The history of Russian Avtomat:
evolution of the Kalashnikov AK, from its early origins to the present

Russia, 2023

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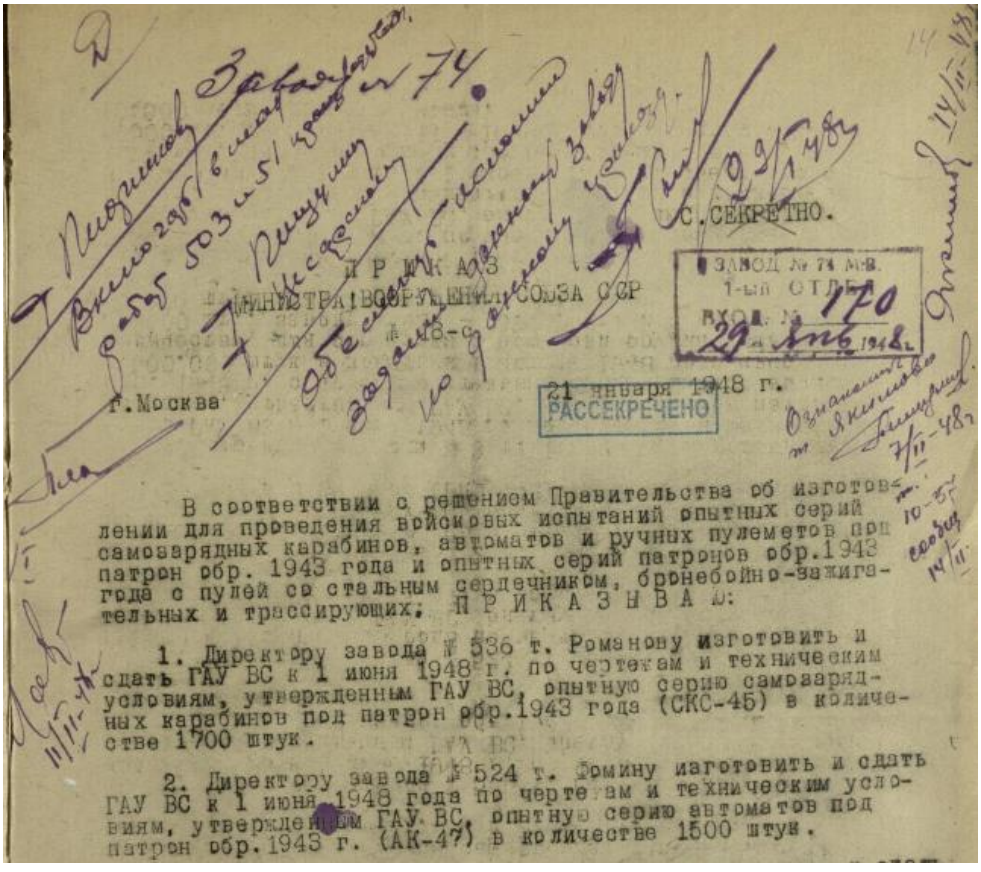
Author's preface to the free E-Book

This free e-book is an abridged and unedited version of the original title "The history of the Russian Abtomat", which was intended to be printed in USA and distributed on a commercial basis. However, the recent political and economical events made this publication impossible, because, as you may or may not know, I live in Russia and have no plans to move elsewhere.

Countless Internet discussions time after time have shown me a significant lack of information and understanding of an average Western gun enthusiast about the events that surround the birth and evolution of the world's most prolific assault rifle, the Avtomat Kalashnikova, of the AK in short. So, it was decided to make certain portions of my not yet published book available for anyone for free, in an attempt to spread the knowledge and to dispel the disinformation and various myths.

This free publication was made possible with the indispensable help of the Sureshot Armament Group www.sureshot-armament.com , www.sureshot-usa.com , the company that makes the finest custom tuning parts for various Kalashnikov rifles and other firearms, both civilian and military

This text is based on more than two decades of research and study, using many original Russian and Soviet declassified documents and publications not generally available in the West.



С.СЕКРЕТНО.

ЗАВОД № 74 МВ.
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РАССЕКРЕЧЕНО

В соответствии с решением Правительства об изготовлении для проведения войсковых испытаний опытных серий самозарядных карабинов, автоматов и ручных пулеметов под патрон обр. 1943 года и опытных серий патронов обр.1943 года с пулей со стальным сердечником, бронебойно-зажигательных и трассирующих; П Р И К А З Ы В А Ю:

1. Директору завода № 536 т. Романову изготовить и сдать ГАУ ВС к 1 июня 1948 г. по чертежам и техническим условиям, утвержденным ГАУ ВС, опытную серию самозарядных карабинов под патрон обр.1943 года (СКС-45) в количестве 1700 штук.

2. Директору завода № 524 т. Ромину изготовить и сдать ГАУ ВС к 1 июня 1948 года по чертежам и техническим условиям, утвержденным ГАУ ВС, опытную серию автоматов под патрон обр.1943 г. (АК-47) в количестве 1500 штук.

A page from a declassified order from the Minister of Armaments to produce trials batches of the SKS-45 carbines and AK-47 assault rifles, dated January 21st, 1948

What is in this book and what is not

As the name implies, this e-book is specifically dedicated to the history of the Kalashnikov assault rifle in Russia, tracing its roots from the early experiments before and during the WW1 and up to the most recent versions produced in the 2020s.

What is not there is a broad spectrum of other (non-AK) assault rifles and their histories that either competed with various versions of the AK or complemented them for certain special niches, such as suppressed weapons for the Spetsnaz and underwater assault rifles for combat divers. It also does not include several extensive appendixes. All this stuff, which amounts to at least a half of the orginial manuscript, plus many additional high-quality photos are reserved for a printed book, which I hope will see a day, sooner or later.

This book also lacks professional English editing, which significantly improved my original manuscript that was planned to go to print. However, all this editing is copyrighted by the people who did it, so it was agreed to shelve it in hopes of a printed publication at some future date. As such, please forgive my less-than-ideal English language.

I hope you'll enjoy reading this text, and find it educational.

Yours truly, Maxim Popenker

About the author

Maxim Popenker is a firearms enthusiast, historian and writer from Russia. His major interest is the modern military small arms of the 20th and 21st centuries. Maxim's primary background is in IT, and he served as an officer in the Russian Air Defence Forces. Back in 1999 he started one of the world's oldest firearms related web sites, known as "Modern Firearms", which is currently available at the address www.ModernFirearms.net

During the last 20+ years, he published hundreds of magazine articles in Russian and English languages and authored a dozen books about modern military small arms, including the four books published in UK in English language.

Maxim lives in St.Petersburg, Russia, with his beloved family and a cat, and can be reached via the email shooter@guns.ru

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Chapter 1. Origins of the Avtomat.

The First World War brought up several new classes of weapons, from submachine guns to tanks and attack airplanes. Among the newest military developments that saw extensive use also were so-called “machine rifles”, or automatic rifles. Their key difference with light machine guns was that while the latter were primarily designed to fire from the ground, using a small bipod or tripod, machine rifles were primarily intended to be fired off-hand, such as during assaults on enemy positions, to support troops armed with clumsy and slow-firing bolt action rifles. This concept was pioneered by the French, who in 1915 introduced the CSRG M1915 machine rifle, also known as Chauchat, after one of its designers. American Browning automatic rifle M1918 also followed the same pattern. Semi-automatic infantry rifles saw limited use during the Great War, mostly in the hands of French infantry (RSC M1917 and M1918). However, probably the closest equivalent of the modern assault rifle, which also saw limited use by French infantry toward the end of the war, was the American Winchester M1907 rifle, fitted with extended detachable magazines. This rifle fired medium-range and medium-power .351WSL (9x35SR) cartridge.

The Russian military also tried to go along with progress. The artillery committee of the Russian Imperial Army (ArtCom in short) had invested in research and testing of semi-automatic rifles well before the start of the Great War. Many foreign and domestic designs were tested, and among the most promising ones was the semi-automatic rifle, designed in 1911 by Captain Fedorov, one of the key members of the Artillery Committee. After initial tests, in 1912 Setroretsk factory began tooling up for the manufacture of the 7.62mm Fedorov semi-automatic rifle, with the intent to produce 150 rifles for troops trials. It must be noted that captain Fedorov was a firm believer in reducing rifle calibers to 6.5mm from the then-current 7.62mm and did a lot of research to prove his point, including studies in wound ballistics and lethality.

the experimental Fedorov semi-automatic rifle, model 1912, chambered for the 7.62x54R ammunition

Thus he developed a proprietary 6.5x57mm rimless cartridge, which propelled an 8.5-gram spritzer bullet to the velocity of 850 meters per second, offering a combination of good lethality, flat trajectory, and relatively mild recoil, and experimentally adapted his rifle for this round. The key mechanical difference between the 7.62mm and 6.5mm Fedorov rifles was the design of the magazine. While the 7.62mm rifle featured a single-stack magazine, the 6.5mm rifle had a more compact double-stack magazine. The capacity in both versions was five rounds.

The start of World War one in 1914 put a temporary stop on Fedorovs’ design works, as he was assigned important duties of observing the procurement, use, and repair of small arms on the front. In 1915 Fedorov was sent to France with the task of studying most modern arms and developments there, and, among other things, he familiarized himself with the new CSRG M1915 machine rifle. Fedorov

immediately embraced the concept of the relatively lightweight and highly maneuverable automatic weapon, and upon his return to Russia quickly redesigned his experimental 6.5mm and 7.62mm semi-automatic rifles with fixed magazines into select-fire weapons using detachable, higher capacity magazines. Since there was no chance to put his own 6.5x57 mm ammunition into production during the war, Fedorov instead adapted his experimental 6.5mm weapons for the Japanese 6.5x50SR Arisaka cartridge. This ammunition was available in large numbers due to the expedient purchase of many thousands Arsiaka rifles, obtained from Japan via UK in 1915 and used to arm Russian units on the Northern front. All experimental work on Fedorov machine rifles was carried out at the workshop of the officers' musketry school in Sestroretsk, not far from the arms factory.

Using previously manufactured parts for Fedorov 7.62mm semi-automatic rifles, following weapons were assembled in 1916 for troops trials:

- 7.62mm semi-automatic rifles with 5-round fixed magazines: 45 guns
- 7.62mm machine rifles with 15-round detachable magazines: 8 guns
- 6.5mm semi-automatic rifle with 5-round fixed magazines: 1 gun
- 6.5mm machine rifles with 25-round detachable magazines: 3 guns
- 6.5mm lightened machine rifle with 50-round detachable magazines: 1 gun

In the summer of 1916, a company from the 189th Izmail infantry regiment was armed with a mix of new experimental rifles, designed by Fedorov, in both calibers and variants (semiautomatic and select-fire), and sent out to the front for combat evaluation.

Initial testing brought up generally positive results, and in late 1916 Artillery committee issued an order for 15,000 6.5mm Fedorov machine rifles to be produced at the Sestroretsk plant. However, increased demands for standard-issue Mosin rifles and Maxim machine guns resulted in delays and cuts, and no production rifles were made before the revolutions of 1917 and the fall of the Empire.

Following the two Russian revolutions (first, the Bourgeois revolution that displaced Tsar Nikolas 2nd in February, and the second Socialist revolution in November) Fedorov, then in the rank of General Lieutenant of Artillery, sided with Bolsheviks. In early 1918 he was assigned as a superintendent to the recently built machine gun plant in the city of Kovrov. The plant was originally constructed to produce Madsen light machine guns under a Danish license, but for a variety of reasons, the production of Danish guns was never started. So it was decided to use the factory to produce Fedorov machine rifles for the recently founded Red Army. The initial order, issued in 1918, called for 9,000 guns in 6.5x50SR Arisaka. During preparations for manufacture, the machine rifle was improved in several ways by its author. The first batch of 200 Fedorov 6.5mm machine rifles was produced in the summer of 1919. Production of this weapon continued until 1925, with an estimated total number of guns being about 3,200. It must be noted that in Red Army service these Fedorov machine rifles were used in the same manner as similar French (CSRG M1915) or American (BAR M1918) weapons, that is, as squad support weapons rather than individual rifles. Contemporary field manuals called for special care for firing and maintenance discipline for gunners, because Fedorov machine rifles were found to be complicated, insufficiently reliable, and unsafe to handle under certain circumstances. Also, according to contemporary Red Army tactical doctrine, the Fedorov machine rifle was considered as a crew-served weapon, manned by a three-man team consisting of the gunner, assistant gunner, and ammunition bearer. During the Civil war Fedorov machine rifles were used by Bolshevik forces on Northern and Caucasian fronts, and in early 1921 special classes were formed at officers musketry school “Vystrel” to train automatic riflemen and armorers.

Fedorov Avtomat, model of 1919.

Specifications:
Ammunition: 6.5x50SR
Overall length: 1040 mm
Barrel length: 520 mm
Weight, with empty magazine: 4.4 kg
Magazine capacity: 25 rounds
Rate of fire: 600 rounds per minute

The Fedorov Avtomat is a short recoil-operated, locked-breech weapon that fires from a closed bolt. It has a relatively compact machined steel receiver, with a barrel buffer spring mounted at the front of the receiver, below the barrel. The detachable top cover is machined from steel and houses a permanently attached return spring guide. The barrel is partially fluted to decrease its weight and improve cooling. The bolt locking is achieved by two locking plates, located at either side of the breech and pivotally connected to the barrel extension. Those plates are allowed to tilt slightly down and up upon recoil, locking and unlocking the bolt with special lugs on their inner surfaces. The trigger unit uses a pivoting hammer to fire, and separate manual safety and fire selector levers are installed within the trigger guard. Trigger-blocking safety is located in front of the trigger, and the side-swinging fire mode selector is located behind the trigger. The stock is made from wood, with a semi-pistol grip and an additional vertical foregrip in the front of the magazine. The curved box magazine contains 25 rounds in two rows and is detachable. A special bayonet is attached to the front of the steel heat-shield below the barrel. Iron sights on 1916 and 1919-pattern models were copied from Arisaka model 30 carbine; 1923-pattern rifles have proprietary iron sights, with rear sight graduated to 2100 meters.

Concluding this chapter, we must point out that as an infantry weapon Fedorov Avtomat was, technically speaking, somewhat less successful than its major contemporaries, the CSRG M1915 and BAR M1918 machine rifles. Not as reliable as the Browning and produced in relatively small numbers, it, nevertheless, served as an important step in the evolution of the new Soviet small arms design school. With the benefit of hindsight, it can be considered one of the world's first practical assault rifles. Despite its original tactical niche of the squad automatic, the Fedorov Avtomat was in fact used as an individual weapon, the assault rifle, during the Winter War with Finland in 1939-40. Lack of hand-held automatics, badly needed during rapid clashes between small units of ski riders in the frozen woods of Karelia, resulted in a recall of several hundreds of Fedorov avtomats for active service. Issued to special assault units, Fedorov rifles proved to be formidable weapons when used against Finnish troops armed with bolt action rifles and Suomi submachine guns.

Soviet soldiers armed with the Fedorov Avtomat rifles, Karelia, 1940

Chapter 2. Interwar years.

The Soviet troops on the parade in Moscow in 1938, armed with the AVS-36 rifles

During the first years of the Red Army, the 6.5mm Arisaka ammunition was perceived as a better rifle round, and some effort was made to design new weapons chambered for this cartridge, besides the already mentioned Fedorov Avtomat. However, in April of 1924 Red Army officially selected the old 7.62x54R cartridge as the only standard rifle and machine-gun ammunition, and production orders for 6.5mm Arisaka cartridges, previously issued to the Podolsk ammunition plant, were canceled. Russian experts saw future armament of the Red Army comprised of semi-automatic rifles, new light machine guns, and heavy machine guns (Maxim M1910), all firing the same 7.62mm ammunition. Appropriate new orders were issued to commence the development and trials of new semi-automatic rifles and light machine guns. At about the same time, Fedorov rifle received its new name, the “Avtomat” (which means “Automatic” in Russian), conceived by the commander of the officers’ musketry school, Nikolai Filatov. The simple name stuck and was soon adopted for all types of shoulder-fired automatic weapons.

Despite the decision to abandon the 6.5mm caliber, existing stocks of ammunition and a shortage of light machine guns resulted in the use of the Fedorov Avtomat until 1928. Most of these guns were concentrated in the Moscow regiment of the Proletarian division. In 1928 all avtomats were withdrawn from service, overhauled, and put into storage.

It must be noted that Fedorov Avtomat and its author made a much deeper and more important impact on the Soviet small arms industry than it might appear at first glance.

Working at the Kovrov machine-gun plant, Fedorov trained his apprentices, Vasilij Degtyarov and Georgy Schpagin, who soon became important Soviet small arms designers of the pre-WW2 era. Fedorov also extensively worked on the establishment of new industry standards, manufacturing, and quality control practices for small arms. He wrote and published several important textbooks on small arms, their evolution, history, and design. Fedorov Avtomat served as a starting point for the first-ever unified small

arms system, based on a single design and set of common major parts (receiver with all inner workings, compatible magazines). Other than the Avtomat itself, by 1924 this system included the following experimental weapons, all firing 6.5x50SR Arisaka ammunition:

- Light machine guns with air-cooled, water-cooled, and forced air-cooled (Lewis-style) barrels, using the box or flat pan magazines. Some guns with air-cooled barrels featured quick-change barrels.
- Tank machine guns in single or double mounts, using the box or flat pan magazines
- Aircraft machine guns (flexible), in single, double, and triple mounts, using flat pan magazines
- Medium machine guns (on a wheeled mount with armored shield), with flat pan magazines

Of those Avtomat-based guns, several were produced and issued for field use, including the 6.5mm Fedorov tank machine guns, which were used to arm the first soviet MS-1 (T-18) tanks.

The experimental 6.5mm water-cooled light machine gun based on the Fedorov avtomat

Besides various 6.5mm guns, in 1924 Fedorov and Degtyarov produced several 7.62x54R light machine guns, based on the same Fedorov action. The technical evolution of the Fedorov Avtomat stopped in 1925, when Degtyarov, under the close tutelage of Fedorov, designed his prototype gas-operated light machine gun that fired 7,62x54R ammunition from flat pan magazines. This machine gun served as a starting point for the famous Degtyarov DP light machine gun, which was adopted by the Red Army in 1928 and served with distinction through the Soviet-Japanese conflict at Khalkhin Gol of 1939, the Winter War with Finland of 1939-40, the Great Patriotic War against Germany and its allies of 1941-45, and through many smaller subsequent conflicts across the globe.

As said above, the Soviet military saw a full-power semi-automatic or even a select-fire rifle as the primary infantry arm of the future. Also, starting in the mid-1920s, the Red Army began the development of pistol-caliber automatics. The original tactical niche for the submachine gun was the personal defense weapon for NCOs and junior field officers. The Red Army adopted its first submachine gun, the 7.62x25mm Degtyarov RPD-34, in 1934.

Work on a new military rifle was far more complicated. After several rounds of trials, in 1936 Red Army adopted the AVS-36 rifle, designed by Simonov. It was a gas-operated, select-fire rifle firing standard-issue 7.62x54R ammunition from a detachable 15-round magazine. Early experience with this rifle in the field proved it to be too complex, fragile, and unreliable, and in 1938, after the next round of trials, the Red Army adopted the SVT-38 rifle, designed by Fedor Tokarev. It was a semi-automatic, gas-operated rifle with tilting bolt locking. It used detachable 10-round magazines, which could be topped up in-place using standard stripper clips, with the bolt locked back by an automatic hold-open device. In 1940 the Tokarev rifle was slightly lightened and modified according to new military requirements, and significant orders were placed with Soviet arms factories to produce more than a million new SVT-40 rifles to re-arm front-line infantry units of the Red Army. Rearmament plans of 1940 called for 4,5 million SVT-40 rifles issued to infantry by the end of 1942, complemented by roughly 5 million bolt action rifles and several hundreds of thousands of submachine guns. An interesting offspring of the Tokarev rifle, which saw very limited use, was the AKT-38 automatic (select-fire) carbine and its AKT-40 version. A real handful to fire due to a combination of relatively light weight and powerful cartridge, this weapon nominally was a perfect fit for the present-day formal Russian definition of “Avtomat” as a select-fire carbine.

The 7.62mm Simonov AVS-36 rifle

The 7.62mm Tokarev SVT-40 rifle

Despite the heavy orientation of the Red Army towards the full power semi-automatic rifles, some noted experts continued to preach transition to the intermediate round and appropriate avtomat and light machine gun to fire it. Among those was Fedorov, who by 1940 had the rank of General of artillery and was employed as an official consultant to the GAU for the manufacture of small arms. During all those years Fedorov continued to push for a decrease of the rifle caliber toward 6 – 6.5mm, in search of a flatter trajectory and decreased recoil.

