fitted with a number of accessories such as AAC silencer, Vltor rail forend and buttstock, and Trijicon ACOG 4X optical sight

This weapon was intended to replace in service some M9 pistols, as well as some aged M3A1 submachine guns and some M16A2 rifles. New weapon was much more handy and comfortable to carry, than the long M16A2 rifle, so the US Special Operations Command (SOCOM) put its eye on the M4 as a possible universal weapon for all Special Operations community. For this purpose M4 was latter modified with the M16A3-style flat-top receiver with integral Picatinny-type accessory rail instead of the M16A2/M4-type integral carrying handle. This modificatin retained the M4 index. The only difference between the M4A1 and M4 is that its trigger unit of M4A1 is modified to fire full-auto instead of the three shots bursts in M4. Specially for the SOCOM M4A1s US Naval Surface Warfare Center developed a SOPMOD M4 kit, that consisted of the M4A1 carbine equipped with Rail Interface System (RIS) instead of the standard handguards.

The kit also includes a variety of the add-on goodies, such as various sights (ACOG 4X telescopic, ACOG Reflex red-dot, detachable back-up open sights), laser pointers (visible and infra-red), detachable sound suppressor (silencer), modified M203 40mm grenade launcher (with shortened barrel and improved sights). The kit also included a detachable front grip and tactical light.



Colt M4 carbine, current issue model with removable carrying handle, left side

At the present time, the M4 carbine is used as a front-line weapon by US Army, Marine Corps and SOCOM operators in Iraq and Afghanistan. Combat experience with this weapon resulted in update program, which will, as of now (mid-2010) following steps. First, Army wanted to install heavier barrel to allow more sustained firepower, combined with full-automatic mode of fire instead of 3-round burst, and ambidextrous safety/selector switch. Second stage will see improved rail adapter and a new, improved bolt carrier, and a possible third stage will include change of operating system (most probably, from direct gas to the gas piston).



Colt M4 carbine, old version with fixed M16A2-style carrying handle and M203 grenade launcher

At the present time, the Colt company still is the the prime M4 carbine manufacturer for US Armed forces, but many other companies build similar "milspec" weapons for other US and foreign customers, such as government and private security organizations, law enforcement etc. To name just few, M4-type carbines are manufactured by Bushmaster Firearms, Olympic Arms, THOR Global Defense Group and others



THOR Global Defense Group TR-15 carbine, manufactured along the lines of US GI M4 and equipped with 10.5" CQB barrel, Daniel Defense RIS II Rail System and Troy BattleSight Back Up Iron Sights

SOPMOD M4 Accessory Kit

Carrying Handle/Sight

ACOG Reflex
0-300m Range

ACOG 4X Scope
0-600m Range

Visible Laser
0-300m Range

AN/PEQ-2 IR Pointer/Illuminator
0-600m Range

Rail Interface System (RIS)

Forward HandGrip

QD Sound Suppressor
30 dB Reduction

Visible Light
9 Volt

M203 Grenade Launcher with QD Mount

Modified M203 Leaf Sight

M4A1 Carbine
(5.56 mm NATO)

Special Operations Peculiar Modification to the M4 Carbine (SOPMOD M4) Accessory Kit

Program Objective: To provide Special Operations Forces the ability to adapt the M4A1 Carbine to increase its operational effectiveness through improved target recognition, acquisition, and hit quality during day and night from Close Quarters to 500 meters.

Program Sponsors: United States Special Operations Command

Program Manager: Crane Division, Naval Surface Warfare Center

SOPMOD M4 Website: <http://sopmo.org/www.navy.mil/428.html/sopmod3.htm>



Colt M4 carbine, current issue model with removable carrying handle, right side



Colt M4 carbine, current issue model with Trijicon ACOG telescope sight installed over the integral Picatinny rail and M203 grenade launcher mounted onto the RIS forend.



Colt M4 carbine with Mk.18 CQBR upper receiver, fitted with Aimpoint red-dot sight and additional back-up iron sights (BUIS)

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CQ / M311 assault rifle (China)

Caliber: 5.56x45 mm
Action: Gas operated, rotating bolt
Overall length: 986 mm
Barrel length: 508 mm
Weight: 2.9 kg empty
Rate of fire: 900 rounds per minute
Magazine capacity: 30 rounds



Original CQ rifle

Chinese CQ rifle, as offered for export through NORINCO corporation, is a straightforward copy of the American M16A1 assault rifle. CQ first appeared during early 1980s, produced by Chinese state arms factories for export only. This rifle was made in both military (selective-fire) and civilian (semi-automatic only) versions. Recently, Chinese factories also copied US M4A1 carbine under the same CQ designation. This rifle is not used by PLA (Chinese army) or PAP (Chinese police), but apparently it has found some buyers in Asia; Iran makes a copy of CQ rifle as S-5.56.



CQ-M4 carbine

CQ rifle operates exactly the same way as M16A1 rifle; it uses same two-part aluminum receiver, same direct gas action and same rotating bolt design. Magazines also are compatible. The only visible differences between CQ and M16A1 are different shape of pistol grip, handguard and buttstock.

Typical receiver markings of CQ rifle



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Cristobal M2 and M1962 assault rifle / carbine (Dominican republic)

	Cristobal Model 2	Cristobal Model 1962
Caliber	.30 M1 US Carbine (7.62x33 M1)	
Action	Delayed blowback	
Overall length	945 mm	866 mm
Barrel length	405 mm	310 mm
Weight, empty	3.53 kg	3.96 kg
Rate of fire	580 rounds per minute	
Magazine capacity	30 rounds	



Cristobal Model 2 assault rifle / carbine

The Cristobal Model 2 assault rifle / carbine is an interesting weapon which is somehow not easy to classify properly. Technically, it is close to typical submachine guns, as it fires from open bolt, but its cartridge is way too powerful to be considered as a "pistol" round, as the .30 US Carbine develops about 1300 Joules of muzzle energy and thus is about 2-3 times more powerful than a typical military pistol round like 7.62x25 TT, 9mm Luger or .45 ACP, and has maximum effective range of 300-400 meters.



Cristobal Model 1962 assault rifle / carbine

The Cristobal Model 2 assault rifle / carbine was developed by famous Hungarian small arms designer Pal Kiraly, who after the WW2 left Hungary and settled in the Dominican republic.

The Cristobal Model 2 assault rifle / carbine is broadly based on two submachine gun designs - internally it resembles the Hungarian 39M submachine gun (designed by Kiraly), and externally it somehow resembles Italian Beretta M1938, which at the time of M2 development was manufactured under license in Dominicana.



Cristobal Model 2 assault rifle / carbine

Production of the Cristobal Model 2 assault rifle / carbine began in mid-1950s, and it was produced in significant numbers. In 1962, a modified version, known as Cristobal M1962, was designed and entered production. The Cristobal Model 1962 assault rifle / carbine was slightly shorter but heavier than its predecessor. It was also manufactured with fixed wood stock or with side-folding wire stock.