Following experiences of the Winter War with Finland, the Red Army quickly re-evaluated its views on submachine guns, and in 1941 adopted a Shpagin-designed PPSh-41, also known as «*Автомат образца 1941 года*» - Avtomat obraztsa 1941 goda, “Model of 1941 automatic”. It was a classic submachine gun of its time, using simple open bolt blowback action and a 71-round drum magazine, easily mass-produced and fairy effective. It appeared just in time for the next bloody round of history, the Great Patriotic war of the Soviet Union against Germany and its allies, which started early in the morning of June 22nd, 1941.

Chapter 3. Hard lessons of the Great Patriotic war.

German invasion, which started at 4AM on the morning of June 22, 1941, caught the Red Army in the middle of the rearmament program, and the Soviet Union was generally unprepared for war. It is not that Stalin did not expect the war to start; only he had false hopes to delay it through political means until about 1942. Hitler refused to fulfill Stalin's plans, and the second half of 1941 turned out to be a military and industrial disaster of an epic scale for the USSR. Red Army lost a large number of men and significant stocks of all equipment, from rifles to tanks and aircraft, and many factories were either destroyed, occupied, or had to be hurriedly relocated further East, away from advancing German armies. A serious shortage of arms and equipment was felt until late 1942 or early 1943; soviet factories struggled to produce enough arms and ammunition for fighting troops, and relocation of factories caused many additional manufacturing and logistic problems and challenges.

Soviet children assembling the PPD-40 submachine guns in the besieged Leningrad, 1941

The Tokarev SVT-40 rifle had some design problems to start with, such as overly 'lightened' construction or too complicated gas regulator. Lack of skilled labor due to many workers drafted or volunteered to fight invaders, as well as lack of quality materials and poorly established (after hurried evacuation) production facilities, resulted in severe quality issues that plagued SVT rifles through most of their production history. Tokarev rifles suffered frequent parts breakages, numerous stoppages, and poor first-shot accuracy. The use of American gun powders, supplied via the Lend-Lease program, further complicated the situation because the SVT gas system was 'tuned' for ammunition loaded with Russian powders, while American ball powders had different pressure curves. However, some troops, especially more technically savvy Naval Infantry units, formed from Navy personnel that had no ships to fight on, preferred SVT-40 over M1891/30 for its greater firepower and used "Svetka" (widely used affectionate nickname for SVT-40, derived from female name Svetlana) rather effectively through the war. It also

must be noted that Germans extensively used captured SVT-40, due to the distinct lack of their semi-automatic rifles.

Soviet infantrymen with SVT-40 rifles fighting near Voronezh, 1942

Certain quality problems also plagued PPSH-41 submachine guns during the early months of the war, but those guns were much simpler and cheaper, and the harsh realities of the war changed the small arms distribution plans of the Red Army. Production of the SVT-40 rifle reached its peak in 1941 and steadily declined afterward, with a total of about two million rifles produced between 1941 and 1944. Production of submachine guns, on the other hand, increased with each year, reaching a total of six million Shpagin PPSh-41 plus slightly less than one million Sudaev PPS-43 by May of 1945. Production of the Mosin M1891/30 rifle and M1938 and M1944 carbines exceeded ten million during the same time frame.

While the SVT-40 rifle was generally not popular among the troops for its complicated maintenance and insufficient reliability, the PPSH-41 was well-liked for its firepower and maneuverability. However, the lack of light machine guns during the early stages of war resulted in the development of the AVT-40 automatic rifle, which was an SVT-40 with a modified trigger group that allowed for select-fire operations. It was found that AVT-40 was quite useful when repelling German attacks at short ranges (100 meters and less), and from 1942 onward only AVT-40 automatic rifles were produced for front-line troops. Some effort was put into the development of the large-capacity magazines for AVT-40, including 20-round boxes and drums. However, none of these designs were found to be satisfactory for front-line use, and AVT-40 rifles were used through the war with their standard 10-round magazines, often reloaded with stripper clips, through the top of the action.

General experience of the war was that more often than not firepower and the sheer amount of small arms fire trumped the individual accuracy, and older expectations of long-range infantry marksmanship were greatly overstated; machine guns, mortars, and field artillery were much more effective “long-range” infantry killers than any rifle fire. As a result, by 1943 entire assault units of platoon and company

size were armed with PPSH-41 submachine guns instead of rifles, and those units, often riding into the battle on the backs of the famous T-34 tanks, put fear into the hearts of even the most battle-hardened German troops.

The famous Soviet "tank riders" armed with PPSh-41 submachine guns

However, Germans were not to be underestimated, and in the middle of 1943 Red Army ordnance experts received news from the front about the latest German infantry weapon, initially classified by Russians as a light machine gun. Captured German guns belonged to an entirely new class of infantry weapons – automatic carbines firing intermediate power ammunition in 7.9mm caliber. The story of the German assault rifle program, which began in 1935 and took serious momentum in 1940, with the adoption of 7.9x33 Kurz ammunition and contracts issued to Haenel and Walther for new automatic carbines is pretty well known and we will not discuss it here. The key events, relevant to our story, happened when Soviet troops, fighting at the North-West front, captured several examples of the MKb.42(H) assault rifle and its ammunition. Those automatic carbines were sent by Germans to the Russian front for ultimate testing, and they made a sufficient impression on both sides of the battle.

A German soldier with an MKb.42(H), the first German mass-produced assault rifle

The story of the first captured Mkb.42(H) rifles is quite interesting. For many years, it was believed that the first MKb.42 was captured in late 1942 or early 1943, but it contradicts German archive documents regarding the issue of those rifles to the troops. So far, it is believed that the first four "German carbine machine guns firing short ammunition" were acquired by a Russian recon unit on June 22nd, 1943, according to the surviving after-action report from the unit to the Army HQ. This historic event happened during a rapid and violent clash at the "no man's land", where 18 soviet "avtomatchiks" (infantrymen armed with PPSh-41 or PPS-43 submachine guns) from the 117th infantry division, assaulted and dispersed a German recon unit of 26 men strong from the 93rd infantry division of the Wehrmacht. According to the report, the surprise Russian attack ended with 12 german soldiers killed and three more captured. The report also listed as captured trophies four German automatic weapons of the new type.

Chapter 4. Birth of the Soviet intermediate cartridge program.

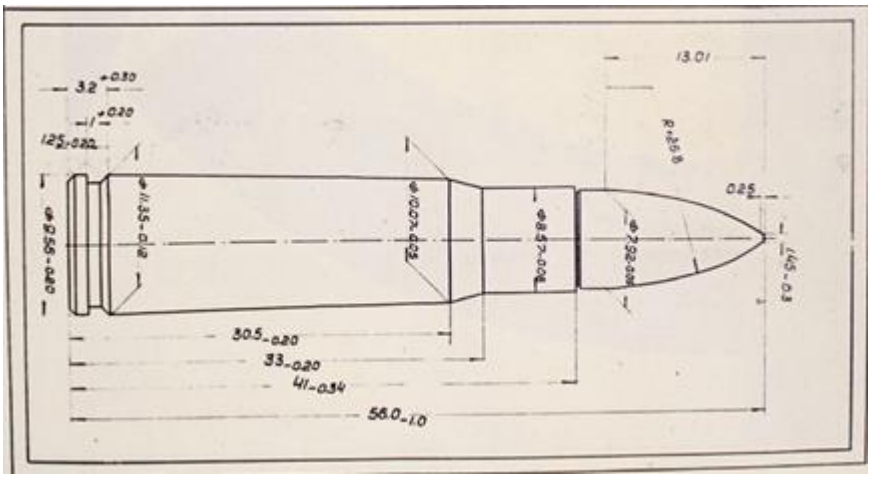
On July 15th, 1943, the technical committee of the Peoples' Commissariat for Armaments (a contemporary name for the Soviet Ministry of Armament production) examined a recently captured German MKb.42(H) rifle and an American M1 carbine (supplied through the Lend-Lease program) along with their respective ammunition. A study of combat experiences already suggested that the maximum effective range of shoulder small arms fire (rifles and submachine guns) rarely exceeded 400 meters; therefore, the adoption of reduced power ammunition somewhat similar to German and American rounds would produce numerous logistic and tactical benefits without sacrificing overall effectiveness of the infantry firepower. The task of creating the new intermediate round was assigned to the OKB-44, the leading Soviet small-arms ammunition development center of the time. Provisional requirements, set by the committee, called for an individual weapon with an effective range of 400 meters, with a barrel of about 52 cm (20 inches) long. Under pressure from General Fedorov requirements listed a caliber of 6.5mm as the most preferred one, with alternate options of 5.6mm and 7.62mm. All small arms design bureaus were to participate in the development of new small arms once the design of the new round was finalized.

Instead of a single weapon, Soviet experts wanted to produce a completely new small arms system covering squad and platoon level and using the same new intermediate cartridge throughout. This system in its final shape was to be centered on a semi-automatic carbine as a primary infantryman's arm, complemented by squad automatic weapons (light machine guns); select-fire Avtomat was seen as a specialist weapon and a direct replacement for a submachine gun in the hands of NCOs, assault and airborne troops, and certain auxiliary personnel in the front line units. Finally, a fall-back option and a possible inexpensive weapon for rear-echelon troops, a bolt-action carbine, was also proposed by the GAU.

It must be noted, however, that before and during the first stage of trials of 1944, the military did not make a clear distinction between an individual "Avtomat" and a squad support weapon. Some experts, such as General Fedorov, believed that a squad support function could be performed by the same automatic carbine but fitted with a lightweight bipod, somewhat similar to the present American concept of the "M27 infantry automatic rifle" in the US Marine Corps use. However, this idea was soon abandoned and a clear distinction was made between an individual "Avtomat" as a direct replacement to the pistol-caliber submachine gun, and a new light machine gun, firing the same intermediate power ammunition but specifically designed do deliver more sustained firepower as a squad support weapon.

Early experiments and calculations at the OKB-44 brought up the conclusion that despite pressure from Gen.Fedorov caliber of 7.62mm is preferable to 6.5mm. Besides the obvious benefits of existing barrel-making machinery, available for 7.62mm but not existing in smaller calibers, there were considerations of stopping and wounding power, production of specialized projectiles (incendiary, tracer, and armor-piercing), and technological problems, associated with chrome plating of smaller caliber bores. The first draft of the new cartridge design was prepared in September of 1943 by a group of ammunition specialists led by N. Elizarov and B.Semin. The new cartridge featured a rimless, bottlenecked case 41 mm long, made of bimetal (carbon steel covered with a thin protective layer of tombac). It was loaded with a jacketed pointed bullet with a lead core. The bullet weight was 8 grams; the muzzle velocity from the 520mm test barrel was 740 m/s. The new cartridge was noticeably lighter than the standard 7.62x54R rifle round and offered a much better range and penetration compared to the 7.62x25mm pistol round, used in submachine guns. It was stated that an infantryman could carry 138 new cartridges for the weight of the one hundred 7.62x54R rifle cartridges, and the production of one million new rounds would save more than a metric ton of lead and a ton and a half of the rifle powder, also

compared to 7.62x54R. Considering the fact that during the year 1943, the Red Army expended close to 3 billion 7.62mm rifle rounds and a similar number of 7.62mm pistol rounds, the change to an intermediate cartridge promised huge material and logistics savings and noticeable tactical benefits.



Drawing of the first version of a 7.62mm M1943 cartridge, with a case 41mm long, 1945

With cartridge design and basic features more or less set up, and initial chamber drawings made, GAU (General Artillery Department of the Red Army) prepared new requirements for the small arms that should fire the 7.62mm intermediate cartridge model of 1943. As said above, the new Avtomat was seen as a part of the larger schema, a specialist weapon. The following requirements were set up for the first Soviet assault rifle:

- Caliber: 7.62mm
- Ammunition: 7.62x41mm M1943 cartridge
- Barrel length: 500-520 mm
- Overall length: no more than 1000 mm
- Weight, with empty magazine: no more than 5 kg
- Magazine: detachable, capacity 30-35 rounds
- Accuracy in single shots: not worse than M1891/30 rifle at 100 meters
- Dispersion in full automatic fire (short bursts): not worse than DP-27 light machine gun, at ranges of up to 600 meters.

Considering the last requirement that dispersion in full automatic fire to be similar to or better (smaller) than of a much heavier Degtyarov machine gun, one must bear in mind that originally all new avtomats were to be equipped with light folding bipods, and this requirement was applied to firing from prone, supported position.

For comparison, the new semi-automatic carbine was to have a barrel 620 mm long, weight no more than 3.8 kg empty with an integral folding bayonet, and have a 10-round internal magazine, loaded from stripper clips.

Work on a new avtomat commenced as soon as official drawings and specifications of the new cartridge were made available to Soviet designers in late 1943. Soviet military as a whole firmly believed that competition was the optimal way to get the best possible results and conducted various competitive research and development programs for anything from pistols to tanks and heavy bombers and, later on, ballistic missiles and nuclear warheads. However, once the best design was ‘sealed up’ and approved for production, planned Soviet economics stepped in and decided the assignment of production orders

to various factories, which were normally not expected to 'compete' for contracts in the Western sense of capitalist business.

Each class of weapons had its own set of competing design teams and bureaus that joined the races. Regarding the development of Avtomat, initially, there were close to a dozen designs, including submissions from patriarchs of the Soviet small arms industry such as Degtyarov, Tokarev, and Schpagin, plus several less-known designers, like Bulkin, Korovin, or Korobov, but the undisputed favorite in the first round of this race was Alexey Sudaev. He was already recognized as a successful small arms designer, as his 7.62x25mm PPS-43 submachine gun was recently adopted by the Red Army to serve and fight alongside the PPSH-41. Trials of new weapons commenced in the spring of 1944, but none of the submitted designs came close to set objectives. After about a month of fervent upgrade work, designers returned to the NIPSVO proving ground near the town of Schurovo on July 1st, 1944, for the second round of trials.

After rigorous testing, the Sudaev AS-44 assault rifle came first, while some competing designs proved to be real disasters for their designers. One such disappointing example was Shpagin Avtomat. Designed by an author of the highly successful 7.62x25mm PPSH-41 submachine gun, this weapon featured the same simple blowback action as the submachine gun, despite the use of much more powerful ammunition. It had the bolt weighing some 1.2 kg (a little less than 3 lbs), and as a result, it featured severe recoil, high dispersion, and very bad reliability, suffering terminal failure after just 315 rounds. Other weapons fared little better, but Sudaev again was recognized as an undisputed leader. Following initial tests, the trials commission recommended extended field trials, and later on, an order was issued to TOZ - Tula Arms factory for the production of the test batch of AS-44 rifles. The order was completed in the spring of 1945, with an estimated one thousand Sudaev AS-44 rifles delivered for field testing, which took place in the summer of 1945, about a month after the end of the war in Europe. Guns were tested by the troops of Leningrad, Moscow, Central-Asian, and Caucasian military districts, as well as in the Soviet-occupied zone of Germany. AS-44 was also tested as a primary individual rifle of a proposed mechanized squad by the Soviet Armored corps, along with a new Degtyarov RPD-44 light machine gun which fired the same 7.62mm M1943 ammunition. Overall results were generally positive, but several important suggestions were made for further improvements. For one, troops wanted a lighter gun, as an AS-44 with a fully loaded 30-round magazine weighed a hefty 6.2 kg (13.6 lbs). Also, ordnance experts wanted better single-shot accuracy, originally compromised by the fact that the AS-44 fired from an open bolt. By October of 1945, Sudaev produced a new version of his gun, which came noticeably lighter than the previous one, and thus was provisionally designated as OAS (*ОАС – Облегченный автомат Судаева*, Oblegchennyj Avtomat Sudaeva, lightened Sudaev Avtomat). However, tests of OAS proved unsatisfactory concerning the accuracy and increased dispersion, which, with the benefit of hindsight, was to be expected somehow from the start due to the lighter weight of the new gun.

Sudaev Avtomat, AS-44.

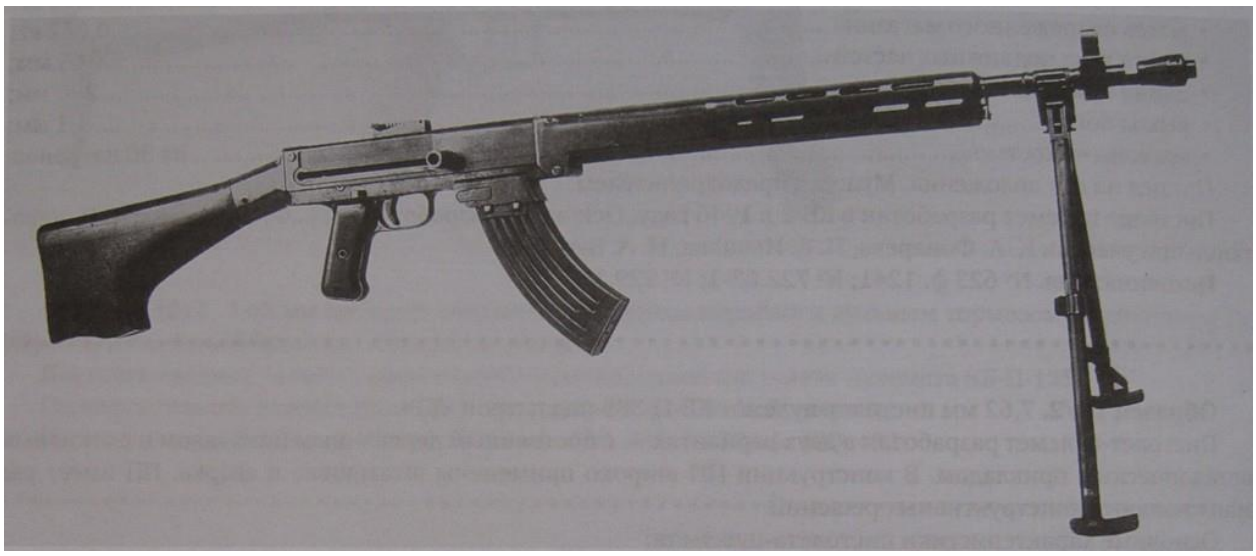
The 7.62mm Sudaev AS-44 assault rifle

Specifications:

	AS-44 (1944 production)	OAS (1945 production)
Ammunition	7.62x41 M1943	
Overall length	1027 mm	1003 mm
Barrel length	505 mm	500 mm
Weight, with an empty magazine	5.6 kg (with bipod)	4.7 kg
Magazine capacity	30 rounds	
Rate of fire	520 rounds per minute	600 rounds per minute

Sudaev AS-44 assault rifle is a gas-operated, select-fire weapon. It has a long-stroke gas system and uses tilting bolt locking, somewhat similar to the Tokarev SVT-40 rifle. It fires from an open bolt, in single shots, and is fully automatic. An important feature of the AS-44 was that its bolt group had ample clearances inside the receiver, with relatively small friction areas, which greatly improved the reliability of the gun. The fire mode selector lever is located on the left side of the gun, above the trigger; manual safety is a cross-bolt button located above the pistol grip. There is a dust cover for the bolt handle slot. When the bolt is in the forward position, the dust cover can be raised manually to close its slot. When the gun is cocked, the bolt handle automatically turns the dust cover down into an open position. The rifle is equipped with a wooden stock and a separate wooden pistol grip. The barrel is fitted with a muzzle brake, bayonet lug, and folding bipod. Ammunition is fed from detachable box magazines with a 30-round capacity.

Upon request from the military in 1945 Sudaev produced a lightened version of his gun, the OAS. It had a lighter barrel and stock and lacked an integral bipod and bayonet mount. Changes were made to the bolt group and receiver as well. A new dust cover was added to the charging handle slot, with safety cuts for the bolt handle to be held stationary in cocked or forward positions. The new rifle was more comfortable to carry, but, not surprisingly, it produced more recoil and dispersion when firing short bursts.



The Degtyarov prototype, made in 1944 for a new 7.62mm M1943 cartridge, was closer to a light machine gun than to an assault rifle. It was one of several prototypes tested during the first round of trials against the AS-44

Since the war was officially over, the Soviet military felt that the pressure for the immediate adoption of a new assault rifle had decreased a bit, and there was now enough time to procure the best possible gun rather than the first available one. As a result, a new round of trials was ordered for 1946. This round had even more demanding requirements for accuracy and weight; new, noticeably more powerful assault rifles were expected to deliver the same maximum dispersion as the venerable PPSH-41 that fired pistol-caliber ammunition.