The Cristobal Model 2 assault rifle / carbine is a delayed blowback weapon that fires from open bolt. In this system, bolt consists of two parts, with pivoting lever attached to the forward part (bolt head). When in battery, the bottom hand of the lever is resting against the receiver, and the upper rests against the rear part of the bolt (bolt body). Upon discharge, movement of the bolt head forces the lever to rotate back, thus speeding up the bolt body and slowing down the initial opening of the bolt head. Once the lever is fully pivoted, both parts of the bolt can recoil together freely against the return spring, to complete the firing and reloading cycle. Firing is from open bolt, in full automatic mode or single shots. To select mode of fire, weapon is provided with two triggers - front trigger delivers single shots and the rear trigger delivers full automatic fire. The manual safety lever is located on the left side of the receiver, below the rear sight. Feed is from detachable box magazines with 30-round capacity. Standard stock is made from wood. On Model 2 rifles, the rear sight is adjustable for range from 100 to 500 meters, the Model 1962 has a simplified L-shaped flip-up rear sight.

CZ 805 BREN A1/A2 assault rifle (Czech republic)

Caliber: 5.56x45 mm NATO, 7.62x39 M43 interchangeable; also 6.8x43 Rem SPC proposed in near future

Action: Gas operated, rotating bolt

Overall length: 910 mm (butt extended)

Barrel length: 360 mm standard, other lengths available

Weight: 3.6 kg less magazine and accessories

Rate of fire: ~ 700 rounds per minute

Magazine capacity: 20, 30 or 100 rounds

The CZ 805 assault rifle was first introduced to the public in 2009, as a possible future replacement for aged Sa. Vz. 58 assault rifles still in use by Czech armed forces. According to the recent news, early in 2010 the CZ 805 was selected as a next standard military rifle for Czech armed forces, with production contract issued to the famous Czech arms factory CZ-UB in the city of Uhersky Brod. It is quite possible that CZ 805 rifles also will be offered for export, either in military (select-fire) or in civilian (semi-automatic only) versions.



CZ 805 BREN A2 assault rifle with short barrel and red dot sight; iron sights are folded

The CZ 805 (which is apparently dubbed as "CZ 805 BREN A1" in Czech sources) is a modular weapon of modern appearance. In its layout it is somewhat similar to the Belgian FN SCAR assault rifle (against which CZ 805 competed and won in Czech army trials), but similarity is not exact and there are significant design differences between these two weapon systems.

The CZ 805 assault rifle is of modular, multi-caliber design, with aluminum alloy upper receiver and polymer lower receiver / fire control unit. The magazine housing is a separate detachable unit, which can be replaced in the field in the course of caliber change. CZ 805 also features quick-change barrels, allowing to change calibers and barrel lengths according to the mission profile (in each caliber there are short carbine barrel, standard barrel and long "marksman" or "squad automatic" barrel). The basic action uses fairly common piston-operated gas action with manual gas regulator, and a rotating bolt locking. For each proposed caliber, there is a separate bolt with appropriate dimensions.



CZ 805 BREN A1 assault rifle with standard barrel

Fire control unit includes ambidextrous safety / fire selector switch, which permits single shots, 2-round bursts and full automatic fire. Charging handle can be installed on either side of the gun, depending on user preferences. Feed is from detachable box magazines, which are inserted into detachable magazine housing. In standard configuration, the CZ 805 will use proprietary 5.56x45 caliber 30-round magazines made of translucent polymer. Other magazine housings will allow use of STANAG or HK G36 5.56mm magazines, as well as various 7.62x39 and 6.8x43 magazines.



CZ 805 BREN A2 assault rifle with short barrel, butt folded, iron sights raised.

CZ 805 assault rifle is fitted with integral Picatinny rail on the top of receiver, with additional rails running on the sides and the bottom of the forend. Rifle will be issued with folding iron sights, and will also accept a wide variety of additional sighting equipment (red-dot or telescope day sights, night sights, lasers etc). Rifle is equipped with side-folding buttstock, which is adjustable for length of pull, and can be completely removed if maximum compactness is required. Additional equipment also includes new, specially designed 40mm underbarrel grenade launcher CZ G 805 and also a new knife-bayonet.

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Daewoo K2 assault rifle and K1 assault carbine (South Korea)

	Daewoo K2 rifle	Daewoo K1A1 carbine
Caliber	5.56x45mm NATO	
Overall length (butt open / folded)	980 / 730 mm	838 / 653 mm
Barrel length	465 mm	263 mm
Weight	3.26 kg less magazine	2.87 kg less magazine
Magazine capacity	30 rounds	
Rate of fire	750 rounds per minute	800 rounds per minute
Effective range	500 meters	250 meters

The K1 assault rifle was developed circa 1983 by the South Korean company Daewoo Precision Industries Ltd (a division of the large industrial corporation DAEWOO International Corp.) as a replacement for the license-built M16A1 rifles, used by the South Korean Army during the 1970s. The improved version, Daewoo K2, appeared circa 1987 and replaced the K1 rifle in production and service. At the present time the K2 assault rifle and K1A1 carbine are the general issue shoulder arms with the South Korean Army. Semi-automatic only, export versions of the K2 rifle, known as a Daewoo DR-100 (pre-1994), DR-200 (post-1994, both chambered for .223 Remington cartridge) and DR-300 (post-1994, chambered for Russian 7.62x39mm cartridge), are intended for the civilian and police markets. The earlier K1 semi-automatic versions were exported from Korea as Daewoo MAX-1 and MAX-2 rifles (both in .223 caliber).



Daewoo K2

The K2 rifles were designed as improved variations of the M16 rifle. While retaining most of the M16 design features, Daewoo designers replaced the direct gas system of the AR-15/M16 rifle with the more common and reliable gas piston system, and made several other improvements, resulting in very good combat weapon.

Technical description.

The Daewoo K2 is a gas operated, selective fire, magazine fed weapon. The K1 rifle and K1A1 carbine differs from the K2 rifle by different gas system, shorter barrel with different muzzle compensator / flash hider (K1A1 carbine only), and different type of buttstock.



K-2, butt folded

The K2 gas system features a long stroke gas piston, located above the barrel. The bolt group is more or less similar in design to the M16 design, with rotating bolt that have 7 lugs and locks directly into the barrel extension. The cocking handle is attached to the right side of the bolt carrier and reciprocates when gun is fired. Some sources, however, stated that the K1 rifle had the gas system similar to the one found in AR-15/M16 rifles, with no separate gas piston and gases being directed straight into the bolt carrier. The return spring with its guide rod is located behind and partially inside the gas piston rod, and, unlike the M16, does not take space in the buttstock, allowing for folding or completely retractable butt to be used.



Daewoo K1A1 (shortened version); buttstock in extended position

The receiver is generally similar in design to the M16 rifle, and is made from two halves, upper and lower, machined from the aluminum alloy forgings, and linked by two cross-pins. It must be noted, however, that Daewoo receivers are NOT interchangeable with any AR-15/M16 type receivers.

The trigger unit is fitted with the 4 position safety / fire selector switch, located at the left side of the receiver, above the pistol grip. The switch has positions for Safe, Single shots,

3 rounds bursts and Full auto fire. It must be noted that the 3 rounds burst counter does not reset itself if trigger is released before all 3 rounds are fired.