Chapter 5. Trials of 1946 - 1947. Enter Mikhail Kalashnikov

The first round of 1946 trials started with submissions of design draft proposals. There were as many as sixteen submissions. Seven came from the design bureau of Kovrov weapons plant Number 2, four from the NIPSVO proving ground in-house design team, and two designs each were submitted from TOZ - Tula arms factory and TsKB-14 design bureau, located in the same city. Two more came from the OKB-61 in Klimovsk and one from the Artillery Academy in Moscow. In August of 1946 trial commission approved ten designs for the manufacture of prototypes. Among experienced engineers and small arms designers like Tokarev, Shpagin, Detyarov and Simonov, there were several new names. One of these was the young sergeant originally from the tank corps, Mikhail Kalashnikov.

Bio: Mikhail Kalashnikov. 1919 - 2013

Mikhail Timofeevich Kalashnikov was born on November 10, 1919, in a small village located in the Altay Mountains region. He graduated from 7th-grade school and worked at a railroad depot, where he showed significant interest in everything mechanical. In late 1938 he was drafted to the Red Army and sent to NCO tank school. After the NCO school, he served as a tank driver, and during the 1939-41 timeframe, he designed some indigenous and useful mechanical implements for tanks, such as an inertia-operated shot counter for the main gun, mechanical work-hours counter for the engine, and electrical circuit breaker.

Author's note: many ignorant people call Kalashnikov "a peasants son", and thus hardly literate and with zero technical knowledge, which is not true. As far as a piece of common education and literacy goes, his school 7th-grade background was much better than, say, the basic education of someone John Moses Browning. Furthermore, his military specialization as a "tank driver and mechanic" required an in-depth practical knowledge and understanding of all major mechanisms that comprised the engine, drive-train, and driving controls of the T-34 tank. Also, according to the available documents, Kalashnikov completed a 10-year school curriculum by 1947, taking evening classes after work.

By the start of the Great Patriotic War, Kalashnikov was already a tank commander with the rank of senior sergeant. He was severely wounded in battle in October 1941, when his T-34 tank was knocked out by German artillery, and sent back home for 6 months of medical rehabilitation. While on medical leave, in early 1942 he designed his first gun – a compact 7.62x25mm submachine gun with folding stock, which he felt to be a much better personal defense weapon for tank crews than a TT pistol or Nagant revolver, usually issued at the time.

Author's note 2: It was a fairly common occurrence of ordinary people designing various military weapons, equipment and improvements in their own time and submitting them for consideration of appropriate authorities. Soviet wartime archives contain hundreds of reports of analysis and testing of such inventions, from pistols and submachine guns to improvements in large caliber cannons, submitted by the people from all walks of life (workers, soldiers, students etc).

After examination by ordnance experts Kalashnikov SMG was found to be too complicated to warrant further development. However, its design showed dedication and a definite spark of talent, so instead of going back to the tank corps, in late 1942 Kalashnikov was transferred to the Inventions department of the Red Army and assigned to the NIPSVO small arms proving ground design bureau for further training as an apprentice gun designer. The NIPSVO was located in a small town of Shurowo, not far from Moscow.

Author's note 3: the NIPSVO was much more than just a place to test-fire guns under controlled conditions. It was staffed by experienced ordnance personnel who were required to produce scientific and technical analysis reports on all weapons and ammunition tested there and provide feedback and recommendations to small arms designers and manufacturers. It also held a large reference collection of live weapons, both foreign and domestic, and, last but not least, had its own design bureau.

Kalashnikov's first original work at the NIPSVO was the 7.62x54R light machine gun. It was a short recoil-operated, magazine-fed weapon that was completed in late 1943. This machine gun was not successful, as well as his subsequent project, the semi-automatic carbine, chambered for the new experimental 7.62x41 M1943 ammunition. This carbine was heavily influenced by the US M1 Garand rifle, using a somewhat similar feed system with en-block clips and rotary bolt locking. Gun also differed from Garand

in several important ways, including the use of the short-stroke gas piston, located above the barrel, and a separate compact bolt carrier, located above and around the bolt instead of the Garand-type op rod. The Kalashnikov 1945 model carbine was found to be inferior to the Simonov SKS-45 because the latter was a much more developed and refined design. During the same 1943-45 timeframe Kalashnikov also participated in the design and development of various modifications to the Goryunov SG-43 medium machine gun. Some of his work was later incorporated into an improved SGM machine gun, which was adopted shortly after the war.

Surrounded and guided by top ordnance experts of NIPSVO and having access to its extensive collection of domestic and foreign small arms, Kalashnikov quickly learned the basics of the trade of gun designer, and by 1946 he felt ready for the next big challenge.

After winning the 1947 trials with his AK-47 rifle, Kalashnikov was ordered to move to Izhevsk to oversee the initial production of his rifle and remained there until he died in 2013. During his course of work at the IZHMASH factory, he worked on several generations of AK assault rifles, and also on many other small arms projects, from pistols to sniper rifles. The most successful of these other projects, unquestionably, is the 7.62x54R PK / PKM general-purpose machine gun.

Early experimental weapons designed by Mikhail Kalashnikov are on display in the Artillery Museum in St.Petersburg. Top to bottom: his submachine gun from 1942, his 1945 semi-auto carbine, and a light machine gun from 1943

In August of 1946 Soviet Avtomat program suddenly lost its leader; Alexey Sudaev died from severe illness at the age of just 33, leaving no one behind to keep working on the improved AS-44 / OAS rifle. However, there were many other strong contenders and several highly interesting and advanced designs. For example, at least three designers worked on the so-called “bullpup” rifles, although in the Soviet nomenclature of the time, these were simply called “short rifles”. Those were Prilutsky, Korovin, and Korobov. All three bullpup rifles featured gas-operated actions, although their inner workings were quite different and neither weapon performed satisfactorily during the tests. However, originally Korobov's design was seen as a rather promising one, receiving 2nd overall place during the examination of projects. 1st place was assigned to the design by experienced engineer Rukavishnikov from NIPSVO. Other designs, approved for the manufacture of prototypes, were submitted by Baryshev, Bulkin, Dementiev, and Kalashnikov. Actual work on prototypes commenced in October of 1946, with the next round of trials scheduled for December of 1946.

Some of the experimental assault rifles that were tested by the Soviet Army in 1946. Top to bottom: designs by Kubynov, Efimov and Korovin. Note that the bullpup rifle designed by Korovin lacks a handguard, which was destroyed or lost over time. Photo from the Artillery Museum in St.Petersburg.

Since NIPSVO had very limited manufacturing facilities at its workshop, Mikhail Kalashnikov was sent to the city of Kovrov, a well-established small arms manufacturing center. Kalashnikov had to work at the same Factory number 2 that hosted the Degtyarov design bureau; he was assigned a small team of workers and engineers to help him build his new Avtomat. Most important of those people was Alexander Zaitsev, a relatively young small arms designer who proactively participated in the design of the new gun. The very first AK-46 rifle, produced in Kovrov, featured machined steel upper and lower

receivers, assembled using bayonet lock and held together by a single removable cross-pin, located behind the magazine housing. The upper receiver had a separate top cover. The gun had a short-stroke gas piston, located above the barrel, a rotary bolt with two massive lugs that locked into the cuts in the upper receiver, and a heavy bolt carrier, inherited from Kalashnikov's 1945 experimental carbine. The trigger unit was of indigenous design, with two separate levers on the left side of the lower receiver; one lever acted as a safety, and another as a fire mode selector switch. This gun proved to be too expensive to make, and very soon Kalashnikov produced two more prototypes, now using stamped steel for upper and lower receivers. The upper receiver now had a solid roof, and the upper and lower halves were connected by two cross-pins, one at the rear of the magazine well and another at the very end of the upper receiver. Most internals remained the same. AK-46 prototype No.2 featured fixed shoulder stock made from wood, while AK-46 prototype No.3 featured under-folder shoulder stock made from steel.

The next round of trials took place between July and August of 1947, and included the following contestants:
- **Kalashnikov AK-46**, briefly described above.
- **Rukavishnikov AR-46**. Gas-operated weapons with rotary bolt locking and stamped steel receiver. The gas piston was located below the barrel.
- **Korobov TKB-408**. A gas-operated weapon with a vertically tilting bolt, made in a bullpup layout. Ejection was to the right side, precluding shooting from the left shoulder. The magazine catch was unusually located at the base of the pistol grip, and the gun required specially designed magazines. The gun proved to be quite unreliable during trials but sparked significant interest due to its compact layout
- **Bulkin AB-46 (TKB-415)**. Gas-operated weapon with rotary bolt locking and long-stroke gas piston, located above the barrel. The gun featured a stamped steel receiver with a detachable top cover, also made from stamped steel.
- **Dementiev AD-46 (KB-P-410)**. Another gas-operated weapon with rotary bolt locking and a long-stroke gas piston located above the barrel. AD-46 had a hinged lower receiver consisting of the magazine housing, trigger housing, a pistol grip, and a detachable rear-end cap with a shoulder stock, held in position by a single cross pin at the rear of the receiver.

Kalashnikov AK-46.

The original AK-46 prototypes on museum display. Top to bottom: the AK-46 No.1 with a machined receiver, the AK-46 No.2 with a stamped steel receiver, and an AK-46 No.3 with a folding stock. Photo from the Artillery Museum in St.Petersburg.

Specifications

	AK-46 with wood stock	AK-46 with metal (folding) stock
Ammunition	7.62x41	
Overall length	950 mm	900 mm (660 mm with stock folded)
Barrel length	450 mm	400 mm
Weight, with an empty magazine	4.33 kg	4.09 kg
Magazine capacity	30 rounds	
Rate of fire	600 rounds per minute	

The AK-46 is a gas-operated weapon and uses a short-stroke gas piston, located above the barrel. The first prototype featured a machined receiver; the second and third prototypes, which were tested at NIPSVO, featured a stamped steel receiver of the “inverted U” cross-section. The funnel-type magazine housing is permanently attached to the receiver. A separate trigger unit with a pistol grip and shoulder stock fixture formed what would be called a “lower receiver” in American terms. It is attached to the receiver using two removable cross-pins. A non-reciprocating charging handle is located on the left side of the receiver. The separate bolt group has a now-familiar rotating bolt with dual large locking lugs and a single operating lug, which interacts with the cam-shaped slot cut on the underside of the bolt carrier to lock and unlock the bolt. Hammer fired trigger unit features two separate firing controls on the left: One located above the trigger is responsible for the safety, and the second one, located forward of the trigger guard, selects the mode of fire – single shots or fully automatic. Prototype No.2 featured wooden handguards, pistol grip, and shoulder stock. Prototype No.3 featured bottom-folding shoulder stock, made from metal. Iron sights consist of a front post, mounted near the muzzle on a relatively high base, and the adjustable rear, provided with a U-notched blade and with range settings between 100 and 800 meters in 100-meter increments. 30-round box magazines are made from stamped steel.

Top: the Bulkin TKB-415 (AB-46) with a fixed stock, and bottom the Dementiev KB-P-410 (AD-46) with a folding stock. Photo from the Artillery Museum in St.Petersburg.

It is interesting to note that the AB-46 and AD-46 rifles had some common design features, such as a bolt carrier, made as a single unit with a long-stroke gas piston, and the simple rotating bolt inserted into the front of the bolt carrier. They differed in the method of bolt rotation for locking and unlocking. AB-46 used a cross pin inserted into the bolt carrier, which interacted with a spiral-shaped cut made in the shank of the bolt. AD-46 had spiral lugs on the bolt shank which interacted with respective cuts inside the bolt carrier. On the other hand, the AK-46 bolt had a rotating lug located at the outer edge of the bolt head, which interacted with a spiral cut made on the underside of the bolt carrier. In theory and practice, this feature gave AK-46 much more potential for reliable unlocking and primary extraction under harsh conditions due to the greater leverage, applied to the bolt upon its rotation.

Results from the summer trials of 1947 were somewhat disappointing. All contestants were unable to fulfill requirements, with insufficient accuracy, reliability, and durability. Of all guns tested, three designs were recommended for further work and re-evaluation after recommended updates. Those were AB-46, AD-46, and AK-46. Each designer received a set of recommendations from the trial commission, consisting of many items.

For example, the list of desirable changes to AB-46 included the redesign of the charging handle, forend, and shoulder stock, and strengthening of many parts that broke during the first stage of trials. The total number of recommendations: five.

For AD-46 it was recommended to simplify the design of the upper receiver, increase the dimensions of the bolt locking lugs to ensure necessary locking strength, redesign the bolt carrier interface, and generally increase the durability of major parts. The total number of recommendations: eleven.

For AK-46, the trial commission suggested redesigning the trigger unit and firing controls; specifically, to make safety and fire selectors as one lever. Another recommendation suggested redesign of the receiver and strengthening of several parts. The total number of recommendations: eight.

According to the memoirs of Mikhail Kalashnikov himself, as well as the memoirs of Alexander Malimon, an ordnance officer who served at NIPSVO in various capacities from 1943 until 1960, the AK-46 was originally considered a failure in summer trials. However, Mikhail Kalashnikov managed to talk to several members of the trials commission, whom he knew from his previous work at NIPSVO, to reconsider their

opinions. It seems that those experienced officers had enough faith in the young aspiring designer to amend the final report and recommend AK-46 for further updates and re-testing.

All designers then were sent back to the factories to work on their guns, with orders to return to NIPSVO for the next round of trials in December of the same year.

With less than half of a year to make all necessary changes, Kalashnikov decided to take a significant risk and completely redesign his weapon along the lines of recommendations from trials. Apparently, Kalashnikov and his aide, young designer Zaitsev, decided to "look over the shoulders" of their major competitors and borrow some promising ideas from the Bulkin AB-46 rifle, most notably the U-shaped layout of the stamped receiver with detachable top cover, design of the bolt carrier with integral long-stroke gas piston, return spring guide and overall set-up. The trigger design was copied with some amendments from the Czechoslovak ZH-29 rifle, as per trial commission recommendations, with the addition of the combined safety/fire selector/dust cover setup, obviously inspired by the Remington Model 8 rifle, designed by John Browning. The key feature, inherited from the previous Kalashnikov design was the interface between a bolt and a bolt carrier, which provided positive unlocking and extraction even under the most severe conditions. Three original AK-47 guns were made in Kovrov in November of 1947. Gun bearing serial number 1 was used for factory trials for a full endurance test of 15,000 rounds, and guns numbers 2 and 3 were sent to the NIPSVO for official tests. One of these guns featured fixed wooden stock, another one had underfolding shoulder stock, made from metal. It must be noted that most major changes, introduced into the AK-47, were following direct recommendations from the previous round of trials. The trials commission suggested the redesign of the receiver, so the shoulder stock would be attached directly to it; it also suggested a detachable or hinged (AS-44 type) top cover. Other recommendations include redesigning the trigger and safety, so there would be only one safety/selector lever instead of two. The only major change not suggested by the trials commission was the use of the long-stroke gas piston.

Similar recommendations were also issued to Bulkin and Dementiev, but for some inexplicable reasons, both rivals ignored most of these suggestions for improvements.

Kalashnikov AK-47 (trials prototype).

Specifications:
Ammunition: 7.62x41
Overall length: 874 mm (652 mm with stock folded, for metal stock version)
Barrel length: 400 mm
Weight, with empty magazine: 4.04 kg (4.13 kg for metal stock version)
Magazine capacity: 30 rounds

Rate of fire: 550-600 rounds per minute

The first and original AK-47 set the general pattern for all subsequent Kalashnikov assault rifles. It was a gas-operated weapon, with a long-stroke piston gas system, located above the barrel. The gas piston rod was permanently attached to the massive bolt carrier, with a two-lug rotating bolt that engaged slightly angled cuts in the forward trunnion, pinned to the receiver. The barrel was screwed into the same trunnion and pinned in place. The receiver was formed (stamped) from sheet steel, with bolt guide rails welded inside. The top cover was also stamped from steel and was held in place by a rearward-facing projection on the base of the return spring guide. The return spring guide was a captive telescopic set-up. The charging handle was permanently attached to the right side of the bolt carrier and was of a simple tubular shape. The safety/fire selector lever had a machined projection for the operating finger about the middle of its length. When "on safe", this lever covered the rear part of the slot for the charging handle but permitted partial retraction of the bolt group. That way, it was still possible to check if the gun had a round in the chamber with the safety on, but the available movement of the bolt group was not sufficient to fully extract it or chamber the next round from the magazine. The barrel of the gun was equipped with a short muzzle brake – compensator, which formed a part of the front sight base. The gun was fitted with a wooden handguard and forend, wooden pistol grip, and wooden or metallic shoulder stock. In the latter case, the stock was made to fold down and forward. The front sight was mounted on the relatively high base near the muzzle end of the barrel; the rear sight, which featured a U-shaped notch, was adjustable between 100 and 800 meters in 100-meter increments. Ammunition was fed from detachable box magazines, made from stamped steel. There was no provision for a bayonet.

The last round of trials started on December 16, 1947, and finished on January 11, 1948. The official report, which summarized their results, was signed by the trials commission on January 15, 1948. It contained more than 170 pages with a detailed breakdown of various tests and analysis of properties of all three designs, submitted for trials. Each designer delivered two guns, one with a fixed stock and one with a folding stock. The report concluded with the following statements:

"*1. 7.62mm Kalashnikov Avtomat for the most part fulfills requirements for reliability, durability, and its major features and properties. It can be recommended for limited serial production and subsequent troop trials.*
2. Dispersion of fire is not acceptable as per requirements. Considering the fact that in single shots AK is much more accurate than the PPSh-41, and in full automatic fire from the supported position it has the same dispersion as PPSH-41, Kalashnikov Avtomat can be recommended for troops trials. It is necessary to perform further work on improvements in full automatic dispersion in parallel with preparations for serial manufacture.
3. When preparing drawings for mass production, it is necessary to fix deficiencies found during trials and listed in full in paragraph 21 of this report.
4. 7.62mm avtomats by Bulkin and KB-2 (Dementiev) did not fulfill major requirements, failed the trials and their further development is not feasible"

To be more specific, the slightly modernized AB-46 was found to be inferior to AK-47 in regards to reliability when subjected to sand or dusty environments. Avtomat by Bulkin had unreliable ejection, an underpowered gas drive, which resulted in frequent short strokes of the bolt group, and an inefficient system of bolt rotation for locking and unlocking. Apparently, the same low power of bolt group recoil resulted in better (smaller) dispersion when firing in bursts, as the AB-46 was the only gun that came close to fulfill dispersion requirements when fired from an off-hand position, standing or kneeling. The AD-46 was much more unreliable than both of its rivals in almost all 'harsh environment' tests and had insufficiently strong bolt lugs which caused headspace issues after intense use. It must be noted that AB-

46 and AD-46 both had several major parts breakages when fired for a large number of shots; the AK-47, on the other hand, had no major parts break and generally performed almost a magnitude better. To be more exact, of two AK-47 rifles one had only 8 stoppages for a total of 15,000 shots (0.05% failure rate) while another had 62 stoppages of all types for 13,176 shots (0.47% failure rate), with most of the stoppages occurring early in the test due to faulty extractor which was quickly fixed. One AB-46 rifle had 24 stoppages for 6,134 shots (0,39%) before going out of action due to the critical failure of the bolt carrier. The second AB-46 went down due to a failed extractor after 6,194 shots with 41 stoppages (0.66%). One AD-46 rifle tested for durability had 73 stoppages for 14,626 shots (0.51%), and the second Dementiev rifle was damaged beyond repair even before the start of durability tests.

As a direct result of this report, as well as reports from a separate carbine and light machine gun trials, on January 21st, 1948, the Soviet Ministry of Armaments issued an order No.18-S ("Secret") which demanded the following production:

1. 1,700 SKS-45 semi-automatic carbines to be produced by June 1st, 1948, by factory No.536 (TOZ – Tula arms factory)
2. 1,500 AK-47 avtomats to be produced by the same date by factory No.524 (Izhevsk motor plant)
3. 250 RPD-44 light machine guns to be made by factory No.2, located in the city of Kovrov (today it is the ZiD factory)
4. 1,5 million ball 7.62x39mm cartridges with steel core bullet, to be made by ammunition factory No.3 (Ulyanovsk ammunition plant)
5. 300,000 7.62x39mm cartridges with armor-piercing – incendiary bullets to be made by the ammunition factory No.17 (Barnaul ammunition plant)

Early evolution of the 7.62mm M1943 cartridge

As mentioned above, the original version of the M1943 cartridge used a bottlenecked rimless case 41 mm long, loaded with a pointed, flat-based bullet with a lead core. All cases were made of steel. However, by 1947 it was decided to partially replace relatively expensive lead in the bullet core with cheaper and much more abundant mild steel, which also slightly increased penetration of the bullet. Since the steel is less dense than the lead, it takes more space for the same weight. To achieve the necessary ballistics and keep the original bullet weight unchanged, designers from OKB-44 developed a new, boat-tailed bullet with a steel core, wrapped in a thin layer of lead inside the bimetallic jacket. To keep the total length of the round unchanged, so all existing weapons would not require expensive and time-consuming redesign, the top of the cartridge case was cut down at the neck by 2 mm, so the new round now had a metric designation of 7.62x39 mm – same as it is known by today.

A closing note must be made about the fact that the AK-47 has failed the trials regarding the dispersion in fully automatic mode. Per initial requirements, when firing short bursts, the new rifle should deliver dispersion not greater than R100 = 35 cm when firing from a supported prone position, and not greater than R100 = 70 cm when firing from an unsupported prone position, both at 100 meters range. During the trials, AK-47 delivered burst dispersion R100 = 53 cm (roughly 21") from the supported position. It took Soviet designers ten more years to achieve the desired short burst dispersion parameters with AKM rifles, and it is interesting to compare those results with contemporary Western weapons. During

the soviet tests of the captured Stg.44, it provided short bursts dispersion (R100) of 48 cm, when fired from a prone supported position at 100 meters range. The new US Light Rifle, then still in development, was expected to group all hits in short bursts within a 40-inch (102 cm) circle at 200 yards (181 meters), when fired from a supported prone position. However, in reality, a 40-inch dispersion (R100=51cm) from a light automatic rifle firing 7.62x51mm NATO ammunition could be reasonably expected only at ranges of 50 yards or less.

Chapter 6. Experimental production and field trials. Adoption of the AK

As a result of the official orders, in February of 1948, Mikhail Kalashnikov had to move from Kovrov, which was located about 200 km (125 miles) to the East of Moscow, to Izhevsk, a further 720 km (450 miles) eastward. The first small batch of about a hundred AK-47 rifles, produced at the Izhevsk motor factory No.524, failed trials at the NIPSVO due to numerous deficiencies, and further work had to be done at the factory until the entire batch of 1,500 guns (some with folding stocks, most with the fixed stocks) was accepted by the military. Troop trials lasted until the end of 1948, with generally positive results and numerous requests for improvements. Among the changes, suggested by troops, were redesign of the manual safety (so it would work in "Safe – Semi – Auto" sequence instead of the "Safe – Auto – Semi"), addition of the bolt hold-open device, changes to the shape of the charging handle and a host of other possible improvements. It must be noted that Kalashnikov arrived at Izhevsk not alone – he was accompanied by two designers from the Kovrov plant, aforementioned A.Zaitsev, and V. Soloviev. GAU also sent two of its representatives from NIPSVO – ordnance expert Lt. Col. Deijkin and inspection and acceptance specialist Capt. Sukhitsky. Once production of the initial batch of AK-47 was completed in September of 1948, engineers from Kovrov were allowed to return home, but Kalashnikov remained in Izhevsk to live there for the rest of his long and productive life.

The AK-47 with a folding stock. It was manufactured in 1948 at the factory No.524 *for field trials. Note that it has a small muzzle compensator integral to the front sight base, a feature which was abandoned after the adoption*

Hugo Schmeisser in Izhevsk: German influence to AK, the myth and the truth
One widely distributed myth concerning the development of AK says that a group of German designers somehow participated in its creation, with the name of Hugo Schmeisser being mentioned most often.

USSR indeed tried to capture as much German knowledge and manufacturing equipment as possible, the same way its allies did toward the end of the war. For example, French authorities raided the Mauser and Walther factories, taking out most of the surviving equipment and 'inviting' a group of noted German small arms engineers such as Ludvig Vorgrimmler to work for a while on the newest French armaments. USSR did the same with a small group of German small arms experts from the region of Suhl, including Schmeisser, Horn, Barnitzke, Gruner, and a few others, for a total of 15 men. Those were sent to Izhevsk in 1946 along with their families, and worked there at Factory No.74 (IZHMASH) until 1950-51 in a separate department, under the close supervision of NKVD and Soviet small arms experts. A significant amount of declassified paperwork was recently found in the archives of the IZHMASH factory, and it tells an interesting story.
For one, the Germans were working not as prisoners of war, but rather as a sort of 'special employees', earning significant salaries and living in ordinary housing in the city with their spouses and children. Second, they had very different attitudes toward their new masters; for example, Hugo Schmeisser refused to do any significant design work, citing his "lack of special education" and his management, rather than design experience. On the other hand, Dr. Gruner, one of the fathers of the famous MG-42 machine gun, was quite loyal to his new masters and did everything he was told to with typical German meticulousness. According to the reports, Dr.Gruner was especially useful in the development of various manufacturing tools, implements, and machines. He also continued design work on his late-war MG-45 machine gun with a delayed blowback action. Several design drawings of various weapons and parts (machine guns, submachine guns, magazines), all marked in German, survived in archives. However, there's no evidence that anything designed by the Germans in Izhevsk was ever made 'in the flesh'. Also, there were very specific instructions from the NKVD to keep German engineers away from anything classified as 'secret', and the AK and its drawings were considered secret until 1951.
In short, there was no need for German experience in designing the Soviet assault rifle. The only area where Germans could have been useful, at least in theory, was mass production using steel stamping and forming. However, it seems that the Soviet production facilities of the time were not up to the task, at least for a while.

Successful field trials led to the official adoption of the new weapons. On June 18th, 1949, the Soviet government issued order Number 2611-1033 SS (classification "Top Secret") which declared the official adoption of the AK, SKS, and RPD weapons, all firing the same 7.62x39 M1943 ammunition. One might note that this order listed weapons by their short and full names but without any mention of the year of the first appearance. Before that moment, guns were usually listed as PPSH-41, RPD-44, SKS-45, or AK-47. After that date, most (but not all) official paperwork included either a name without a date (i.e. "Avtomat Kalashnikova" or simply the "AK") or GAU (later GRAU) indexes, assigned to all weapons and most of the equipment, adopted by the Soviet army. However, the "AK-47" designation still appeared in some factory documents, official letters, and test reports from time to time for a year or two after its official adoption. Also, it must be noted that an AK with a folding stock was officially designated as the "Avtomat Kalashnikova with metallic shoulder stock", or "AK with metal stock" in short. The "AKS" acronym was officially introduced much later, after the adoption of the AKMS rifle.

After the official adoption, a decision was made to assign the production of the new Avtomat to another manufacturing facility in Izhevsk, factory number 74, the former Izhevsk Weapons plant, which produced arms for Russia since 1808. During the Great Patriotic War Factory No.74 manufactured Mosin rifles, aircraft machine guns, automatic cannons, and other important articles of war. Between 1941 and

1945 this factory alone produced more than 10 million rifles and carbines, more than 130 thousand aircraft machine guns and cannons, 80 thousand infantry machine guns, and so on. With the end of the war and the cessation of manufacture of M1891/30 rifles and M1944 carbines, the factory had significant unused production capabilities that were waiting for some new product. And in 1949 it came, along with the large orders. Mikhail Kalashnikov also had to move his workplace to the new, bigger factory.

Avtomat Kalashnikova AK, the first production version of 1949 (AK Type 1).

Specifications:
Ammunition: 7.62x39
Overall length: 870 mm
Barrel length: 415 mm
Weight, with empty magazine: 4.3 kg
Magazine capacity: 30 rounds
Rate of fire: 600 rounds per minute

While generally similar to the trial gun, described above, the first production version of the AK (also generally known in the West as “Type 1 AK”) had some differences and upgrades. Starting from the forward end, the muzzle now had no compensator, but a simple thread, protected by a screw-on nut. The muzzle compensator was rejected by the troops due to an increased backward-directed muzzle blast which badly affected the shooter and his buddies close by. Muzzle thread was originally intended for the installation of a blank-firing adapter, and later on, also served to mount a sound suppressor. The bolt charging handle now had a more familiar and comfortable crescent shape. Trigger group pins, which were originally permanently fixed to the receiver, were made removable, to permit complete disassembly of the trigger group. Like its predecessor, this variant has a pistol grip, assembled from two wooden halves (left and right) around the vertical metal base, permanently attached to the receiver. The pistol grip had a prominent angle to the rear. This gun also was produced with fixed wooden stock or with underfolding metallic stock with machined struts and a U-shaped steel buttplate.

Chapter 7. The mass production of AK begins. The teething problems

It is interesting to note that preparations for mass production of AK began at factory No.74 even before official adoption, in late 1948, and the first AK rifles were produced at the factory in early 1949. It must be also noted that most of the equipment and machinery at the factory was well worn-out after the war, and many machines were obsolete or 'general purpose', making the production of automatic weapons even more complicated and time-consuming. Also, as with every new design, AK had many unsolved quirks and teething problems; small parts broke, springs lost their tension, etc. All those problems and broken parts, however small, required reliable solutions. Most serious problems were caused by the stamped steel receiver, which had machined steel trunnions pinned at the front and the rear, and the bolt carrier rails welded inside. This design of the receiver did not lend itself to sufficient rigidity, and quite often assembled receivers were slightly warped or deformed during or after pinning, welding, and heat treatment, causing reliability problems for complete rifles. Additional issues were caused by the constant flow of reclamations and suggestions from the troops, which found many new and sometimes creative ways to damage or maim their rifles. Constant small amendments to various parts and technological processes caused additional headaches, delays, re-tests, and, sometimes, new issues. During 1949 alone, the factory recorded more than 900 separate changes to drawings of parts and assemblies and had to rework or replace about 20% of jigs and gauges, used during the assembly of AK. By the end of 1949, it was decided that a machined receiver would be more economical to produce than an original stamped one, and the first samples of AK with machined receivers were sent to NIPSVO for testing in December of the same year. Despite more expensive manufacturing processes and more metal going to a scrap pile, single-piece machined receivers allowed significant savings of working time on assembly, extensive quality control, and routine 'unbending and straightening' of stamped receivers with their pinned and welded construction. It took almost a year to test, refine, and approve the new design of the receiver with the Soviet Ministry of Defense, and the first production batch of new AK rifles with machined receivers was manufactured only in late 1950. The new design was approved in December of 1950, and, besides the machined receiver, it also included a simplified return spring guide, more durable multi-strand springs for the hammer and extractor, a stronger top cover, and several other upgrades. Mass production of the machined receiver AK rifles commenced in 1951. Interestingly enough, despite noticeable design changes the designation and GAU indexes remained unchanged for an improved AK. To distinguish versions with stamped or machined receivers, field and repair manuals from the fifties listed the AK rifles with stamped receivers as weapons "of early production". The "AK type 1" and "AK type 2" designations, common in present-day Western literature, were never used in Russian nomenclature and are originating from the West.

But even after that major change various minor amendments, updates, and improvements kept design and production teams at the factory working long hours. Soviet Ministry of Defense wanted more than two million AK rifles to be delivered by 1955, and keeping up with that demand was a serious challenge for Mikhail Kalashnikov and all his colleagues and co-workers.

Avtomat Kalashnikova AK with the machined receiver, 1951 (AK type 2).

The folding stock AK "Type 2" with an experimental lightweight bipod, from a private collection

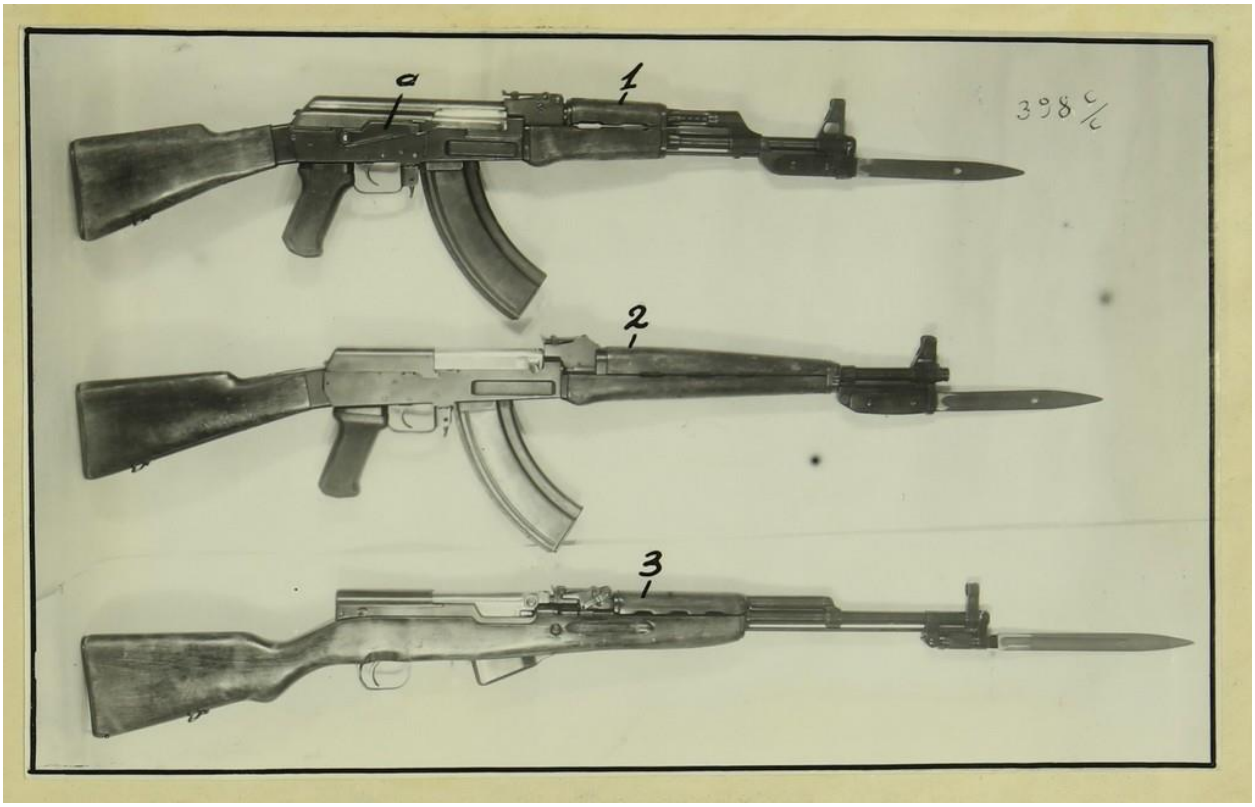
Specifications:
Ammunition: 7.62x39
Overall length: 870 mm
Barrel length: 415 mm
Weight, with empty magazine: 4.3 kg
Magazine capacity: 30 rounds
Rate of fire: 600 rounds per minute

Also known in the West as “AK Type 2”, this version introduced several important changes to the basic design. First and most important was the new receiver, machined from a single block of steel, which dispensed with separate forward and rearward trunnions of the previous design. Other changes include a new, single-piece pistol grip made from wood, which was attached to a separate base below the receiver using a single vertical bolt. This single-piece grip was less prone to cracks than two relatively thin separate grip panels, used before. Wooden shoulder stock now also has its separate mounting socket, made from steel and pinned to the rear end of the receiver. Less visible changes involved improved springs, made from three-strand wire, stronger top cover, and changes in gas piston tube, barrel, and bolt carrier.

Another constant headache for Kalashnikov and his team was the dispersion of hits in full-automatic fire. The army still considered it too big, and quite a lot of effort was put into various experiments. Those included experimental forward grips with built-in monopods, various lightweight bipods, muzzle compensators, and so on. Even more radical approaches were tried by turning the AK upside down or placing pistol grips above rather than below the receiver. Those helped to decrease dispersion in automatic mode, but made general handling of the gun very awkward, and were rejected too. At the time, despite all efforts, no acceptable solution was found.

Chapter 8. On the way to AKM

The adoption of the AK by the Soviet army did not result in the cessation of competing design and research programs across various small arms design establishments in the USSR. The use of Simonov SKS semi-automatic carbine side by side with Kalashnikov AK resulted in an obvious idea that a single weapon would be a better choice than two different ones. As such, in March of 1950 official requirements were issued for an "Avtomat – carabin" (*автомат – карабин*, automatic carbine), a select-fire weapon with a detachable magazine with carbine-type stock and slightly longer 45-50 cm barrel. Other requirements include a clip-loading feature with the magazine held in place, through the top of the opened action. Extensive experimental work has been done in Izhevsk, Kovrov, and Tula to produce several prototypes of such weapons. In the process, designers tried a variety of operating systems, including short- and long-stroke gas pistons and delayed blowback. Work in this regard continued until late 1954, when it was decided that an Avtomat as it is, with its 41-centimeter barrel and separate pistol grip, is sufficient as a single, general-purpose infantry rifle, as long as it can be fitted with a detachable knife-bayonet. Of all the developments on the 'automatic carbine' program, worthiest of note were experimental guns from Mikhail Kalashnikov from Izhevsk, Sergey Simonov from Klimovsk, and Alexey Konstantinov from Kovrov.



One of several different experimental "Avtomat-carbine" by Kalashnikov (in the center) compared to an AK and SKS

Despite the development of an Avtomat-carbine, work on an Avtomat continued as well. One such effort came from the city of Tula, not far from Moscow. Tula is the historical center of small arms production in Russia, with its famous TOZ weapons factory established in 1712, on the order of the Tsar and Emperor Peter the Great. One name that stood out among a multitude of contemporary small arms designers from Tula is German Korobov.

We already know him by his unorthodox TKB-408 bullpup rifle, which was tested in 1945-46 but found to be too unreliable. By 1949 Korobov reverted to the classic layout of the gun but went for somewhat

unusual (at least for the Soviet design school) delayed blowback action instead of more common gas-operated, locked-breech action. In around 1950 Korobov went for a type of delayed blowback action, based on ideas of Hungarian gun designer Pal Kiraly, and previously used in 39M and 43M submachine guns, employed by the Hungarian army during WW2. This system featured a two-part bolt group with a lever interposed between a relatively light bolt head and a much heavier bolt body. A very similar system was later used in a couple of French weapons, namely the AAT-52 machine gun and the FAMAS assault rifle. Clever use of delayed blowback action and dynamics of the bolt group and trigger permitted the new TKB-454 assault rifle to be made 0.5 kg lighter than an AK, and achieve markedly tighter dispersion in full-automatic fire. Korobov rifle was also simpler and potentially cheaper to make than the then-new AK type 2. This work inspired further research and development in search of lighter and more effective Avtomat. At least 50 semi-experimental TKB-454 rifles were made at the Tula Arms factory before 1955 for extensive test and evaluation. As a result of these tests, additional trials were carried out between TKB-454, slightly modified AK, and several other prototypes, but no conclusive results were achieved.

The Korobov TKB-454, made circa 1954, was a very influential design

The initial success of the TKB-454 prompted the GAU to issue new requirements for the lighter and more effective assault rifle. Distributed to all relevant parties in 1953, those requirements called for an empty weight of the rifle to be not greater than 2.7 kg, with short burst dispersion from supported prone position to be not greater than R100 = 20 cm.

As a result of those requirements, in 1955 Izhevsk plant No.74 began manufacture of the 'lightened AK', generally known in the west as the 'Type 3'. Born out of competition with Korobov TKB-454, it was lighter than the 'Type 2' AK, produced between 1951 and 1954, by about 0.5 kg (1.1 lbs), and noticeably cheaper to manufacture. It was also more reliable than the delayed-blowback TKB-454, especially under harsh environmental conditions. During the same period, the AK family was extended with the introduction of the 'Night' versions. Those guns were equipped with a side rail on the receiver, which was used to mount NSP-2 night sights with infrared illuminators.

Avtomat Kalashnikova AK (lightened), 1955 (AK Type 3).