The feeding is achieved by using M16-type magazines. Both K2 and K1 rifles incorporate a bolt stop device, which holds the bolt open after the last shot from the magazine is fired.



Daewoo DR-200 (semi-auto civilian version in .223 Remington), without magazine; note the "post-1994 ban" thumbhole non-folding buttstock, required by current USA laws

The sighting system consists of the hooded front sight, mounted on the gas block, and the L-shaped dual aperture rear sight, with one small aperture for daylight conditions and another larger aperture for low light conditions. The range adjustments are made by the rotating knob at the right side of the rear sight block. Maximum range setting is 600 meters. K2 also can be fitted with the see-thru scope rail just ahead of the rear sight block.

The K2 rifle is fitted with the side-folding plastic buttstock and plastic furniture. K1A1 carbine has the retractable steel wire buttstock.

Diemaco / Colt Canada C7A1 C7A2 assault rifle, C8 carbine
(Canada)

	Diemaco C7	Diemaco C8
Calibre	5.56 x 45 NATO	
Length	1020 mm	840 / 760 mm
Barrel length	510 mm	370 mm
Weight	3.3 kg empty w/o magazine 3.9 kg loaded with 30 rounds	2.7 kg empty w/o magazine 3.2 kg loaded with 30 rounds
Magazine capacity	30 rounds	
Rate of fire	800 rounds per minute	900 rounds per minute

In 1984, Canada adopted a new 5.56 mm assault rifle. To avoid research and design expenses, the Canadians simply purchased the license from USA for a new assault rifle, chambered for the latest 5.56 x 45 NATO ammunition. This was the Colt model 715, also known as the M16A1E1 rifle. Adopted as the C7, this rifle combined features from both earlier M16A1 rifles, such as full automatic fire mode and a two-position flip-up diopter sight, and from the newest M16A2, such as heavy barrel, rifled with faster 1:7 twist, better suited for 5.56mm NATO ammunition. Latter on, Diemaco (now Colt Canada) developed a short-barreled carbine version, fitted with telescoped buttstock, which was designated the C8. While the C7 rifle went to the Canadian armed forces, the C8 is in use with Canadian police forces.



Diemaco C8A1 carbine

According to the recent trends in small arms development, Diemaco also produced so called "flat top" models of both the C7 and C8. These models have a Picatinny-style rail instead of the M16A1-style integral carrying handle with rear sight, and are usually issued with the Elcan optical sights, or with the detachable carrying handle with M16A1-type diopter sights.

Designated by the manufacturer as the C7FT and C8FT, in Canadian service these models are issued as C7A1 and C8A1, respectively. Other derivatives are the LSW (Light Support Weapon, basically a heavy barreled C7) and SFW (Special Forces Weapon, a heavy barreled C8). Netherlands adopted the C7 (in both standard and flat top versions) in 1994, and Denmark purchased and adopted the C7FT as the Gevaer M/95 in 1995. Currently Canadian army is upgrading existing C7 and C7A1 rifles in Canadian service to new C7A2 configuration, which combines the standard C7-type 50cm barrel with C8-type telescoped buttstock, colored furniture, C7A1-type Picatinny rail upper receiver, and additional short Picatinny rails on the sides of front sight block for mounting sighting aids like laser pointers and tactical lights. C7A2 also is fitted with improved sight, Elcan C79A2. Other changes include ambidextrous magazine release and safety/fire selector switch, and other minor improvements.



Diemaco C7A1 rifle (top) and upgraded C7A2 rifle (bottom), both fitted with Elcan optical sights

Internally, the C7 differs very little from the original M16A1 rifle, with the most visible differences being the heavy M16A2-style barrel and A2-style handguards. Flat top models (C7FT / C7A1) are quite similar in appearance to the M16A3 rifles, and issued with Elcan optical sight along with backup iron sights. The C8/C8FT carbines are quite similar to the US M4/M4A1 carbines.

Enfield EM-2 / Rifle, Automatic, caliber .280, Number 9 Mark 1 (Great Britain)

Caliber: 7x43 mm (.280 British)

Action: Gas operated

Overall length: 889 mm

Barrel length: 623 mm

Weight: 3.41 kg with empty magazine

Rate of fire: 450 - 600 rounds per minute (depends on source)

Magazine capacity: 20 rounds

The history of the British EM-2 (Experimental Model-2) assault rifle is interesting and somewhat pitiful story. The EM-2 was born as a result of the experience with small arms, gained during the Second World War. It was obvious that the modern warfare will require the infantry to be armed with light, selective fire weapon with effective range of fire much longer than of submachine gun, but shorter than of conventional semi-automatic or bolt action rifles. This requirement effectively led to the development of the various "intermediate" cartridges. The first power to adopt this concept was the Germany, which issued in limited numbers the selective-fire weapons with intermediate cartridge (7.92x33mm Kurz) since 1942. The Soviet Union was the second to this case, developing its own intermediate cartridge in 1943 and began issuing weapons for it on limited basis since 1944 and on large scale since 1949. The Great Britain also felt the need to replace both Sten submachine guns and SMLE No.4 bolt-action rifles with more modern equipment.



EM-2 assault rifle, officially adopted in Britain as Rifle, Automatic, No.9 Mk.1 but never put into service

The research and experience clearly showed that it is entirely possible to replace both of these weapons with single new weapon, with effective range of fire of no more than 1000 yards and with selective-fire capability. This weapon, of course, required a new cartridge, which was developed after extensive research and development. This cartridge, an "ideal" from British point of view, was of .280 caliber (7mm) and had a bottlenecked case 43 mm long. The pointed bullet weighed 9.08 g (140 grains) and had muzzle velocity of about 745 m/s (2445 fps).

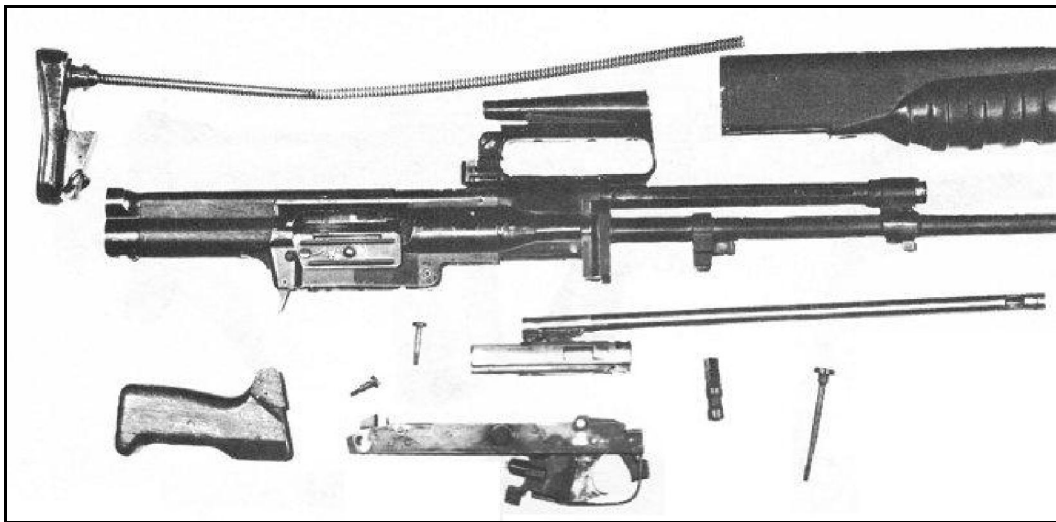
The rough comparison of this round against other most common modern cartridges can be found in the table below. Basically, this cartridge offered significant advantage in effective range and penetration against not only 9x19mm Luger pistol cartridge, but also against 7.92x33mm Kurz German and 7.62x39mm Soviet intermediate cartridges, producing slightly more recoil, which was still significantly less than of .303 British rifle cartridge or latter 7.62x51mm NATO cartridge. This cartridge immediately attracted the attention of the Belgian company Fabrique Nationale, which at the same time worked on the advanced version of their SAFN-49 rifle. Canada also showed significant interest in this cartridge.