Specifications:
Ammunition: 7.62x39
Overall length: 870 mm
Barrel length: 415 mm
Weight, with empty magazine: 3.8 kg
Magazine capacity: 30 rounds
Rate of fire: 600 rounds per minute

The lightened AK with a machined receiver, generally known in the West as “AK type 3”, introduced several smaller changes and a few important ones. For one, its barrel, stock, receiver, and its top cover, and some trigger parts were made lighter. Several important parts, including the trigger and bolt group, were now made from less expensive steel alloy, compared to previous types. New lightened magazines were made from thinner steel and reinforced with stamped ribs. These new steel magazines weighed 320 grams empty, as opposed to 400 grams of the early slab-sided steel magazines. The forward sling attachment loop was moved from the forward end of the lower handguard to the gas block, and a new knife-bayonet was adopted along with the gun. The gas system was slightly revised to provide more reliable functioning under harsh conditions

After examination of the results of the “Avtomat-carbine” program, it became quite clear that the AK was a more effective and more reliable weapon than the SKS, and recommendations were made to gradually retire SKS from front-line service and replace them with ‘lightened AK’ (type 3) rifles, issued with knife bayonets. Also, the barrel length of the AK was found to be sufficient. Another contemporary finding was that the Degtyarov RPD light machine gun was insufficiently reliable and durable, and from the standpoint of logistics and training, it was found desirable to have an Avtomat (assault rifle) and a light machine gun (squad automatic weapon) to be built on the same unified platform. Official requirements for the new squad weapon system, firing the same 7.62x39 M1943 ammunition, were issued by the GAU on January 31, 1955. New Avtomat had to be no heavier than 2.7kg (less magazine), and not longer than 92 cm. Accuracy requirements for the new Avtomat required the best 50% of hits at 100 meters to land inside a 10x10 cm square in single shots and within 20x20 cm square in short bursts. Both Avtomat and LMG were required to be compatible with existing AK magazines and produced with the maximum possible use of stamped steel instead of machining.

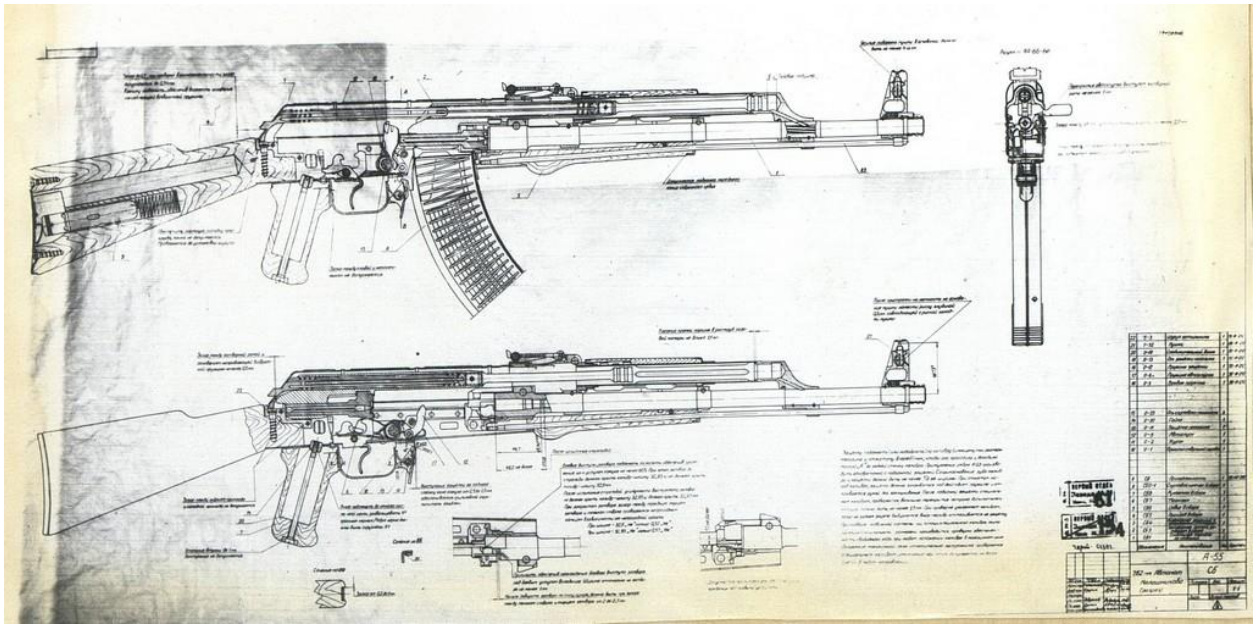
Like before, several design teams joined the race to produce a new small arms system. Those included teams led by Kalashnikov from Izhevsk, Konstantinov, and Bolkhovitinov from Kovrov, Korobov, and Afanasiev from Tula, and Simonov (of SKS fame) from Klimovsk. First trials commenced in late 1956 and included the following rifles:

- Konstantinov 2B-A-30 (with fixed stock) and 2B-A-35 (with down-folding stock) rifles, with delayed blowback action and fluted chamber. Bolt opening delay is achieved by a Kiraly-type lever and a two-part bolt system.
- Afanasiev (index unknown), a gas-operated weapon with rotating bolt locking and the bullpup layout
- Korobov TKB-517, with delayed blowback action and fluted chamber, based on earlier TKB-454. Bolt opening delay is achieved by Kiraly-type lever and two-part bolt system
- Kalashnikov S-04-M, a gas-operated weapon with a long-stroke piston and rotary bolt locking, which was based on the original AK system. The gun featured a now-familiar stamped steel receiver with machined steel trunnion, pinned at the front. There were many other changes as well.

Originally, light machine guns and avtomats were tested separately, but in 1956 it was decided to test them together as systems; however, some designers were permitted to participate with only half of the desired system, i.e. Simonov with his AS-104-P-56 rifle or Degtyarov and Garanin with their KB-P-790 light machine gun.

The experimental 7.62mm assault rifle by Konstantinov, with a delayed blowback action

For the next round of trials, Kalashnikov and his team submitted a new rifle, designated as A-55. Besides numerous small changes, this rifle featured increased clearances between the bolt carrier and inner walls of the receiver, as well as between the bolt and the bolt carrier. This, along with other modifications, permitted significant improvements concerning reliability under various severe conditions. The new light machine gun was also based on the A-55, but with several changes, required for squad automatic role. Those included, among others, a longer and slightly heavier barrel, a folding bipod, and a strengthened receiver, made from a thicker steel.



The diagram of the Kalashnikov A-55 prototype with a stamped steel receiver. Note that its trigger still lacks the hammer delay lever, which was added later during the development

Military requirements for the new LMG also included the development of large-capacity magazines. Besides extended 40-round double stack box magazines, participating teams produced several more capacious designs, including 75-round drums (Kalashnikov), 75-round multi-layer flat pans (Konstantinov), and 75-round 4-stack box magazines (also Konstantinov). Korobov went the extra mile and designed a quick-detachable belt feed unit on his TKB-516 light machine gun. This belt feed unit permitted the use of standard-issue RPD-compatible belts; with the belt feed unit removed, an AK-type box magazine could be inserted into the opening at the bottom of the receiver.

The next round of trials was completed by mid-summer of 1957. Trials commission in its report stated that neither system is completely satisfactory, and only Kalashnikov and Korobov weapons are worth further development.

The final round of competitive trials was scheduled for September 1957. For some inexplicable reason, Korobov failed to deliver his updated weapons on time and thus was excluded from competition. The improved Konstantinov rifle, which was resubmitted by the Kovrov mechanical plant on their initiative, soon failed again due to numerous stoppages, misfires, and several accidental discharges when dropped. Kalashnikov was the sole winner in this round, there were no more questions about that.

The final report on trials was issued on March 29, 1958, after the extensive tests of updated Kalashnikov A-55 rifle and P-55 light machine guns at the NIPSVO proving ground. It recommended new Kalashnikov weapons for the manufacture of the experimental batch for troops trials.

Following troops' trials, a new small arms system was adopted by the Soviet government on April 8th, 1959. It comprised of the following components:

- AKM (*АКМ - Автомат Калашникова Модернизированный*), Kalashnikov Avtomat, modernized, GRAU index 6P1 (*6П1*)
- RPK (*РПК - Ручной Пулемет Калашникова*), Kalashnikov light machine gun, GRAU index 6P2 (*6П2*)

The iconic duo – the RPK light machine gun and the AKM assault rifle

Each of these guns also was available with several 'Night' versions, equipped with a side rail for night vision scope, and, in certain versions, with long flash hiders. Basic 'Night' versions were designated with the letter 'N' (Cyrillic «Н») in the end, as in AKMN or RPKN; versions of AKMN with added flash hiders were designated with the letter 'L' (Cyrillic «Л»). AKMN and RPKN weapons were originally issued with NSP-2 infra-red night sights with IR illuminators, and, later on, with lighter and more effective NSPU or NSPUM image-intensifying night sights. AKML and RPKL were originally issued with NSP-3 or NSP-3A image-intensifying night sights. Besides the muzzle device, there were differences in side rail designs, due to differences in scope mount interfaces.

The RPKN light machine gun with a contemporary NSP-2 night sight and a 75-round drum

It must be noted that the folding stock versions of the AKM and the RPK, intended primarily for airborne troops, were adopted only in 1962. The reason for this delay was that the folding stock version of the AKM required quite a lot of additional effort to be made strong enough for Airborne use. For example, a new rifle was expected to survive as much as twelve hits against the concrete surface when dropped "stock down" from the height of 150 cm (roughly five feet), without any major damage to the gun. Those new guns, when adopted, were designated as AKMS (*АКМС - Автомат Калашникова Модернизированный со складным прикладом*), Kalashnikov Avtomat, modernized, with folding stock, and RPKS (*РПКС - Ручной Пулемет Калашникова со складным прикладом*), Kalashnikov light machine gun, with folding stock. Their assigned GRAU indexes were 6P4 and 6P8, respectively. It must be noted that RPKS had an entirely different folding stock when compared to AKMS; while the latter had an underfolding stock made from stamped steel, RPKS had a more robust side-folding stock made of laminated wood.

Avtomat Kalashnikova Modernized AKM

The AKM made in 1959, as issued, with an early AK-type steel magazine and no muzzle compensator

The same rifle but with important upgrades from the mid-1960s, the spoon-type muzzle compensator and the new lightweight plastic magazine

The AKMS rifle, produced toward the end of its manufacturing run, in 1975

Specifications:
Ammunition: 7.62x39
Overall length: mm
Barrel length: mm
Weight, with empty magazine: kg
Magazine capacity: 30 rounds
Rate of fire: 600 rounds per minute

The AKM introduced several major updates to the basic design of the AK. First and most importantly, it re-introduced a stamped steel receiver, although its design was quite different in detail from the original AK receiver of 1949. The forward trunnion is much smaller, and the fixed ejector is a part of the receiver rather than the trunnion. The barrel is now pressed into the forward trunnion and then pinned in place, instead of the previous method of screwing it in. The rear trunnion is significantly revised, as well as the particulars of assembly of these trunnions into the receiver. The top cover is strengthened by introducing stamped ribbing. The gas block and gas tube are revised. The front sight base is made narrower and lighter. The trigger unit is modified with the introduction of the hammer delay device, a ratchet-type subassembly that delays the fall of the hammer for a small fraction of a second. It does not affect the cyclic rate of fire but allows for more consistent ignition after stabilization of the bolt group in the forwardmost position. The return spring guide is simplified – instead of a telescoping setup, it is now formed from two elongated loops of steel wire, chained one to another, although this feature may not

be present on the AKM guns of earlier manufacture. Another “late” addition, approved only in 1965, which then became standard for AKM-type rifles is the spoon-type screw-on muzzle compensator, which helped to decrease muzzle rise and dispersion when firing bursts.
The lower handguard was modified with the addition of gripping protrusions on both sides. All wooden parts were now made from laminated wood rather than older-style hardwood. The forward sling loop was moved back from the gas block to the forward metal cap of the lower handguard. Rear sling loops were moved from the rear of the receiver to the rear of the stock, close to its bottom edge on the left side. A bayonet lug was added to the base of the gas block, and a new 6X3 multi-purpose knife-bayonet was designed for the AKM and AKMS.
The AKMS, a folding-stock version of the AKM, featured stamped steel struts for the down-folding shoulder stock, plus an added stop that precluded damage to the lower handguard from folded stock.
The AKM retained compatibility with older AK-type steel magazines, and a new, aluminum alloy magazine was created to further decrease the load of an infantryman. It was originally intended as a general issue item, not the “airborne special”, as it is often considered. However, limited manufacturing capabilities and insufficient durability resulted in a restricted supply of those magazines, and many AKM and AKMS rifles were initially used in service with older-style, ribbed steel magazines.

Chapter 9. AKM by the million

As said above, the AKM / RPK system was adopted by the Soviet army in 1959. Production orders for AKM and AKMS rifles were issued to the Izhevsk Machine-building plant IZHMASH (former factory No.74) and the Tula arms factory – TOZ. Production orders for the RPK and RPKS were issued to the "Molot" factory in the city of Vyatskie Polyany. During the sixties industrial capabilities of all factories were greatly improved and upgraded, resulting in a constant increase in the number of guns produced per year, along with decreases in production and labor costs. For example, in 1965 Izhevsk plant alone made about 260,000 AKM and AKMS rifles; in 1967 the annual output from IZHMASH rose to 372,000 guns, and in 1969 it reached 510,000 guns per year. This was achieved by constant improvements in manufacturing processes, including gradually increased use of precision cast and stamped parts that replaced forged and machined parts. It is interesting to note that cast metal parts for IZHMASH were made by another Izhevsk gun factory, the Izhevsk Mechanical Plant (IZHMECH), which perfected precision casting manufacturing processes during the mid-to-late fifties while mass-producing the Makarov PM pistol for soviet military and law enforcement.

Unfinished cast parts, produced by IZHMECH, in a factory museum display

From 1969 and until the end of mass production of AKM rifles in both Izhevsk and Tula in 1977, the annual output of IZHMASH exceeded half-million guns, with a peak production of 563,000 guns made in 1974. Exact production figures for the TOZ-made AKM rifles are not available yet, but the current estimate is that Tula amounted to roughly half of the total production of Kalashnikov AKM and AKMS rifles in the USSR. The best available estimate of the total number of AKM and AKMS rifles made in the USSR is 10.2 million guns. Production of "Night" versions was much smaller, with an annual output of AKMN and AKML rifles running in hundreds or low thousands.

The Soviet Naval Infantry of the Baltic fleet is parading with their brand new AKM rifles, ca 1965

The year 1963 marked the finalization of a new small arms system for the Soviet army. Besides 7.62x39mm AKM and RPK weapons, used at the squad level, it also added two new 7.62x54R weapons – the Dragunov SVD semi-automatic sniper (designated marksman) rifle and the Kalashnikov PK general-purpose machine gun. In the same year, Soviet ordnance experts performed a comparative test between the new Soviet small arms system and various NATO small arms systems, which included 7.62x51mm rifles such as M14, FN FAL, HK G3, and Armalite AR-10, as well as general-purpose machine guns such as M60, MG3, and FN MAG. All those weapons and suitable ammunition were obtained by Soviet intelligence from a variety of sources worldwide and were thoroughly studied and tested.

Special combat effectiveness tests were conducted to find which system offered better target hit probabilities or greater numbers of successfully engaged targets under various conditions and tactical scenarios. Those findings were later extrapolated for units of various strengths (squad, platoon, troop) using their respective country-specific tables of equipment, ammunition load-outs, and tactics. Overall findings of comparative trials were that at ranges of up to 400 meters, the Soviet infantry had a distinctive edge over their NATO adversaries. On average, for units of comparable size, the Soviet troops were expected to achieve a 20% higher hit rate than the American troops armed with M14 rifles and M60 machine guns, of 100% higher hit rate than the French troops with M1949/54 rifles and M1952 machine guns. At the extended ranges, however, the tables were turned in favor of the NATO troops, mostly due to the larger number of rifle-caliber machine guns per platoon and larger units. At 800 meters, for example, an American platoon was expected to hit targets about twice more often than a Soviet infantry unit of similar strength. The NATO rifles also offered somewhat better single-shot accuracy due to their longer sight radiuses, but it felt to be less relevant than the amount of fire, at least for proposed WW3-style scenarios.

Where the new Soviet system was superior to its Western counterparts was the combat load and maneuverability of an individual infantryman. On average, an AKM was about 15 – 20 cm (6-8 inches) shorter than a contemporary 7.62mm NATO rifle, making it much better suited for mechanized infantry use and for fighting in urban or forest environments. With 120 rounds of ammunition in four loaded magazines an AKM weighted 5.5 or 6.2 kg (12.1 or 13.7 lbs), with aluminum or ribbed steel magazines, respectively. The 7.62mm NATO rifles with 100 rounds in five magazines weighted between 7 kg (15.4 lbs) for a HK G3 with aluminum magazines and 7.8 kg (17.2 lbs) for an M14.

The size comparison of the US M14 and the Soviet AKM

During the 1960s, the AKM and AKMS constantly received various small, but useful upgrades. Starting in 1965 new AKM rifles were fitted (and some older rifles retrofitted) with a screw-on spoon-type muzzle compensator, which helped to control muzzle rise during a full-automatic fire. This little and seemingly very simple device was a result of several years' worth of experiments with various muzzle brakes, compensators, and other similar add-ons intended to help control muzzle rise and/or recoil.

Toward the end of the ninety sixties, older steel and aluminum alloy magazines were replaced in production with so-called “bakelite” magazines of characteristically red-brown color. Those magazines were produced from glass fiber-reinforced AG-4 plastic. Steel reinforced feed lips and locking lugs were

added after initial experience in the field, to increase service life and reliability of these magazines. Initial low-intensity production of plastic magazines commenced in 1964 in Izhevsk, but it took several more years for them to fully replace older metal magazines on factory floors in Izhevsk, Tula, and Vyatskie Polyany. New magazines were noticeably lighter than steel ones and much sturdier than aluminum alloy magazines. Actual bakelite was used for the manufacture of pistol grips for AKM rifles, which replaced earlier wooden ones in 1963. AKMS rifles retained more expensive old-style laminated wood grips, which proved to be more impact-resistant – a feature, especially important for airborne troops.

A variety of the standard issue AK, AKM, and RPK magazines, L to R: the early AK steel magazine, the ribbed AK steel magazine, the RPK steel magazine (40 rounds), the aluminum AKM magazine, the green (painted) plastic AKM magazine for the border troops, the standard plastic AK magazine and the 40-rd plastic RPK magazine. On the top is the 75-rd steel drum for an RPK

Despite the mass production of the AKM rifle, experimental work on new Avtomat and ammunition designs was still performed on a significant scale in all design centers. There were several directions for research, but most important, as ever, was the creation of more combat-effective small arms. Other secondary goals included lighter weight and lower production costs.

[the section about various experimental weapons is withheld and reserved for a future printed book]

The late sixties brought up an interesting offspring of the AKM family, the 6P1V rifle, which was simplified for mass production at general metalworking and machine-building factories. This rifle was intended for emergency wartime manufacture and was designed at IZHMASH around 1968 and perfected by 1970. It featured a simplified trigger system, cheaper and less durable plastic furniture, simplified rear sight, and several other time- and money-saving shortcuts, suitable for an "all-out nuclear war" class of emergencies.

The 6P1V – a simplified AKM derivative, designed to be mass-produced at non-specialized factories in the case of the WW3

Speaking on AKM and its descendants we certainly shall mention the original "Saiga" carbine, which was designed in 1974 to control the rapidly growing population of the Saiga deer in the steppes of Kazakhstan. Designed at IZHMASH, these carbines were built on original AKM receivers, fitted with new barrels, and chambered for the 5.6x39mm hunting cartridge. The 5.6mm round, originally developed in the mid-fifties, was based on the 7.62x39mm case necked down, so it was a relatively simple conversion. New stocks with semi-pistol grips, 15-round magazines, and semi-auto-only triggers completed the setup. These carbines were made in relatively small numbers (several hundred) and were issued to professional hunters who worked on saiga deer population control to protect local crops. This concept was resurrected 20 years later, with the introduction of highly successful lines of similarly named semi-automatic shotguns and rifles in post-Soviet Russia.

The prototype of the original Saiga 5.6x39mm hunting rifle, built on the AKM receiver in 1974

Chapter 10. Spetsnaz Special 1. Suppressing the AK

Soviet 'Spetsnaz' (*Спецназ – Войска Специального назначения*, Special Purpose Forces) played a key role in the Soviet military doctrine of the Cold War era. Various Spetsnaz units, responsible for reconnaissance and diversionary work behind enemy lines and other special operations, were formed at all levels. The most elite units reported directly to GRU, the General Intelligence Department of General Staff, Soviet Army. Suppressed weapons formed an important part of Spetsnaz equipment, and GRU and GAU paid special attention to the development of such weapons. During the Great Patriotic War, Soviet units that operated behind enemy lines successfully used suppressed Mosin M1891/30 rifles, fitted with Bramit clip-on sound suppressors. Several experimental sound and flash suppressors were developed for light machine guns (DP, DPM, and later RP-46). Some integrally suppressed automatic weapons, primarily submachine guns based on the PPD-40 and PPSh-41, were tested during the war. Those experimental suppressed submachine guns used special 7.62x25mm ammunition loaded with pointed L-type rifle bullets (same as used in 7.62x54R ammunition) to achieve subsonic velocities. None of these guns were adopted.

Work on subsonic ammunition and sound suppressors for use in all 7.62x39mm weapons (AK, SKS, and RPD) commenced at NII-61 as early as 1953, under requirements from the GAU. After initial tests with experimental subsonic ammunition and screw-on or clip-on sound suppressors, carried out in 1955-56, it was decided to stop the development of suppressed versions of RPD and SKS and concentrate further efforts on the AK only. The reason for this decision was that the subsonic powder charge was relatively weak, and bullets lost a significant amount of their velocity in longer barrels of SKS and RPD, compared to shorter AK. Also, accuracy in longer-barreled weapons was more erratic due to greater variations in muzzle velocities between shots.

Subsonic ammunition took some time to refine because the military wanted both sufficient accuracy and penetration; for this reason, a new, heavier projectile was designed with a core that was part steel (front) and part lead (rear). It weighed about 50% more than a standard 7.62x39 PS "ball" bullet and was of flat-base shape, rather than boat-tailed.

Extensive field tests of suppressed AK and new, subsonic ammunition were carried out in 1957, and a new system, consisting of the AK rifle with the new rear sight, PBS suppressor, and US (*УС – Уменьшенная Скорость*, Reduced Velocity, GAU index 57-N-231U) subsonic ammunition was formally adopted in 1959. Selected AK rifles, either with fixed or with folding stocks, issued to Spetsnaz, were upgraded with the installation of the special rear sight, with windage adjustment mechanisms and two range scales. One scale was a standard one, marked from 100 to 1000 meters and intended for use with standard ball ammunition. The second scale, located on the underside of the rear sight, was marked from 100 to 400 meters. It was intended for use with "US" ammunition. If required, this special rear sight could be installed or replaced on any standard AKM or AKMS gun at the unit armory level. The PBS-type sound suppressor completed the set, optimized for stealth use behind enemy lines.

The AKMS rifle equipped for the Spetsnaz operations with an early PBS silencer, a special rear sight, and a lightweight aluminum magazine

The PBS (*ПБС – Прибор для бесшумной Стрельбы*, Device for Noiseless shooting) suppressor, while rather conventional in concept, was quite unusual in its design. It featured an all-steel clam-shell construction, assembled from two semi-circular halves hinged at the front. Half-moon-shaped suppressor baffles were machined integral with suppressor body halves, and the entire setup was held together in a cylindrical shape by a screw-on rear end cap, which also had a threaded interface for installation on the muzzle of the host gun. The clam-shell design was initially chosen to simplify cleaning of the interior and replacement of the rubber wipes. Those wipes played a dual role – first, they captured powder cases inside the suppressor, decreasing the blast, and, second, they increased back pressure in the barrel, helping to cycle the action during semi- or full-automatic fire. In semi-automatic mode, the expected service life of the wipe was about 200 rounds, and spare wipes were packed in crates along with "US" type 7.62x39 subsonic ammunition, three wipes in each box of 600 rounds. During extremely cold weather, or under full-automatic fire, the service life of the wipes decreased noticeably. Use of the standard, supersonic ammunition with the suppressor installed was normally discouraged due to additional wear to the gun and the very short service life of rubber wipes. However, in real life, many Spetsnaz operators loaded their magazines for about half of their capacity with standard ammunition and then topped them up to full 30 rounds with US-type subsonic rounds. The rationale behind this was that in most cases operators had realistic chances to fire only a few "surprise" suppressed subsonic rounds; after that, a covert operation was either over or escalated into a conventional firefight, where there was no time to unscrew the suppressor, and remaining service life of the wipe be damned. It is not known if it has been practiced during the Soviet era, but it was reported as a fairly common occurrence during Russian operations against Chechen terrorists in the late 1990s. In that case, the PBS served as a "tactical" sound and flash suppressor.

The service life of the PBS suppressor was relatively short, as the new, similar muzzle device was introduced in 1962. It was the PBS-1 sound suppressor, which soon replaced older PBS in use by Soviet Spetsnaz. The new suppressor, developed by IZHMASH, was of a more robust design and less expensive construction. It offered better sound suppression, but still used a combination of steel baffles and expendable rubber wipes, as with its predecessor. PBS-1 had a cylindrical steel body with a screw-on rear cap. Steel baffles were assembled into an easily removable stacked unit, using three connecting rods. Despite their old age, PBS-1 suppressors and their host AKM or AKMS guns still can be found today in use by some units of the Russian MVD and Army, although these are now commonly replaced by much more effective 9x39 weapons.

The same rifle but fitted with an improved PBS-1 suppressor

The special rear sight, necessary to fire both a standard PS ball and a "US" reduced velocity ammunition accurately

[the section about experimental weapons is withheld and reserved for a future printed book]

Closing this chapter, we must note an interesting if a bit anecdotal example of the contemporary Western expertise on Soviet small arms and equipment. Back in 1985, the American "Combat weapons" magazine published an exclusive analysis of the "Spetsnaz silencer", which was captured somewhere in Afghanistan by Mujaheddin. Written by a famous expert on sound suppressors, "Doc" Dater, this article contained a spectacular mix of praise and critique for the Russian device, which, judging from the photos, was a standard-issue 7.62mm PBS-1. On the plus side, Dater noted the ruggedness, simplicity, and "soldier-proof" design of the can, as well as its utility for combat application; on the minus side, he

noted crude workmanship, and insufficient sound suppression effectiveness, compared to the best Western devices. In the process he also misattributed some parts, and, besides that, he expressed his belief that the device in question was intended for use with a 5.45mm AK-74 rifle, and thus compared it with American .22-caliber suppressors. The reason for that misattribution was disclosed in the closing paragraph of the article, which stated that Dater “never laid his hands on it”, for security and legal reasons, and all his analysis was based on a set of photos and nothing more.

The officer of the Spestnaz posing with an AKMN rifle kitted out with everything possible, including a night sight, a suppressor, and an underbarrel grenade launcher

Chapter 11. Following American steps: decreasing the caliber

Soviet military experts learned about new American developments in the field of Small-caliber, High-Velocity military small-arms ammunition in 1959. Some American gun magazines and several specimens of loaded .223 Remington cartridges were obtained in USA and sent for consideration to NII-61 in the city of Klimovsk.

This is a part of the American article about the first AR-15, printed in 1959. A copy of this publication, along with other items of interest, was quickly scooped by the Soviet intelligence

Since the number of original .223 Rem cartridges supplied from USA was very small, researchers at NII-61 (present TSNIITOCHMASH) created their own 'ballistic clone' of this cartridge, using readily available cases of 5.6x39 Blum hunting cartridge, developed in USSR in 1954. This small-game round was based on the 7.62x39 M43 case necked down, and normally loaded with relatively light, jacketed, or soft-nosed bullets. The first step in new research was to duplicate American bullets, with lead core and a total weight of about 3.5 – 3.6 grams (approx. 55 grain). Similar bullets were tested at various velocities, from 600 and up to 1350 meters per second, using 7.62x39, 7.62x54R, and 8.2x66 cases necked down. At least six different load combinations were tested, five with a 3.5-gram bullet and one with a 5-gram bullet and 39mm case. Research, conducted through the year 1960, resulted in the following conclusions: reduced caliber ammunition was found to produce less recoil than 7.62x39, it had a flatter trajectory, allowed for lighter guns, and generally was a very promising concept.

In 1961, the first provisional objectives were drawn for a new reduced-caliber small arms system. Those called for extremely lightweight guns (about 2 kg without magazine) with increased hit probability, longer effective range, and low recoil. Ammunition characteristics were set as a 5.6mm bullet with a weight of about 3.5 grams and muzzle velocity from an Avtomat barrel of about 1000 meters per second. All work on ammunition and all initial testing was performed by NII-61, and their first purposely-designed 5.6mm load was designated 13 MZh (*13МЖ*). It was assembled using a necked-down 7.62x39 M43 steel case. The first test guns to fire 13MZh ammunition were rebarreled AKM rifles made at Tula Arms factory, as well as the recently developed experimental AO-25 avtomat, designed by V.Shilin at NII-61. The latter gun was originally built to fire 7.62x39mm ammunition, as a lighter and less expensive alternative to AKM. At first glance, AO-25 looked much like the AKM, but was quite a bit lighter, only 2.55 kg less magazine; it had a 415 mm barrel and featured a linear striker instead of the more common rotating hammer, as well as a simplified trigger mechanism. Initial tests of both guns gave very promising results, with dispersion in short bursts reduced almost by half, compared to a standard 7.62mm AKM rifle. The AO-25, however, appeared to be a bit too light, as an anecdotal situation has been recorded during the military tests. One of the first AO-25 prototypes routinely failed to produce full automatic fire, jamming after almost every single shot. The reason for this problem has been identified as the slightly bent receiver, which was damaged by an overly enthusiastic and rather powerfully built test shooter.

Next year, work on reduced caliber cartridges was expanded to include two more potential calibers – 4.5mm and 6.5mm. Also, significant effort was put into a separate research program, performed jointly by the teams from NII-61 and Rzhevka proving ground, located in the suburbs of Leningrad city (present-day Saint-Petersburg). In the year 1961 Rzhevka proving ground assumed small arms and ammunition test and evaluation duties of the former NIPSVO, which was reorganized in 1960. This new massive field and theoretical study was established to research and analyze modern-day and future tactics of infantry units, employment of small arms, new types of targets, and their behavior on a battlefield. As a result, this program was intended to establish practical and reasonable requirements for future individual and squad-level small arms. Besides theoretical calculations, the study also included a significant number of test firings by a variety of shooters (from mediocre to highly experienced), using a wide variety of tactical scenarios and targets. Due to the large amount of work, this research program was carried on until 1963. The year 1963 also saw the rejection of 4.5mm caliber as too small and ineffective. Comparative tests of several weapons, chambered for 5.6mm and 6.5mm against the standard-issue 7.62mm AKM were carried the same year.

Those early trials of 1963 included AKM rifles, rebarreled to 5.6 and 6.5mm, as well as two purely experimental rifles in 5.6mm – Shilin AO-25 from Klimovsk and Korobov TKB-022PM-5 from Tula. As a result, 6.5mm ammunition, which was tested in two experimental loads, with the 4.8-gram bullet at 850m/s and 5.6-gram bullet at 795 m/s, was rejected as providing no noticeable gain in effectiveness over the 7.62x39 M1943. The 5.6mm weapons, on the other hand, performed rather well, offering an overall increase in effectiveness (target hit probabilities) of about 70% at ranges of up to 400 meters, and a 25% increase in effectiveness at 600 meters, also compared to 7.62x39.

Experiments and refinement of the 5.6mm cartridge continued through 1964 and 1965. Designers and ballisticians from NII-61 tried different bullet shapes and weights, experimented with the design and relative weights of the combination steel and lead core, adjusted powder charges, and so on. Additional efforts were concentrated on the development of an effective and reliable tracer bullet that would have a trajectory matched to the standard ball load. Several new rifles were designed to fire new cartridges, including:

- AO-34; had a barrel and receiver movably mounted inside a bullpup housing like an artillery barrel mounted on the carriage, with buffers that softened recoil and counter-recoil cycles of the entire action
- AO-35 with a ‘constant recoil’ system, in which the bolt group runs out on its rearward motion without hitting the receiver
- AKM-based rifle with ‘balanced’ action
- AKM-based rifle with the rate of fire increased to 1,000 rounds per minute
- TKB-022 PM-5 bullpup with very short action and vertically sliding breechblock instead of the most common horizontally moving bolt group (an evolution of the earlier TKB-022 PM in 7.62x39mm)

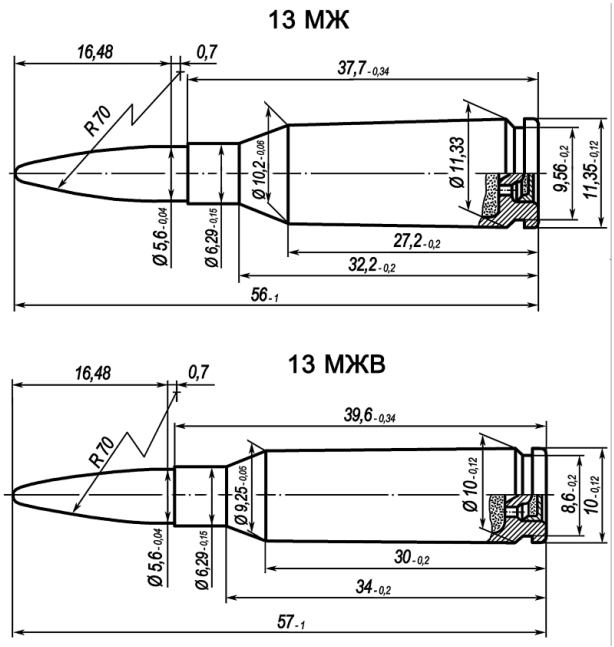
In mid-1964 a comparative dispersion test was carried out for 5.56mm Colt AR-15, 5.6mm AO-25, and 7.62mm AKM rifles. The table below shows average results when firing short, controlled bursts from various positions.

Table 11.1 Average dispersion of short bursts, (R100) at the range of 100 meters.

Firing position	AR-15	AO-25	AKM
Prone, supported	34 cm	33 cm	48 cm
Prone, off-hand	123 cm	97 cm	127 cm
Standing, best shooter	250 cm	260 cm	280 cm
Standing, worst shooter	570 cm	520 cm	580 cm

In mid-1965 Soviet Army performed its first large-scale field test of 5.6mm weapons, using the rebarrelled AKM rifles and RPK light machine guns. At least 80 riflemen and 12 machine gunners were organized into 4 test platoons. First, they performed a standard tactical field marksmanship course with their issued 7.62mm weapons, to be used as the base of measurements. After that, they were ordered to perform the same tactical course of fire with new 5.6mm weapons. Accumulated results were again quite positive: In defensive scenarios (firing from trenches and using supported positions) small-caliber weapons increased the overall effectiveness (number of hits) of units by as much as 75%. In offensive scenarios, when soldiers fired on the move and from unsupported, off-hand positions, overall effectiveness was increased by 45%. Another interesting result was that quite a lot of soldiers who performed marginally or worse with 7.62mm weapons, had their scores noticeably improved with the new 5.6mm guns.

1965 brought up important program change. It was the introduction of a new, smaller diameter case, known as 13MZhV (13МЖВ). It had a case length of 39.6mm (as opposed to 37.7mm of earlier 13 MZh), and its base diameter was decreased from 11.35 to 10.0 millimeters, making the cartridge slightly lighter and less expensive. Case taper was decreased for a more optimal shape, to help reliable feeding and extraction.



The diagram comparing the early 13 MZh and the latter 13MZhV experimental 5.6mm cartridges

The years 1966 and 1967 followed with the more evolutionary development of the cartridge, including nuances in the design of the bullet, case shape, primer, and powder charge. Several new rifles were tested during this period, including the following most interesting ones:

- The heavily modified AO-25, which now used its magazine as a pistol grip, with the trigger moved appropriately to the front of the magazine housing. It also had a holder for a spare magazine at the front, which could be used as a forward grip.
- The AO-36 with twin barrels and a single bolt carrier/bolt group and gas system. Gun fired salvos of two bullets to achieve a 'shotgun' effect and improve hit probability per single pull of the trigger
- The AO-38, a new balanced action rifle by P.Tkachov
- The AO-40, with gas-operated action and so-called "recoil impulse accumulation system"

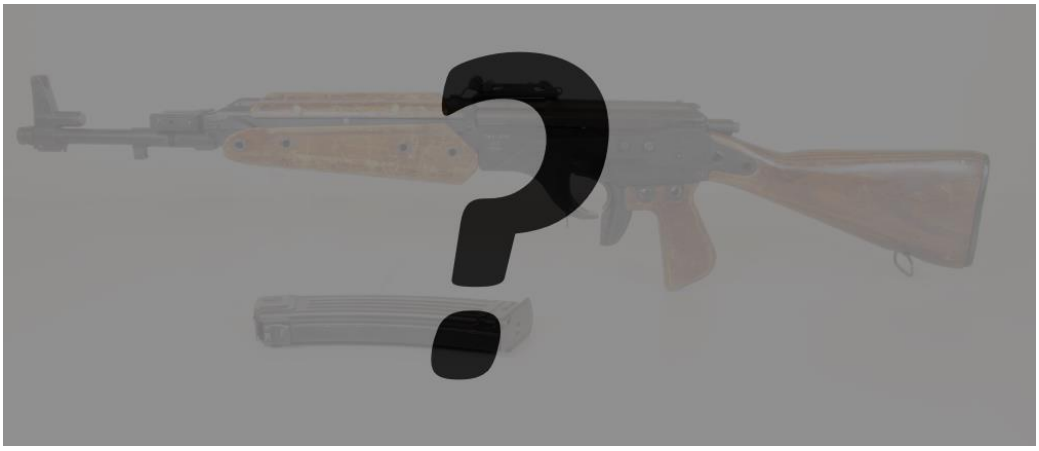
In the summer of 1967 the General Artillery and Rocket department of the Soviet army, or GRAU in short, issued its official Tactical and Technical Requirements for the new small arms system, consisting of Avtomat and light machine gun and firing 5.6x39mm 13MZhV ammunition. Among numerous 'must-

have' or 'desirable' objectives was an increase of overall effectiveness by the factor of 1.5-2, compared to a similar 7.62x39mm system, and weight of the Avtomat to be no more than 2.5 kg (less magazine, sling, and other accouterments).

During the first half of 1967, the new project entered its next phase. GRAU issued official orders for the final development and manufacture of more than 1 million rounds of the new 5.6mm ammunition and new rifles to fire this ammunition. Ammunition development was again contracted to TSNIITOCHMASH (former NII-61), and cartridge manufacturing orders were issued to Tula and Klimovsk ammunition plants. Rifle development orders were issued to the Izhevsk machine-building plant (IZHMASH), the Central Design Bureau for Hunting and Sporting arms (TSKIB SOO) in Tula, and the Kovrov mechanical plant (KMZ). The original schedule called for initial tests of new systems by the third quarter of 1968 and field trials of selected weapons in the first quarter of 1969.

New ammunition, based on the 13 MZhV case, was extensively tested under a wide variety of conditions, including new and worn-out barrels, with normal or excessive headspace, under temperatures ranging from -50C to +50C.

In December of 1967 weapon manufacturers submitted their projects for approval. IZHMASH submitted two rifles – the A-3 by Kalashnikov, based on the proven AKM, and the AL-4 by Alexandrov, an indigenous lightweight gas-operated rifle of conventional design. Tula also submitted two designs – the TKB-070 by Sokolov and the TKB-072 by Korobov. The first rifle featured a buffered barrel, second was of balanced action design. Finally, Kovrov submitted the SA-003 rifle by Konstantinov, with a classic action and bullpup layout. Sometime later Tula also submitted a modified 5.6mm TKB-011 rifle by Afanasivev, a gas-operated weapon of bullpup layout with a plastic body. Originally developed in 1963, the TKB-011 had an ejection port facing forward and to the right, above the pistol grip, permitting comfortable firing from the left shoulder. All prototypes were tested by the end of 1967, with generally unsatisfactory results.



[the section about experimental weapons is withheld and reserved for a future printed book]

The next round of rifle tests took place between September and November of 1968 at TSNIITOCHMASH. It included improved A-3 and AL-4 rifles from Izhevsk, TKB-072-1 from Tula, and a new SA-006 rifle from Kovrov, which employed gas-operated balanced action. Two experimental rifles from TSNIITOCHMASH were tested for comparative purposes – the balanced action AO-38M and the 'constant recoil' AO-35 rifle. This time no gun came close to desired objectives, too. Once again improved weapons met at the test range in late 1969. Besides the already familiar, but updated A-3, TKB-072-1, SA-006, AO-35, and AO-38M, this round of trials saw a new AL-5 balanced action rifle from Izhevsk.

The results of the 1969 trials were as follows: AL-5 and AO-35 failed due to parts breakages. Regarding reliability and durability, only the Kalashnikov A-3 fulfilled all requirements, with the SA-006 coming close second and the TKB-072-1 third. Those three were approved for the final round of trials at TSNIITOCHMASH, which took place in early 1970. The Konstantinov SA-006 proved to be the best in regards to the effectiveness of fire, having less full automatic dispersion in all shooting positions and scenarios. After a review of the results, A-3 and SA-006 rifles were approved for field trials, and orders were issued for the manufacture of 100 rifles of each design. In 1970, an SA-006 rifle also was tested against an US M16A1 rifle, and found to be superior to American rival, especially when fired in short bursts from off-hand (standing or kneeling) positions.