EM-1 prototype assault rifle

Having the "ideal" cartridge on hands, both Britain and Belgium began to develop its own assault rifles. The Belgian part of the story will be covered in the FN FAL article elsewhere on this site, and the British part goes right here. The Royal Small Arms Factory (RSAF) at Enfield Lock began to develop its new assault rifle in the late 1940s. The design team was led by the LTC Edward Kent-Lemon and Stefan Janson. New prototype rifles were called the EM-1 and EM-2 (Experimental Model 1 and 2) and were of similar layout and dimensions, being different mostly in shape details and controls. Both rifles were of bullpup layout, that means that the magazine and the barrel chamber are located behind the triggerguard and pistol handle. It must be noted that these rifles were not the first ever built in the bullpup layout - I know about at least one bolt action bullpup rifle dated back to post-WW1 period. The EM-2 attracted more attention, being slightly less futuristic in appearance. It was a very well balanced and laid out rifle, with comfortable controls, accurate and reliable. In 1951 the EM-2 rifle was nominally adopted for British service as "Rifle, Automatic, caliber .280, Number 9 Mark 1". Had it been put into service, the British troops could have a first class assault rifle prior to 1960, but due to the NATO standardization issues Britain followed the USA and adopted the overpowered American 7.62x51mm cartridge instead of more promising .280, and EM-2 simply could not be easily rebuilt for this round. So, Brits had to adopt another design, but this is also another story. There's also some rumors that infamous British SA80 / L85 assault rifle, introduced in 1980s, was based on the EM-2 design. It is not true, since the crappy L85 has nothing in common with EM-2 except for general external "bullpup" layout.

The EM-2 rifle is a gas operated, magazine fed, selective fire rifle. It uses gas system with long piston stroke, located above the barrel. The locking system is generally similar to one found in the WW2-period German Gew.43 or in the Soviet Degtyarov DP-27 machine gun (but turned back to front). Bolt locks into the receiver by two flaps, that are pivoted at their rear to extend out of the bolt and into the locking recesses in the receiver walls. Flaps are controlled by the firing pin sleeve, coaxially located inside the hollow bolt, and the sleeve is in turn connected to the gas piston rod by the projection on the rod. The recoil spring is located at the rear part of the gas piston, above the bolt. When gun is fired, the hot power gases cause the gas piston to go to the rear. This movement first causes the firing pin sleeve to retract within the still stationary bolt, causing the locking flaps to be withdrawn from locking recesses and into the bolt. As soon as the bolt is unlocked, it begin to move back against the pressure of the return spring, ejecting the spent case and feeding the fresh round into the chamber on its return into the battery. EM-2 fires from closed bolt all the time. The firing mechanism is striker-fired, with the main spring and the sear located in the bolt. The sear is located at the bottom of the bolt and is operated by the long trigger lever, connected to the trigger. In general, this was somewhat complicated but very dust-proof, reliable and neat design.



EM-2 disassembled into major components

The cocking handle is located at the right side of the weapon, on the front part of the gas piston rod, and can be removed when gun is disassembled. The safety switch is located at the front of the triggerguard and is similar in operation to one found in M1 Garand or M14 rifles, and the fire selector is of cross-bolt push-button type, and located above the pistol handle. All controls are easily reachable with firing hand. The furniture (pistol handle and forend) is made from wood, the buttplate is attached to the receiver directly and can be easily removed for field-stripping. EM-2 was fitted with optical sights, mounted on the integral carrying handle as standard. Optical sights were non-adjustable, and range adjustment capability was built into the aiming reticle picture. The emergency (backup) iron sights were also fitted - rear folding peep-hole (diopter) sight was attached to the left side of the carrying handle, and the folding front post sight was mounted on the left side of the gas block.

Comparison table: British .280 caliber intermediate cartridge vs. most common modern military cartridges

Ballistic data is estimated using Normal ballistic calculator and Sierra Bullets data on ballistic coefficients.

	5.56x45mm NATO	7x43mm EM-2	7.6x39mm M43	7.62x51mm NATO
bullet weight	4.01 g (62 gr)	9.08 g (140 gr)	7.9 g (122 gr)	9.72 g (150 gr)
bullet velocity, at muzzle	921 m/s	745 m/s	710 m/s	860 m/s
bullet velocity, at 300 yards (273 meters)	585 m/s	570 m/s	470 m/s	674 m/s
bullet velocity, at 550 yards (500 meters)	385 m/s	450 m/s	341 m/s	516 m/s
bullet energy, at muzzle	1700 J	2519 J	1991 J	3594 J
bullet energy, at 300 yards (273 meters)	686 J	1475 J	872 J	2207 J
bullet energy, at 550 yards (500 meters)	297 J	919 J	460 J	1294 J



From left to right: British experimental .280 (7x43mm) cartridge for EM-2; Soviet 7.62x39mm M43; US/NATO 5.56x45mm (.223 Rem); US/NATO 7.62x51mm (.308 Win)

Enfield SA-80: L85A1 and L85A2 assault rifle, L22 carbine (Great Britain)

Caliber: 5.56x45 NATO

Action: Gas operated, rotating bolt

Overall length: 780 mm (709 mm in Carbine variant)

Barrel length: 518 mm (442 mm in Carbine variant)

Weight: 4.13 kg (with SUSAT optical sight and no magazine); 5 kg with SUSAT and loaded with magazine with 30 rounds of ammunition

Magazine capacity: 30 rounds

Rate of fire: 650 rounds per minute

Effective range: about 500 meters (with SUSAT sights)

The development of the SA80 (Small Arms for 1980s) system, which included two weapons - SA80 IW (Infantry Weapon) assault rifle and SA80 LSW (Light Support Weapon) light machine gun, began in the late 1960s when British army decided to develop a new rifle, which will eventually replace the venerable 7.62mm L1 SLR (British-made FN FAL rifle) in the 1980s.