The Kalashnikov A-3 prototype, from the declassified report dated 1969

As per orders of the Headquarters of Soviet Land armed forces, field trials were scheduled for January – October of 1971. Meanwhile, TSNIITOCHMASH also tested several new balanced action rifles, including Alexandrov AL-6M (in 7.62x39 and 5.6x39) from Izhevsk and Shilin AG021 from Klimovsk. It is interesting to note that while 5.6mm balanced action rifles offered marked improvements in effectiveness compared to 7.62mm AKM, the 7.62mm AL-6M rifle with the same balanced action was more or less equal to older, but much simpler, and lighter Kalashnikov weapon.

Extensive field trials of A-3 and SA-006 rifles were conducted in the Moscow and Zabaikal military districts and included a broad variety of tactical firing courses, performed by individual soldiers and small units. On average, both 5.6mm rifles performed noticeably better than the standard-issue AKM, with generally similar results. The SA-006 had a slight edge over the A-3 when fired from off-hand positions, but it also had some specific weak points, inherent to its more complicated design. One interesting take-off from these trials was that the combination of the lighter ammunition weight and smaller dispersion allowed, on average, a 50-250% increase in hits per given amount of individual kit weight, considering the full expenditure of ammunition, carried by each soldier. In regards to combat effectiveness, SA-006 was considered to be about 10% better than A-3 in terms of hit probability, but SA-006 was also less durable, much more complicated to maintain and repair in the field, and required much more force to manually cycle the action, especially when clogged with dirt and powder residue after extensive use.

[the section about experimental weapons is withheld and reserved for a future printed book]

An interesting, if not entirely statistically accurate comparative test was carried out at the TSNIITOCHMASH in 1972. It included two new 5.6mm Soviet experimental rifles, pitted against several Western weapons, chambered for the 5.56x45mm ammunition. Two highly experienced shooters fired three strings of 20 rounds from each rifle from each position. For western weapons, one batch of Austrian-made M193 ammunition was used for all tests. These results, listed in the table below, should be taken with a grain of salt because the number of weapons, shooters, and strings of fire was too limited to draw statistically viable conclusions about the comparative merits of each system.

Average dispersion (R100, cm) at 100 meters

Mode of firing and position	A-3	SA-006	M16A1	HK 33	FN CAL
Single shots, prone supported	9,7	12,3	12,1	11,8	11,4
Short bursts, prone supported	28,1	30,5	49,4	46,5	-
Short bursts, prone off-hand	64	82	126	110	-
Short bursts, standing off-hand	117	118	186	167	-

The final round of trials took place during the second half of 1972. It confirmed the overall superiority of the 5.6mm system over the existing 7.6x39mm system and the slight edge of the SA-006 over the A-3 regarding overall combat effectiveness. However, the SA-006 rifle again was found to have some serious flaws in regards to the durability of parts (especially barrel life) and complexity of maintenance and repair, and the Kalashnikov A-3 was recommended for immediate adoption. The SA-006, however, was not rejected outright; the trial report recommended further perfection of the balanced action system in the search for an even more effective rifle. On January 10th, 1973, GRAU officially approved these results. The year 1973 also saw the first official trials of the 5.6mm Kalashnikov P-3 light machine gun, a magazine-fed squad automatic, designed along the lines of RPK but based on an A-3 rifle, as well as a folding stock version of the A-3. Early variants of the folding versions of the new Avtomat featured AKMS-style bottom folding shoulder stocks. However, a more sturdy side-folding triangle-type stock was soon developed by the Kalashnikov team. Made from stamped steel, it was selected for adoption after field trials with airborne units.

This period also saw the change of nomenclature of the new round, from “5.6mm” to “5.45mm”. Original nomenclature came from the bullet diameter (or bore caliber measured by the rifling grooves);

new designation came from nominal caliber, measured by lands of the rifling, as per long-standing Russian tradition. Actual dimensions of the bore and projectile remained unchanged.

As a result of more than a decade of extensive development, on January 18th, 1974, the Soviet Government officially adopted a new small arms system, consisting of the following items:
- cartridge, 5.45mm, 7N6, with a jacketed bullet that has a mild steel core
- cartridge, 5.45mm, 7T3, with a tracer bullet
- Avtomat Kalashnikova AK-74 with fixed stock (GRAU index 6P20) and AKS-74 with side-folding stock (GRAU index 6P21)
- Light machine gun RPK-74 with fixed stock (GRAU index 6P18) and RPKS74 with side-folding stock (GRAU index 6P19)
- "night" versions of all four guns, listed above, with sight rails pinned to the left receiver wall.

The early versions of AK-74 and RPK-74 with the wooden stocks and forends

The first ten thousand AK-74 were produced in Izhevsk by the end of 1974. However, it took several more years to perfect the new system, including solving complicated problems of water in the bore, barrel life, new manufacturing technologies (such as the cold hammer forging process for barrels), etc. As a result of efforts, put into the solution of said problems, the actual barrel life of AK-74 rifles was increased to 15 thousand rounds, and sometimes even more. The problem of firing with water in the bore, which originally caused ruptured cases and other malfunctions and damage to the gun, was eventually solved by improving the configuration of the bolt and slightly increasing the thickness of the cartridge case base. In the end, production guns were expected to withstand at least six consecutive shots with a bore filled with water, without any negative effect on the remaining service life of the weapon under normal conditions.

New ball powders, required for the 5.45mm ammunition, also had their share of teething problems, and the new 5.45mm ammunition was the prime source of delays. Manufacturing orders for AK-74 and AKS-74 rifles were issued to Izhevsk Machine-building plant IZHMASH and Tula Arms factory TOZ, and orders for RPK-74 and RPKS-74 – to "Molot" factory at Vyatskie Polyany. Production of 5.45mm AK-74 and

7.62mm AKM happened at IZHMASH concurrently until 1977, when smaller caliber avtomat finally replaced its predecessor on factory floors.

According to available sources, between 1974 and 1993 IZMASH and TOZ together produced well over five million of 5.45mm rifles, with the Izhevsk factory producing most of these guns. It is worth noting that Tula produced only fixed-stock AK-74 rifles of early pattern, with wooden furniture.

Soviet Border Guard soldier with an early AK-74

It also must be noted that an AK-74 never fully replaced an AKM in the ranks of the Soviet army. Many 'non-infantry' units retained older 7.62mm rifles and machine guns for decades; for example, when the author of this book served with the Air Defense forces of the Russian army in 1997-98, his unit kept full supplement of 7.62mm AKM assault rifles for guard and local defense duties. Most of these rifles were older than that young Lieutenant and enlisted men under his command. Even today, in the year 2023 and almost a half-century since the adoption of the 5.45mm system, old AKM and even older AK rifles may still be encountered in the hands of Russian troops. For example, Military Police units of the Russian Army, operating in Syria in 2018-2020 and protecting the Russian army bases there from ISIS terrorist groups, were noted to carry 7.62mm AK and AKM rifles, apparently taken from the old, Soviet-era reserve stocks. It seems that the key rationale behind this choice was the availability of the locally sourced 7.62x39mm ammunition, which allowed savings on shipping the ammunition from Russia to the Middle East. It also must be noted that many Russian Spetsnaz units, operating at the same time and in the same theater, were observed carrying most modern tactical equipment, including the latest 5.45mm AK-12 rifles.

Another reason to keep 7.62mm AKM and AKMS rifles in armories of certain units that officially switched to 5.45mm AK-74 is the availability of the 7.62mm subsonic ammunition for use with PBS-1 sound suppressors. Such units usually belong to the Spetsnaz or are performing reconnaissance duties

within the infantry, airborne, or naval infantry regiments and divisions. Attempts to produce suppressed 5.45mm weapons turned out to be less than successful, but more on this later.

Avtomat Kalashnikova AK-74

The AK-74, made in 1980 in Tula

The AKS-74 with late 1980s-style plum plastic furniture a rubber tourniquet and a first aid kit in the stock, Afghanistan style

Specifications:
Ammunition: 5.45x39
Overall length: mm
Barrel length: mm
Weight, with empty magazine: kg
Magazine capacity: 30 rounds
Rate of fire: 600 rounds per minute

Mechanically, the AK-74 was similar to the late production AKM rifles, although there were numerous minor changes in some parts, such as bolt or gas block. The barrel was manufactured using a cold hammer forging process, and had a hard chrome coating of increased thickness, compared to older 7.62mm rifles. It featured an entirely new and highly effective muzzle brake/compensator with two

chambers, which reduced felt recoil, and muzzle rise, and also helped to decrease the sound signature of the muzzle blast to some extent. The muzzle brake was attached to the barrel using simple thread and held in place by a spring-loaded plunger, installed in the front sight base. Early guns featured wooden furniture, with fixed butt stocks having horizontal indentations, which helped to reduce weight and to easily distinguish new 5.45mm guns from older 7.62mm guns, even in the darkness. For airborne use, AKS-74 rifles were fitted with a side-folding stock of a new design. Made from stamped steel, it was more robust and comfortable than earlier under-folder stock and folded to the left. The rear sight now was marked to 1000 meters instead of the previous 800, although both settings seem to be rather optimistic. AK-74N and AKS-74N rifles were fitted with scope mounting rails, pinned to the left side of the receiver, to accept mounts for night optics.
Original 5.45mm magazines were made from brown-red glass-fiber reinforced plastic known as AG-4, which is often erroneously referred to as Bakelite. Starting in the mid-1980s, wooden furniture was gradually replaced with plastic furniture, initially of dark plum color. The same plastic was used to make new magazines. Starting in the early 1990s, all plastic parts, including magazine bodies, were made in black color.

[the section about experimental weapons is withheld and reserved for a future printed book]

To conclude this chapter we shall point out that while it appears that during the sixties and early seventies, the USSR tried to catch up with Americans, in the larger scheme of things situation looked somewhat different. It must be noted that the majority of NATO forces that directly faced their Soviet and Warsaw Pact opponents, including the majority of the American contingent in Europe, were still armed with 7.62x51mm rifles and 9mm submachine guns by 1980. Of those NATO armies, only France began the changeover to a 5.56mm FAMAS assault rifle in 1978, and the rest began its rearmament to the newly adopted 5.56mm NATO cartridge only during the mid-eighties, and mostly completed this process by the late nineties.

Chapter 12. Spetsnaz special 2: going under the sea

[the section about experimental weapons is withheld and reserved for a future printed book]

Chapter 13. Upgunning the AK. Underbarrel grenade launchers

Work on the rifle grenade launcher for the AKM rifle began in the TSKIB SOO design bureau in Tula around 1963. Early tests proved that older-style muzzle cup launchers that used blank or live rounds were unsatisfactory, and the decision was made to create a separate weapon, which then be attached to the host gun. Experimental 43mm armor-piercing / fragmentation rounds for the new weapon were designated TKB-047. The launcher to fire these grenades was designated TKB-048 "Iskra" (*Искра*, Spark), and its factory tests commenced in 1966. Armor penetration for the new projectile was estimated as 50mm RHA at 90 degrees. The grenade launcher was a single-shot muzzle-loading weapon with a pistol grip, trigger, and sights. It was attached to the barrel of the host Avtomat using bayonet mount lugs. The 'iskra' was officially tested in 1970, but the results were not inspiring. On the other hand, the new TKB-0121 grenade launcher, developed at the same organization by V.Telesh was a more promising design. A new research and development program codenamed "Kostyor" (*Костер,* bonfire), was initiated in 1971 as a joint effort between TSKIB SOO, responsible for the launcher itself, and "Pribor" medium caliber ammunition factory in Moscow, responsible for ammunition for this project.

The AKM rifle fitted with the experimental TKB-048 "Iskra" grenade launcher, ca 1967

Unlike western rivals, Soviet engineers went for a 'semi-caseless' design of the round, while employing the same basic 'high/low pressure' propulsion system which permitted the use of relatively short and lightweight barrels to launch grenades with muzzle velocities about 75 m/s. Soviet VOG-25 round had its propellant charge stored inside a small tubular 'case' made integral to the base of the projectile. Therefore, upon launch, there was no fired case left in the barrel that had to be ejected before loading the next round. Also, it allowed for a muzzleloading system, which is very fast to reload and has fewer parts than a breech-loading design. This highly successful system was officially adopted in 1978 as a GP-25 grenade launcher, with a GRAU index of 6G15 (*6Г15*). This index was normally stamped on the side of early production launchers. Some western experts misread the digit "6" for the Cyrillic letter "Б", and because of this simple mistake GP-25 was erroneously listed in many Western publications, including Jane's, as "BG-15 launcher".

As time passed, the original GP-25, which was manufactured by the TOZ - Tula Arms factory, was slightly improved and put into production at TOZ as GP-30 in 1989. For some unknown reasons, the Russian military mostly ignored the GP-30 (despite officially approving it and assigning GRAU index 6G30), but several thousand were delivered to the Russian MVD and some more were sold for export.

Later on, IZHMASH developed its version of the GP-25 system, with various minor changes and upgrades, which was adopted under GRAU index 6G34 and entered serial production in Izhevsk in 2005 as GP-34. All those launchers fire the same nomenclature of 40mm semi-caseless grenades, based on the VOG-25, which now includes, besides basic High Explosive / Fragmentation payload, numerous

versions with incendiary, thermobaric, Smoke, Signal and Illumination flares, and several Less-lethal riot control loads with tear gas, flash-bang or 'impact baton' projectiles.

It must be noted that when compared to western breech-loading systems, Russian muzzle-loading grenade launchers have both advantages and disadvantages. A key advantage of the Russian system is noticeably faster reloading, with fewer manipulations required between shots. The key disadvantage lies in the fact that due to the muzzle-loading design, the barrel of the GP-25 and its successors is noticeably shorter than the barrels of M79, M203, AG-36, and other NATO-standard 40mm low-velocity grenade launchers. Thus, to achieve the same muzzle velocity Russian system requires faster acceleration of the projectile, which results in a brisker and more violent recoil. Also, the barrel has to be made from steel, while many Western 40mm grenade launchers have aluminum alloy barrels. Strong recoil requires the use of a clip-on soft rubber buttplate on a host rifle and limits the usage of the grenade launcher on a single host gun to 400 grenade shots. Per the official GP-25 manual, once the host gun reaches 400 discharges from the mounted grenade launcher, it must be retired from the "grenadier" role and used afterward only as a standard rifle, on the dangers of the accumulated receiver damage and possible distortion.

GP-25, GP-30 and GP-34 grenade launchers

The GP-25 grenade launcher on an AK-74M rifle

The GP-30 on an AK103

The GP-34 launcher (less its host rifle), with a variety of 40mm semi-caseless grenades, including the smoke and less-lethal (tear gas) types

Specifications:

	GP-25	GP-30	GP-34
Ammunition	40mm VOG-25		
Overall length	320 mm	276 mm	315 mm
Weight, empty	1.5 kg	1.3 kg	1.4 kg

The GP-25 grenade launcher is a single-shot, muzzle-loading weapon with a rifled barrel. It uses all types of 40mm VOG-25 type grenade rounds with the propellant chamber (case) integrated into the base of the grenade. The trigger is of Double Action Only type, with a manual safety. Additional automated safety precludes loading and firing if the weapon is not properly installed on the host rifle. Grenade launchers are mounted on the host rifle using the built-in mounting interface, which latches onto the bayonet lug of the rifle.
A loaded grenade is held in the bore by a special retaining spring. Unloading is facilitated using a plunger-type extractor, operated manually from the rear of the action.
GP-25 had its iron sights mounted on the left side of the gun. The front and rear sights are mounted on a single pivoting base, with a range scale marked below. The sighting range is up to 400 meters, with indirect fire capabilities.

The GP-30 differs from its predecessor in several ways. It has a different trigger system, with a rocking, rather than linear trigger, and cross-bolt button manual safety. Iron sights are mounted on the right side of the weapon, with a front post and ladder-type rear. The rear sight folds down and forward when not in use. Sights offer no indirect fire capabilities.

The GP-34 is more similar to the GP-25, as it has a linear DAO trigger and a manual safety on the left side of the trigger guard. Sights are mounted to the right of the weapon. Front and rear sights are attached to a single base, which pivots in a vertical plane and can be fixed against a moon-shaped range scale with notches for different distances between 50 and 400 meters. Sight can be used for both direct and indirect fire. In indirect mode, available ranges are between 200 and 400 meters.

To reduce felt recoil, all grenade launchers are issued with clip-on rubber butt-pads, which can be easily installed over the shoulder stock of the host rifle. Due to heavy recoil, early AK-74 rifles had to be issued with new, updated return spring guides with added top cover latches. Late production AK-74M and subsequent rifles had their top covers and return spring guides updated to better withstand the recoil of the grenade launchers.

Firing positions for an GP-25

[the section about special noiseless weapons is withheld and reserved for a future printed book]

Chapter 14. The “Modern” project. AKS-74U, its variants, and rivals

The need for a compact, Personal Defense Weapon for the vehicle, equipment, and heavy armament system crews was recognized for many years, but for the most part, this niche was filled either by a pistol (Makarov PM or Stechkin APS) or by an Avtomat with folding shoulder stock (AKMS). However, in 1969 aforementioned Petr Tkachov, a prolific and talented small arms designer from TSNIITOCHMASH, designed a sub-compact AO-46 “submachine gun” firing then-experimental 5.6x39 MZhV-13 ammunition. It was an unusual weapon with gas-operated action and a magazine that was used as a pistol grip. To provide a more comfortable hold, Tkachov designed a proprietary magazine, where ammunition was canted “nose up” to reduce the length (front to back) of the magazine/grip body. Examination and tests of this little gun led to the opening of the “Lightweight 5.6mm submachine gun” R&D program, which was initiated by the Soviet Ministry of Defense in 1971. This early effort evolved into the “Modern” research and development program, which commenced in 1973 on direct order from GRAU. Official tactical and technical requirements for the sub-compact 5.45mm Avtomat were issued in December of 1973, and several design teams took this challenge. Among those was Stechkin from Tula, Simonov from Klimovsk, Konstantinov from Kovrov, and, last but not least, Kalashnikov from Izhevsk.

Original requirements under the “Modern” program called for the following basic features:
- ammunition: 5.45x39mm, all types
- modes of fire: semi- and fully automatic
- empty weight: no more than 2.2 kg
- maximum length: no more than 750 mm
- length with stock folded: no more than 450 mm
- magazine capacity: 20 and 30 rounds
- maximum effective range: 500 meters

Interestingly enough, original requirements also listed the version with fixed stock, although the folding stock variant was considered to be the primary configuration. Of all the participants, only the Kalashnikov team ignored the fixed stock version and concentrated only on a folded stock, while the rest of the competitors delivered both variants for initial tests.

Simonov AG-42 and AG-43 rifles were of fairly straightforward design, with a gas-operated, rotary bolt action. Stechkin submitted TKB-0116, which used rarely encountered short recoil-operated action with a rotary barrel. It also featured a special muzzle ‘flash moderator’, made necessary due to the relatively short barrel. Konstantinov AEK-958 was also of conventional, gas-operated, rotary bolt construction, but heavily relied on plastics in its design, including the steel-reinforced plastic receiver, with massive muzzle brake/compensator and fixed side-folding polymer stock. Kalashnikov team submitted the PP1, which was based on the new AK-74 rifle and featured shortened barrel, hinged top cover, and AKMS-style underfolding shoulder stock. It must be noted that before the PP1 there was an experimental PPL

prototype, developed at IZHMASH in 1971-72 by the young and aspiring designer E. Popovich. After the initial examination of PPL, Kalashnikov invited Popovich to join his team and to work on the PP1.

The Kalashnikov / Popovich PPL prototype compact assault rifle, 1973

Between 1975 and 1977 Kalashnikovs' team changed their design several times, designing and testing various types of folding stocks and muzzle devices. Their final design featured side-folding shoulder stock, taken directly from AKS-74 and made from stamped steel, as well as a specially designed "afterburner/flash hider" muzzle device which helped to decrease muzzle blast and ensure necessary reliability from the shortened gas system and barrel. Field tests of the new Kalashnikov sub-compact commenced in 1977, and official adoption followed in 1979. It was officially designated as AKS-74U (Ukorochennyj – *Укороченный*, shortened), and received GRAU index 6P26. All experimental work and trial manufacture was done in Izhevsk, at IZHMASH. It also made some production guns until about 1981. Mass production orders for AKS-74U rifles and their derivatives, however, were issued to the Tula arms factory – TOZ, which exclusively produced these weapons for military and law enforcement use between 1978 and 1993. Production AKS-74U rifles featured wooden handguards and forend. Pistol grips were made from plastic. During the late eighties, a complete plastic furniture set of characteristic plum color was developed for AKS-74U, but this was never put into mass production. It must be noted that TOZ retained machinery, jigs, and other manufacturing facilities for AKS-74U until about 1997, but then mothballed its production line due to a lack of orders and a severe financial crisis.