Enfield SA80-IW (Individual Weapon), chambered for experimental 4,85x49 ammunition

When NATO trials were announced in 1977 to select a new cartridge, British state-owned Enfield Small Arms Factory developed its own small-caliber, high velocity round, which was more or less representing the US .223/5.56mm case necked down to accept 4.85mm (0.19 inch) bullet. When cartridge came out, Royal Small Arms Factory at Enfield developed a new weapon around it, initially designated as SA80-IW or XL65. This weapon, being somewhat similar in outline to the much earlier British Enfield EM-2 assault rifle, was internally quite different, and, basically, was more or less the US-made Armalite AR-18 rifle, put into bullpup stock and rechambered for 4.85mm cartridge. After NATO trials, which resulted in adoption of the Belgian SS-109 version of the 5.56mm cartridge, Enfield engineers rechambered XL65 for this cartridge and continued its development under the designation of XL70. Due to Falkland war new system was actually adopted only in 1984.

Original SA80 weapons (both L85 and L86) were plagued with many problems, some being very serious. In general, L85 was quite unreliable and troublesome to handle and maintain, so, finally, in the year 1997, after years of constant complaints from the troops, it had been decided to upgrade most L85 rifles then in service.



L85A1 rifle, with carrying handle and front sight installed instead of more common SUSAT telescope sight

The upgrade program, committed in years 2000 - 2002, was completed by the famous Heckler&Koch, which was then owned by British Royal Ordnance company (German investors bought the HK back in the 2002). About 200 000 rifles were upgraded into the L85A2 configuration, out of total 320 000 or so original L85A1 rifles produced. While official reports about the upgraded weapons were glowing, the initial field reports from the British troops, engaged in the Afghanistan campaign of 2002, were unsatisfactory. Most problems, however, were traced to improper care and maintenance of weapons, and for now the L82A2 performs fairly well both in Afghanistan and Iraq.



Upgraded L85A2 with SUSAT sight

Other than the basic L85A1 variant, the SA80 IW also appeared in the shortened Carbine version, and in the manually operated L98A1 rifle, which got its gas system removed and a larger cocking handle attached.

The L98A1 is used to train the army cadets for basic rifle handling and shooting skills, and the rifle is fired as a manually operated, straight pull magazine repeater rifle. The latest weapon in the SA80 family is the recently adopted L22 carbine, which is issued to tank crews of Royal Armoured Corps. This weapon is available in two versions, L82A1 and L82A2, the latter being fitted with additional Picatinny rail on the right side of front grip base.

The current L85A2 rifles are recognized as reliable and very accurate, especially when using standard issue SUSAT telescope sights. The drawbacks of the L85A2 are somewhat poor balance (which can be improved with installation of HK-made 40mm underbarrel grenade launcher), right-side only extraction and rearward placement of the fire mode selector.



British soldier sights the L85A2 rifle fitted with German-made 40mm grenade launcher

Technical description.

The L85 is a gas operated, magazine fed, selective fire rifle of bullpup layout. The receiver of the L85 is made from stamped sheet steel, reinforced with welded and riveted machined steel inserts. The gas operated action has a short stroke gas piston, located above the barrel. The gas piston has its own return spring. Gas system has a three-positions gas regulator, one position for a normal firing, second for a firing in adverse conditions and the third for launching the rifle grenades (gas port is shut off). The machined bolt carrier rides inside the receiver on the two parallel steel guide rods, with the single return spring placed above and between the guide rods. The typical rotating bolt has 7 lugs that locks into the steel insert in the receiver, just behind the barrel breech.

The charging handle is attached to the right side of the bolt carrier, and prior to A2 upgrade caused some problems by reflecting the ejected cases back into the action, thus causing stoppages. In the L85A2 configuration the charging handle was redesigned to avoid such problems. The charging handle slot is covered by the spring-loaded dust cover. The bolt and its extractor claw also were upgraded in the L85A2, to achieve more reliable extraction of the spent cases. The trigger / hammer assembly of the L85A1 is also typical for a modern bullpup rifle, with the long link from the trigger to the hammer unit, located in the buttstock. The hammer assembly of the L85A2 was redesigned to introduce a slight delay before the hammer release when the gun is fired in the full auto. This did not affected the cyclic rate of fire but improved the reliability and stability of the weapon during the automatic fire. The fire mode selector is located at the left side of the receiver, well behind the magazine housing, and allows for single shots of full automatic modes of fire. The cross-bolt safety button is located above the trigger.



L22A1 carbine

The barrel is rifled for a NATO-standard 5.56mm ammunition, with 1:7 twist, and is fitted with a NATO-standard flash hider, which allows to launch the rifle grenades from the barrel. The L85 is fed using NATO-standard (STANAG) magazines, similar to M16 type magazines, with the standard capacity of 30 rounds. Early L85A1 steel magazines caused a lot of troubles, as well as a magazine housing itself, which had a thin walls that could be easily dented, thus blocking the magazine way. Both magazines and its housings were upgraded in the L85A2 configuration. The standard sighting equipment is the 4X SUSAT (Sight Unit, Small Arms, Trilux) telescope, with illuminated reticle. The SUSAT is mounted on a quick-detachable mount at the top of the receiver, and features an emergency backup open sights at its top.

The SUSAT allows for an accurate fire (mostly in single shots) out to 400-500 meters. For a second-line troops an alternative sighting system is available, that consists of the removable front post sight with high base and post protection "ears", and a detachable carrying handle with built-in diopter rear sight.



L22A2 carbine, as issued to Royal Armoured Corps tank crews in Iraq; note that it has a Picatinny rail above the front grip

The L85 can be fitted with the proprietary knife-type multipurpose bayonet. L85A2 rifles also can be fitted with 40mm under-barrel grenade launcher, using special handguard. Launcher is made in Germany by Heckler-Koch.

FARA 83 assault rifle (Argentina)

Caliber: 5,56x45mm

Action: Gas operated, rotating bolt

Overall length: 1000 mm (745 mm with butt folded)

Barrel length: 452 mm

Weight: 3,95 kg empty

Rate of fire: 750 rounds per minute

Magazine capacity: 30 rounds

FARA 83 assault rifle was developed at Argentinean small arms factory *Fabrica Militar de Armas Portatiles Domingo Matheu* by 1983. About 1200 rifles were produced by 1986, but further manufacture was ceased because of budgetary limitations.



FARA 83 assault rifle is gas operated weapon that uses rotary bolt locking system. Receiver is largely made from steel stampings, with trigger unit hinged to it behind the magazine housing. The gas system was fitted with cut-off valve which permitted launching of rifle grenades using special blanc ammunition. Buttstock was made from polymer and could be folded to the side to save the space.

Fedorov "Avtomat" assault rifle (Russia)

Caliber: 6,5x50SR Arisaka
Action: short recoil operated
Overall length: 1045 mm
Barrel length: 520 mm
Weight: 4,4 kg empty
Rate of fire: 600 rounds per minute
Magazine capacity: 25 rounds

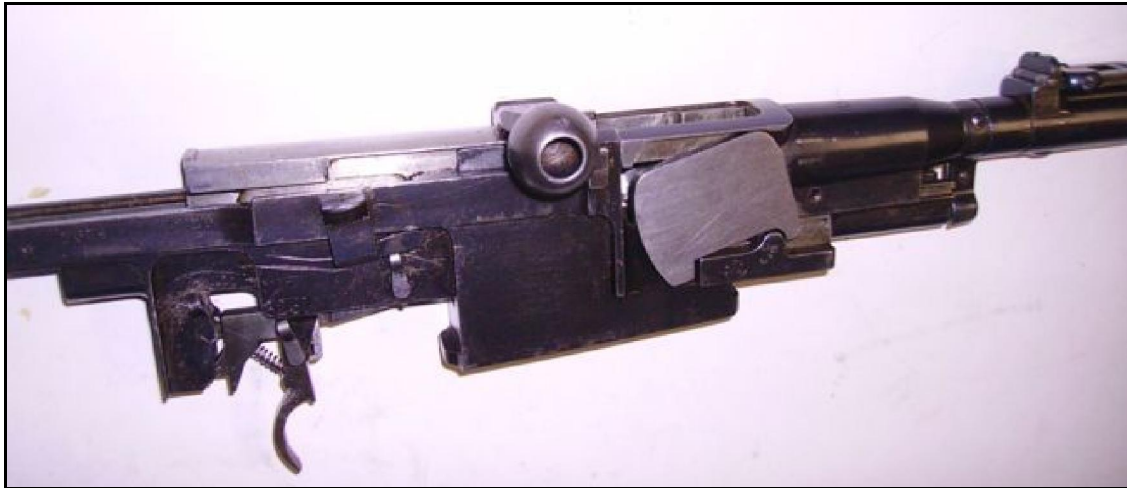
Captain V. Fedorov of the Russian Imperial Army (later - a general of Soviet Army) started development of the self-loading rifle in 1906. His first rifle was chambered for standard Russian 7,62x54R ammunition, held 5 rounds in fixed magazine and fired only semi-automatically. In this job Fedorov was supported by his apprentice V. Degtyarov (who latter became one of most important Soviet small arms designers of pre-WW2 generation). First Fedorov rifle entered trials in 1911. In 1912 the Rifle Commission of Russian Army decided to order 150 more Fedorov rifles for further trials, and in 1913 Fedorov submitted a prototype automatic rifle, chambered for his own experimental rimless cartridge of 6,5mm caliber.

This new ammunition was more compact than Russian 7,62x54R, better suited for automatic weapons (because of rimless cartridge) and has less recoil. This experimental cartridge fired pointed jacketed bullet weighting 8,5 gram at initial velocity of 860 m/s (muzzle energy 3140 Joules as opposed to 3600 - 4000 Joules muzzle energy of 7,62x54R ammunition). 6,5mm Fedorov rifles were tested late in 1913 with good results; these rifles still had fixed magazines loaded from stripper clips. Further trials and development were stopped by the start of World War One. In 1915, however, the need for lightweight automatic arms forced Russian Army to order manufacture of Fedorov automatic rifles with detachable magazines of bigger capacity. Since production of the new cartridge was out of question, it was decided to convert 6,5mm Fedorov rifles to Japanese 6,5x50SR Arisaka ammunition which was in abundance, being purchased through Great Britain along with Arisaka rifles.



Fedorov "Avtomat" - the first practical assault rifle ever adopted

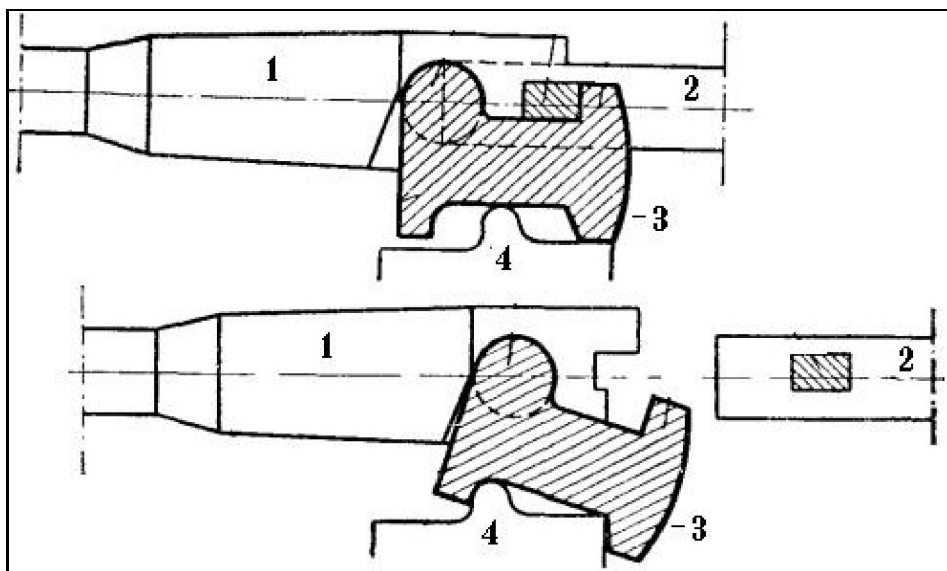
The change of ammunition involved only minimal changes to the rifle, including chamber insert and new range scale for rear sights. In 1916 Weapons Committee of Russian Army decided that it is necessary to order at least 25 000 of Fedorov automatic rifles. In early 1918 orders for Fedorov rifle were limited to 9 000 guns, but as result of turmoil of the revolution and following Civil war only 3 200 Fedorov rifles were manufactured in the city of Kovrov between 1920 and 1924, when production was finally stopped.



Fedorov "Avtomat" action, removed from the wooden stock. Note that barrel is in full recoil position and locking plates are lowered and bolt is unlocked (right locking plate is visible in front of the round cocking handle knob).

It is interesting that at the time of initial orders Russian Army considered Fedorov automatic rifles as substitute light machine guns; although in actual use Fedorov rifles were used as individual armament for infantry soldiers, exactly in the tactical niche of modern assault rifles. Fedorov automatic rifles served with Russian and later with Red (soviet) Army through WW1, Civil war and until late twenties, when it was decided to retire all rifles and machine guns that used non-standard (other than 7,62x54R) ammunition, and Fedorov rifles were put into reserve storage. The last conflict that saw action of Fedorov rifles was Winter war with Finland in 1940, when some Fedorov rifles were withdrawn from storage and issued to elite units of Red Army. One important note must be made about the name of Fedorov rifle, which is universally known as "Avtomat" (automatic). This name was apparently devised by Russian small arms expert Blagonravov during mid- or late twenties. At the time, this term was used to designate any shoulder-fired automatic weapon, be that rifle or submachine gun. Up until now "avtomat" is an official Russian term for automatic weapon. Today this term is most often used for weapons, generally known as "assault rifles", and therefore Fedorov's "Avtomat" can be considered as one of the world's first practical assault rifles. At the time of its peak usage (1918-1924) there was only one practical automatic rifle made in the world which fell into same tactical class - the Browning's BAR M1918. Initially BAR was intended to be used as assault rifle, with individual soldiers firing it from the shoulder or hip during assaults on enemy trenches; however, Browning's rifle was almost

twice as powerful (comparing muzzle energy of US .30-06 ammunition used in BAR and 6,5x50SR used in Avtomat) and exactly twice as heavy compared to Fedorov's rifle. Therefore BAR soon evolved into light machine gun, while Avtomat set the pattern for the whole new class of infantry weapons, which rose to its heights during late stages of WW2 and especially afterwards. Finally, we shall note that Fedorov's Avtomat was not without flaws. Its recoil-operated action was sensitive to fouling; early production guns suffered from non-interchangeability of parts, including magazines; disassembly and especially re-assembly was somewhat complicated. Despite these flaws, it was a formidable and historically important weapon, and, ironically, its ballistic properties are very close to modern idea of "ideal" assault rifle and its ammunition.



*Diagram showing the locking action of Fedorov avtomat. Top - bolt is locked to the barrel, bottom - barrel is in full recoil, bolt unlocked and partially opened
Parts are numbered as follows: 1 - barrel; 2 - bolt; 3 - locking lug (one of two); 4 - fixed lug in receiver.*

Fedorov's "Avtomat" is short recoil operated, locked breech weapon which fires from closed bolt. The bolt locking is achieved by two locking plates, located at either side of the breech. Those plates are allowed to tilt slightly down and up, locking and unlocking the bolt with special lugs. The barrel is fluted to save the weight and improve cooling. Trigger unit uses a pivoting hammer to fire, and separate manual safety and fire selector levers are installed within the trigger guard. The stock is made from wood, with semi-pistol grip and additional vertical foregrip in the front of the magazine. The curved box magazine held 25 rounds in two rows, and was detachable. A special bayonet was attached to the front of the steel heat-shield below the barrel. Standard open sights with tangent rear were installed on the barrel.

FN CAL assault rifle (Belgium)

Caliber: 5.56x45 mm
Action: Gas operated, rotating bolt
Overall length: 926 mm
Barrel length: 467 mm
Weight: 3.0 kg empty
Rate of fire: 850 rounds per minute
Magazine capacity: 20 or 30 rounds

The FN CAL ("Carabine Automatique Légère", or Light Automatic Carbine) was first demonstrated in 1967. It was an early attempt of the famous Belgian company Fabrique Nationale (FN) to produce an assault rifle chambered for then-new American 5.56mm small-bore, high-velocity cartridge. The FN CAL rifle was designed with mass production in mind, with extensive use of steel stampings and plastics. However, the production life of this rifle was relatively short, and only about 12 000 of FN CAL rifles were manufactured before FN closed the CAL production line in 1977 and switched to more promising design, known as FN FNC. Most of these rifles were sold in Latin America and Africa. The main problems, associated with FN CAL rifles, were complexity of manufacture of certain parts, insufficient reliability and somewhat complex maintenance procedures.



FN CAL assault rifle with fixed butt

The FN CAL assault rifle is gas operated, select-fire weapon. It uses short-stroke gas piston, located above the barrel. The locking is achieved by rotating bolt with multiple radial lugs that engage the barrel extension. Receiver is made from steel stampings and assembled from two parts (upper and lower), hinged at the front. Trigger unit is equipped with 4-position safety / fire selector, and allows for single shots, 3-round bursts and full automatic fire. The charging handle is located on the right side of the receiver, and moves along with the bolt group when gun is fired. Rifle can be fitted with fixed plastic butt or side-folding metallic butt. Standard sights consist of front post and L-shaped rear sight with two apertures (for 250 and 400 meters range). The muzzle compensator / flash hider is shaped to accept rifle grenades; the US-made M203 grenade launcher can be fitted under the rifle, if required. Feed was from proprietary box magazines with 20- or 30-round capacity.



FN CAL assault rifle with folding butt and optional telescope sight

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FN F2000 assault rifle (Belgium)

Caliber: 5.56x45 mm NATO

Action: Gas operated, rotating bolt

Overall length: 694 mm

Barrel length: 400 mm

Weight: 3.6 kg empty, in standart configuration; 4.6 kg with 40mm grenade launcher

Magazine capacity: 30 rounds (any NATO / STANAG type magazines)

During the late 1980s and early 1990s famous Belgian company FN Herstal began the search for its next entry into the assault rifle world. The aim this time was to produce a modern, modular weapon, and this ultimately resulted in the FN F2000 rifle, which was first displayed in public in 2001. The F2000 offers all of the most popular features of the modern assault rifle, such as a compact bullpup layout, completely ambidextrous handling, and a modular design with plenty of options and add-ons already available, which allow the rifle to be “tailored” for any particular mission or tactical situation. For example, for peacekeeping operations F2000 could be fitted with less-lethal M303 underbarrel module, which fires tear gas or marker projectiles using pre-compressed air. On the other hand, the F2000 could be fitted with various 40 mm FN EGLM grenade launchers and a proprietary computerized fire control system, instead of the standard low-magnification optical sights. So far FN F2000 rifle found only few buyers, including Armed forces of Slovenia and Belgian Special operations forces. Nevertheless, it is one of most promising assault rifles on the market.



FN F2000 rifle being fired by Belgian soldier. Note spent case emerging from the port at the front of the rifle

Quite recently FN also introduced a civilian version of F2000, known as FS2000. It has a somewhat longer barrel and is limited to semi-automatic fire. Otherwise it is the same excellent weapon, with great ergonomics and 100% ambidexterity.



FN F2000 assault rifle, in "Tactical" configuration, with Picatinny rail and back-up open sights

The F2000 rifle is a gas operated, rotating bolt, selective-fire weapon, featuring a polymer stock with a bull-pup layout. It utilizes a short-stroke gas piston and a 7-lug rotating bolt which locks into the barrel extension. The unique feature of the F2000 rifle is its patented front ejection system: the spent cases, extracted from the chamber, travel from the rear part of the gun to the ejection port near the muzzle via a special ejection tube and fall out of the gun at the safe distance from the shooters' face. This is achieved using a special swinging guide, which enters the way of the closing bolt, and directs the spent case, which is held on the bolt face, to the ejection tube, while, at the same time, lower lugs of the bolt are stripping a fresh cartridge from the magazine.



FN F2000 assault rifle, with telescope sight and 40mm FN EGLM grenade launcher

The cocking handle is mounted well forward on the left hand side, just above the fore grip, and it can easily be operated with the right hand when the gun is held left-handed. The selector switch is mounted at the bottom of the trigger guard. All of these features combine to make the F2000 the first genuinely ambidextrous bullpup,

able to be used with equal ease by right and left handed shooters without requiring any adjustments. In its standard configuration, the F2000 is perfectly balanced around the pistol grip.



FN F2000 assault rifle, in standard configuration, with telescope sight

The stock has built-in standard rails on the top of the weapon (for different sights and scopes etc) and a mounting point ahead of trigger guard, where additional modules may be installed (such as grenade launchers, non-lethal modules etc). In the basic configuration, the upper rail mount is fitted with a 1.6X magnification optical sight, and the lower mounting point is covered by a removable handguard. At the current time, the F2000 rifle may be upgraded, depending on the mission, with FN's 40 mm low-velocity grenade launcher (on the lower mount, instead of the handguard), or with M303 non-lethal module; other options are handguards with built-in laser pointers or flashlights. The standard low-magnification combat scope, which has a back-up open sights on its top cover, may be replaced by any other scope on Piatiny-style mount, or with FN's proprietary computerized fire control module with laser rangefinder, for both the rifle and 40 mm grenade launcher.



FN FS2000, a semiautomatic-only version for civilian shooters



FN F2000 assault rifle, in standard configuration, disassembled into major components

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FN SCAR: Mark 16 and Mark 17- Special Forces Combat Assault Rifle
(USA / Belgium)



FN SCAR-L / Mk.16 rifle partially disassembled; note additional quick-detachable barrel

Mk.16 SCAR-L (Light)

Caliber 5.56x45 NATO

Overall length, standard configuration 850 mm (max) / 620 mm (min)

Barrel length 254mm/10" (CQC), 355mm/14" (Std), 457mm/18" (LB)

Weight 3.5 kg empty

Rate of fire 600 rounds per minute

Magazine capacity 30 rounds standard

Mk.17 SCAR-H (Heavy)

Caliber 7.62x51 NATO basic - 7.62x39 M43 and others additionally

Overall length, standard configuration 997 mm (max) / 770 mm (min)

Barrel length 330mm/13" (CQC), 406mm/16" (Std), 508mm/20" (LB)

Weight 3.86 kg empty

Rate of fire 600 rounds per minute

Magazine capacity 20 rounds (7.62x51 NATO), 30 rounds (7.62x39 M43)

The US Special Operations Command (US SOCOM) issued a solicitation for the procurement of SOF Combat Assault Rifles (SCAR) on October 15th, 2003. This solicitation requested a new combat rifle, specially tailored for the current and proposed future needs of the US Special Forces, which are somewhat different from latest generic US Army requirements, which are being fulfilled by the newest Heckler-Koch XM8 assault rifle. The key difference in basic requirements between XM8 and SCAR is that, while XM8 is a single-caliber weapon system, tailored for 5.56x45mm NATO ammunition, the SCAR should be available in various different calibers. Initial SOF requirements included two basic versions of SCAR system - the SCAR Light (SCAR-L), available in 5.56mm NATO, and the SCAR heavy (SCAR-H), which should be initially available in significantly more powerful 7.62x51 NATO chambering, and should be easily adaptable in the field to other chamberings. These other chamberings initially include the well-spread 7.62x39 M43 ammunition of the Soviet / Russian origins, and probably some others (like the proposed 6.8x43 Remington SPC cartridge, especially developed for US Special Forces). The key idea of SCAR rifle system is that it will provide the Special Forces operators with wide variety of options, from short-barreled 5.56mm SCAR-L CQC variation, tailored for urban close combat, and up to long range 7.62x51 SCAR-H Sniper variant, as well as 7.62x39 SCAR-H, which will accept "battlefield pickup" AK-47/AKM magazines with 7.62 M43 ammunition, available during the operations behind the enemy lines. Both SCAR-L and SCAR-H shall be initially available in three versions, Standard (S), Close Quarters Combat (CQC) and Sniper Variant (SV; now it is dubbed Long Barrel - LB). All these variants, regardless the caliber and exact configuration, will provide the operator with the same controls layout, same handling and maintenance procedures, and same optional equipment, such as sights, scopes, and other current and future attachments.



FN SCAR-L / Mk.16 rifle prototype (1s generation, late 2004), left side view

Late in 2004 US SOCOM announced, that the winner for the initial SCAR contracts is the FN USA, an US-based subsidiary of the famous Belgian company Fabrique Nationale Herstal. prototype rifles were manufactured by FN Manufacturing Inc, US-based subsidiary to FN Herstal; This company will also handle series production of rifles. Starting mid-2005, first SCAR rifles went to end users in US Special Operation Forces.

Since US SOCOM uses Navy-type "mark" designations, SCAR rifles were officially designated as 5.56mm Rifle Mark 16 (SCAR-L / Light) and 7.62mm Rifle Mark 17 (SCAR-H / Heavy). It is believed that Mk.16 and Mk.17 rifles will gradually replace most rifle systems now in service with US SOCOM forces, such as M4 carbines, M16 rifles, M14 rifles and Mk. 25 sniper rifles.



FN SCAR-L / Mk.16 rifle, 2nd generation prototype, with FN EGLM 40mm grenade launcher attached

As it turned out, FN SCAR rifles are not based on any previous weapons but designed from the scratch. In all variants FN SCAR rifles feature gas operated, short stroke piston action with rotating bolt locking. Bolt system appears to be somewhat similar to that of FN Minimi / M249 SAW machine gun. This system apparently is less sensitive to fine sand, dust and any other fouling inside the receiver, than any system with M16-type multi-lug bolt and plunger-type ejector.



FN SCAR-H / Mk.17 rifle prototype in CQC (Close Quarter Combat, short barrel) configuration, 7.62x51 mm NATO version

Receiver is made from two parts, upper and lower, connected with two cross-pins. Upper part is made from extruded aluminium, lower part is made from polymer. SCAR-L and SCAR-H use similar upper receivers that differ only in the size of ejection port. Other different parts include caliber-specific bolt, barrel, and lower receiver with integral magazine housing. Parts commonality between SCAR-L and SCAR-H is astonishing

90%. Barrels are quick-detachable, and held in the upper receiver with two cross-bolts. Barrel change procedure requires minimum amount of tools, takes just several minutes and there is no need to adjust the headspace after the change.



5.56mm NATO FN SCAR-L / Mk.16 rifles of current (2007/2008) production, top to bottom in Long Barrel (LB), bstandard (Std) and Close Quarter Combat (CQC) configurations

The trigger unit with ambidextrous safety-fire mode selector switch allows for single shots and full automatic fire, with no provisions for limited-length bursts mode. The charging handle could be easily installed on either side of the weapon, so the upper receiver has respective cuts on both sides.

Top of the upper receiver is covered by the full-length integral Picatinny rail (MIL-STD 1913); additional Picatinny rails are mounted on both sides and under the free-floating handguards.

Side-folding polymer buttstock is adjustable for length of pull, and is shaped to provide positive cheek rest with adjustable cheek support. SCAR rifles are fitted with removable, adjustable iron sights, with folding diopter-type rear sight on the receiver rail, and folding front sight on the gas block. Any additional type of sighting equipment, necessary for

current tasks, including telescope and night sights, can be installed using MIL-STD 1913 compatible mounts.

Mk.16 SCAR-L rifle will use improved M16-type magazines, made of steel; Mk.17 SCAR-H will use proprietary 20-round magazines in 7.62x51 NATO chambering, or standard AK-type magazines in proposed 7.62x39 M43 chambering. Current prototypes of SCAR rifles do not have bayonet mounts, and, probably, will never have one.



7.62mm NATO FN SCAR-H / Mk.17 rifles of current (2007/2008) production, top to bottom in Long Barrel (LB), bstandard (Std) and Close Quarter Combat (CQC) configurations

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