One of several different PP1 prototypes, ca. 1976

Avtomat Kalashnikova AKS-74U

The AKS-74U with a rare 20-round magazine

The AKS-74U with an experimental plastic forend and an experimental plastic magazine

Specifications:
Ammunition: 5.45x39
Overall length: 730 mm (490 mm with stock folded)
Barrel length: 206 mm
Weight, with empty magazine: 2.71 kg
Magazine capacity: 20 or 30 rounds
Rate of fire: 700 rounds per minute

The basic mechanisms of the AKS-74U are similar to those of the AKS-74, including side-folding shoulder stock, made from stamped steel. Major changes include faster rifling in the bore (1 turn in 165 mm as compared to 1 turn in 200 mm for standard AK-74), a shortened barrel with gas block moved back and the gas piston rod appropriately shortened. A gas tube with upper handguards is held in place by a spring-loaded plunger, rather than the typical rotating lock. The muzzle is fitted with a new flash hider, which noticeably reduces the otherwise severe muzzle blast. The top cover is hinged at the front and opens up and forward, as opposed to the standard, fully detachable top cover of AK-74. The front sight is installed on the gas block, and the simplified flip-up rear sight is mounted on the top cover. The sight blade has two settings – one marked with the Cyrillic letter “П” (P), intended for all ranges up to 350 meters, and the second, marked with the digit “5”, intended for longer ranges of up to 500 meters. “Night” versions, such as AKS-74UN2, were fitted with a side rail, pinned to the left receiver wall, and

intended to accept mounts for night sights. There were no provisions for bayonet mount, although standard knife-bayonets were still issued along with AKS-74U rifles as utility knives. Early AKS-74U featured AKMS-type wooden pistol grips, which were later replaced with brown Bakelite grips. Handguards were made from laminated wood.
A special 20-round magazine was developed for use along with AKS-74U as a personal defense weapon for aircraft crews, but it was relatively scarce.

Like its bigger and older brothers, the AKS-74U also spawned its line of descendants. Those included several “Night” versions with side rails on the left, and a separate line of “Spetsnaz” variations, optimized for suppressed use and described in the next chapter.

A group of Russian police officers from a Rapid Reaction group with AKS-74U rifles, circa 1995

It must be noted that AKS-74U saw different uses. Within the Soviet army, it was issued as a Personal Defense Weapon to a vehicle and various armament system crews, and helicopter crews operating in combat zones (i.e. in Afghanistan). Helicopter crews in Afghanistan received a unique accessory, the large plastic holster, which was normally carried on the hip, attached to the belt. This holster held an AKS-74U sans its stock and flash hider, thus creating a sort of huge automatic pistol for close defense. The holster was designed for the unloaded gun, although one ready-to-be-loaded magazine was carried inside the holster, clipped to the gun by a short rubber band. The extra spare magazines could be carried on the pilot’s vest or in the pockets of his combat uniform. While these holsters were observed in combat use, many airmen preferred to store their issued AKS-74U in a fully assembled condition (with stock and flash hider) somewhere inside a cabin of the helicopter, or strapped to the chest, because heavy holsters seriously impeded movement, especially when abandoning crashed helicopter under enemy fire. There are also some eyewitness reports of those holsters being used by combat helicopter crews during the Chechen campaigns of the 1990s and early 2000s.

The extra rare plastic holster for an AKS-74U, issued to the Soviet helicopter crews in Afghanistan, from a private collection

The same holster in use by the crew of the Soviet Mi-8 combat transport helicopter in Afghanistan

Soviet Spetsnaz also used AKS-74U in a variety of roles, such as a dedicated CQB weapon or as a weapon for night fighting. Contemporary night sights were bulky, heavy, and had limited range, so a lighter AKS-74UN with electronic night sight was easier to carry on long missions than a full-size AK-74N or AKS-74N with the same NSPU or NSPUM image-intensifying sight.

The AKS-74UN, fitted with a side rail for night sights, is another rare variation

The AKS-74U also saw considerable use within Soviet and later Russian law enforcement. Due to its compact size, it was the preferred 'entry' weapon for specialized units within KGB and MVD; it was also employed for patrol police work and as a concealed carry weapon for VIP protection or special crime-busting operations. One of the most famous accessories, developed for KGB use during the 1990s was the so-called "Escort" system, originally employed by the 9th department of the KGB, responsible for VIP protection duties.

The once top-secret "KGB Briefcase" from a private collection

The "Escort" system was built around a standard AKS-74U which had its flash hider removed to fit into available limited space. For routine use, the gun with its stock folded and magazine inserted was carried inside a specially modified but ordinary-looking plastic "Diplomat" briefcase. In case of emergency, the operator had to press a release button, located on the handle of the briefcase. This button released

internal latches, and the briefcase opened automatically, releasing the gun inside, which was attached to the special clamp, connected to the carrying handle of the briefcase. The clamp had a special see-through channel that permitted the use of the rifle sights and was easily removable. Upon release, an empty briefcase simply fell to the ground, leaving the gun in the operators' hands, ready for action. It was probably a little slower to open the fire than a similar gun briefcase, developed in Germany for the HK MP5K submachine gun, but the Russian version certainly was better suited for accurate fire.

Another "KGB special" modification of AKS-74U was the so-called "Vitrina" (*Витрина*, "glass display") system, adopted by KGB shortly before the Moscow Olympics of 1980. It was a special riot control tool, consisting of a muzzle cup type mortar, screwed onto the barrel of the AKS-74U, special "Vitrina-G" grenades, loaded with tear gas, and propelling blanks. Hastily developed, this system was known for brutal recoil and could only be used in "mortar" mode, with the stock of the gun resting against the ground rather than the operator's shoulder.

An interesting aspect of the fate of the AKS-74U lies in a variety of nicknames, applied by its users to address this little gun. While the AK-74 and its predecessors were generally (and neutrally) addressed simply as a "Kalash", the AKS-74U received some emotionally-weighted monikers, with strong positive or negative vibes. Most positive were the "Ksyukha" (*Ксюха*) or "Ksyuscha" (*Ксюша*), affectionate variations of the female name Ksenia. Negative ones included "Plevalka" (*Плевалка*, spitter), "Okurok" (*Окурок*, cigarette stub), or "Ogryzok" (*Огрызок*, fruit stub or fruit core). It also must be noted that the "Krink" or "Krinkov" nickname, which originated from Afghanistan and is popular in the USA, was never really used by Russians.

[the section about experimental weapons is withheld and reserved for a future printed book]

The infamous 7.62mm AKMSU

Finally, we should mention a truly legendary "AKMSU", the 7.62x39 avtomat with a short barrel, AKMS-type stock, and very unusual thumbhole forend. The only known specimen of this mysterious rifle resides in the British "Royal Armories" collection in Leeds, UK. There were multiple legends regarding the provenance of this unique gun, but close physical examination reveals that it is built using a mixture of parts, such as Chinese Type 56-1 stamped steel receiver, Russian forward trunnion (made in Tula in 1977), and bolt group (made in Izhevsk), non-standard muzzle device and forend, and so on. The final revelation comes from the fact that this gun came to the UK from Afghanistan during the late 1980s. So, the hard fact is that this AKMSU was handcrafted somewhere in Pakistan, most probably in Khyber Pass province, known for its cottage gun industry. Similar short-barreled 7.62mm rifles were produced elsewhere, for example in Bulgaria and Yugoslavia / Serbia, but those guns have their unique features, making them easily distinguishable from Soviet-made guns.

Chapter 15. Spetsnaz special 3: suppressing the 5.45

Work on suppressed weapons firing new, small-caliber ammunition commenced as early as 1968. TSNIITOCHMASH was tasked with the development of the subsonic version of the 5.6x39 round, which was still in development, and it turned out to be a very demanding task. The light weight of the projectile along with a relatively low-powered charge, required to push it to subsonic velocities, caused serious problems when firing from 415 mm barrels of A-3 (Kalashnikov) and SA-006 (Konstantinov) rifles, equipped with experimental PBS-2 suppressors. This suppressor was similar in design to the earlier 7.62mm PBS-1, but smaller in dimensions, and used disposable rubber wipes to produce enough back-pressure to cycle gun action. It must be noted that firing from longer light machine gun barrels was found to be dangerous because sometimes bullets remained stuck in the barrel due to low-power powder charge. After a lot of effort, by 1977 TSNIITOCHMAS designed the 5.45x39 7U1 subsonic round, loaded with a tungsten-cored bullet weighing about 4.7 grams. To ensure stable performance, and after a lot of unsuccessful experiments with AK-74, in 1980 it was decided to limit the use of subsonic ammunition to the short-barreled AKS-74U rifle only. The key issue with the mass-produced AK-74 was its cold-hammer firged barrel. Due to minor variations in the bore diameter, different new rifles from the same production batch produced significantly different muzzle velocities with subsonic ammunition, resulting in bad accuracy. Ineterstingly, with standard 7N6 supersonic ammunition same rifles delivered velocities and accuracy well within prescribed limits.

The AK-74 with an experimental PBS-2 suppressor

The AKS-74U also had faster rifling to better stabilize bullets that left its barrel with noticeably slower velocities, compared to standard AK-74. However, the shorter barrel also resulted in a noticeable decrease in the service life of rubber wipes in the PBS-2, which fell from 200 down to 80 rounds, caused by the increased muzzle pressure, compared to AK-74. By 1981 TSNIITOCHMAS designed new PBS-3 and PBS-4 sound suppressors. Both designs dispensed with the problematic rubber wipes. PBS-3 suppressor was designed to deliver reliable semi- and full automatic fire with 7U1 subsonic ammunition and featured a special gas-actuated booster, which also required a modified gas piston and gas block for the host rifle to function properly. In this version, a new gas piston featured a long thin “nose” that protruded forward and out of the gas block through a hole. The suppressor itself featured a large internal coaxial gas piston at the rear of the expansion chamber, which acted upon the gas piston “nose”, providing additional power to cycle the action with low-pressure ammunition. This design, besides added complication, was unsafe and prone to breakages when firing full-power 7N6 ammunition with the suppressor installed.

The experimental PBS-3 suppressor for the AKS-74U, with a built-in gas piston booster

The simpler PBS-4 was of conventional design and could be safely used when firing standard, supersonic 7N6 ammunition without any danger of damage to the suppressor or the host gun. However, 7U1 ammunition was still too weak to cycle the AKS-74U action, and it was decided to develop another dedicated "noiseless" (*бесшумный* – besschumnyj) version, which could reliably work as an automatic weapon with standard 7N6 ammunition or as a manually operated weapon with subsonic 7U1. This required a new bolt with an added spring-loaded plunger-type ejector built into its face (somewhat similar in function to the M16 ejector), as well as a new, slightly enlarged bolt handle, better suited for manual cycling. A PBS-4 suppressor was considered to be an integral part of the system and was normally serially numbered to the host gun. Intended for use by Spetsnaz elements of the GRU and KGB, AKS-74UB with its PBS-4 suppressor that replaced standard flash hider was also available in several 'Night' versions (with side rail for night sights), under GRAU designation of 6P27 (6P27N for night versions). According to contemporary field manuals, the standard load-out for Spetsnaz operators issued with AKS-74UB was 30 rounds of 7U1 ammunition (one magazine) plus 150 rounds in five magazines with 7N6 ammunition. Regarding the PBS-4 suppressor, it must be noted that there are at least two known versions of this device. The earlier one had a simple cylinder body, while the latter featured a rear part of the body of increased diameter, presumably reducing chances of sparks or occasional muzzle flash. Both versions had a dimpled front section at the top to clear the sight line when firing with high elevation, required for a 6G17 underbarrel grenade launcher. A small spoon-like projection at the muzzle end of the PBBS-4 served as a muzzle rise compensator when firing subsonic 7N6 ammunition.

Avtomat Kalashnikova AKS-74UB

Specifications:

Ammunition: 5.45x39
Overall length, with PBS-4 suppressor installed: 887 mm (690 mm with stock folded)
Barrel length: 206 mm
Weight, with an empty magazine and suppressor: 3.8 kg
Magazine capacity: 20 or 30 rounds
Rate of fire: 700 rounds per minute

Special versions of the AKS-74U, intended for suppressed use along with PBS-4 sound suppressors, featured no flash hider; instead, the suppressor was screwed on the muzzle threads and held in place by a spring-loaded plunger. The suppressor was of conventional design, with a stack of several steel baffles mounted inside the tubular case and held together by assembling rods. The suppressor was built to function with both subsonic and supersonic loads, although the power of the 5.45 7U1 subsonic load was not sufficient to reliably cycle the action of the gun. Therefore, AKS-74UB rifles featured modified bolts with added plunger-type ejectors and extended bolt handle, for more reliable manual cycling of 7U1 cartridges.

The modified rear sight unit had two separate rear sights. Forward one, a simple flip-up design with 2 positions (for ranges up to 300 meters and 400-500 meters) was intended to be used with standard 7N6 ammunition. It was marked "*боевой*" (combat) on the sight base. The rear one, a more complicated unit with built-in windage adjustments and rotary range knobs, was intended for use with 7U1 subsonic ammunition. This one was marked "*УС*" (*Уменьшенная скорость* – reduced velocity).

The AKS-74UB also served as a base for the 6S1 (6C1) system, consisting of a rifle with specially modified forend, barrel clamp, PBS-4 suppressor, special clip-on rear sight, and the 6G17 30mm noiseless grenade launcher. Developed under the research and development program codenamed "Kanarejka" (*Канарейка* – Canary), the 6G17 grenade launcher is described above, in chapter 13, along with its predecessor, the 6G16 grenade launcher.

The AKS-74UB, along with the 6S1 system was officially adopted in August of 1985, but its practical use was quite limited.

The lethality and overall effectiveness of the small-caliber subsonic ammunition were not spectacular, to say the least. Furthermore, there were much more powerful and effective suppressed weapons in the pipeline, almost ready for adoption by 1985. Very few AKS-74UB rifles were produced in Tula before the fall of the Soviet Union in 1991. Another reason that led to the quick demise of this system was the fact that the only factory producing 7U1 ammunition was located in the city of Lugansk, Ukraine. So, after the dissolution of the USSR, the new Russian army lost its only source of 7U1 ammunition, and the new Ukrainian army lost its only source of new AKS-74UB rifles. However, the major factor that killed this system was the introduction of the dedicated 9x39 mm subsonic ammunition. Some AKS-74UB have seen use by GRU units in Afghanistan, and combat experience with them caused increased interest in more powerful and effective suppressed weapons. Soviet and then Russian Military Special forces quickly switched to 9x39mm suppressed weapons whenever possible, and the use of suppressed AKS-74UB rifles by Russian Spetsnaz was very limited. Military forces of independent Ukraine, however, used remaining AKS-74UB rifles well into the twenty-first century. For this reason, the Lugansk ammunition plant during the early 2000s manufactured a cheaper version of the 7U1 subsonic cartridge, loaded with commercial-type jacketed bullets with a relatively soft lead core.

The Ukrainian SF operator with an AKS-74UB, early 2000s. Note that the PBS-4 suppressor is installed incorrectly, with its muzzle dimple and compensator facing down rather than up.

Chapter 16. Spetsnaz special 4: Introduction of the 9x39 subsonic rifles

[the section is withheld and reserved for a future printed book]

Chapter 17. The long road to Abakan

[the section is withheld and reserved for a future printed book]

Chapter 18. With an AK in the 21st century

Massive political changes, which started in 1985 after the election of Mikhail Gorbachov as a Secretary-General of the Soviet Communist Party and de-facto country leader, ended in a collapse of the Soviet Union which happened in late 1991. Long-contained national, economic, and political issues erupted into a massive landslide of local ethnic conflicts in newly independent Russia and other former Soviet republics, which also became the new independent states. During the last decade of the twentieth century, the Russian army was heavily underfunded, often lacking money for its essential needs like fuel, spares, and ammunition. Russian law enforcement faced new serious challenges in the form of rising organized crime, extremism, terrorism, and general unrest, also often lacking funds for new equipment, training, and armaments.

Many factories were left with little or no government orders and had to survive by diversifying their product lines and entering new civilian markets, either related to small arms or not related at all. For example, during the early 1990s, IZHMASH brought up a highly successful line of “Saiga” semi-automatic shotguns and rifles, based on their trademark Kalashnikov platform; The KBP and TSKIB SOO from Tula developed several new law enforcement firearms, some successful and some not so, and so on.

In 1991, following a sharp decrease in governmental orders, IZHMASH found out that it was economically not feasible anymore to make four different versions of the same gun, namely the AK-74, AKS-74, AK-74N, and AKS-74N. As a result, it was decided to try and offer its customers a single gun that could fill all those niches. Using previous research and experiments as a base, IZHMASH introduced the AK-74M, which featured a side-folding shoulder stock, made of plastic, and had a side rail for night or red dot sights as a standard feature.

Russian soldier firing an AK-74M rifle

The cash-strapped Russian army instantly liked this ‘one gun fits all’ approach and made its first purchases of the AK-74M in the same year. However, orders for the new AK-74M were still comparatively small and infrequent. Official information on the total production of AK-74M is not available, but it is estimated that less than 100,000 guns of this type were purchased by the Russian government during the late nineties. Besides a lack of money, another reason for such limited procurement was the fact that Russia inherited the huge stocks of older, Soviet-era AK-74 rifles, which

were previously put into long storage as a strategic war reserve. Some sources estimated original reserve stocks at several millions of AK-74 and older AKM and AK rifles. The new Russian army was much smaller than the Soviet army, and thus needed fewer service guns and smaller reserves. As such, IZHMASH had to find new, possibly foreign customers to survive, and in 1992 it introduced the so-called "hundred" series of Kalashnikov assault rifles, which started with the AK-101. This was the same rifle as AK-74M, but adapted to 5.56x45mm NATO ammunition and using proprietary magazines. A similar rifle chambered for old, but still, very popular 7.62x39 ammunition was designated as AK-103. IZHMASH also introduced several compact versions of the hundred series rifles which featured shorter barrels and AKS-74U-style flash hiders instead of AK-74 style muzzle brakes/compensators, used on all standard-sized 'hundred series rifles. The "hundred series" name originally appeared as an internal factory designation, as the new guns were produced at the new department called "production unit No. 100", established especially for the manufacture of the AK-74M and its variations.

Unlike the aforementioned AKS-74U, those new short-barreled rifles featured standard-length gas systems, with bolt/carrier groups compatible with full-size versions in the same caliber. The most widely publicized sale of the AK-101 occurred circa 2000 when Indonesia purchased several thousands of these rifles plus a significant amount of Russian-made 'RS101' 5.56mm ammunition with steel-cored bullets. A compact version of the same gun, the 5.56mm AK-102, was purchased in some numbers by the Malaysian PASCAL special force. So far, the most successful 'hundred series' gun is the 7.62x39mm AK-103. It saw significant contract sales to Venezuela, India, and several African states. This gun was also adopted by several Russian law enforcement agencies, including the MVD (Internal Affairs Ministry), FSO (Federal VIP Protection Service), and FSIN (Federal Correctional Service). Total production of AK-103 so far is estimated at over 300,000 guns, delivered to domestic and foreign customers.

The 5.45mm AK-105 is being fired by a Russian army recon unit soldier

AK-74M

Specifications:
Ammunition: 5.45x39
Overall length: 943 mm (705 mm with stock folded)
Barrel length: 415 mm
Weight, with empty magazine: 3.6 kg
Magazine capacity: 30 rounds
Rate of fire: 600 rounds per minute

The AK-74M differs from previous iterations of the AK-74 by a side-folding shoulder stock, made from impact-resistant plastic and folding to the left. A scope mounting rail is permanently pinned to the left side of the receiver. Pistol grip and handguards also are made from the same high-strength polymer and are black. There are a few minor changes in some parts, and trigger units are slightly redesigned to facilitate more comfortable disassembly. New, more durable black paint is applied to all external metal parts.

100 series AK

5.56mm AK-101

5.56mm AK-102

7.62mm AK-103

7.62mm AK-104

5.45mm AK-105

	AK-101	AK-102	AK-103	AK-104	AK-105
Ammunition	5.56x45	5.56x45	7.62x39	7.62x39	5.45x39
Overall length (with stock folded)	943 (705) mm	824 (568) mm	943 (705) mm	824 (568) mm	824 (568) mm
Barrel length	415 mm	314 mm	415 mm	314 mm	314 mm
Weight, with an empty magazine	3.6 kg	3.2 kg	3.6 kg	3.2 kg	3.2 kg
Magazine capacity	30 rounds				
Rate of fire	600 rounds per minute				

The so-called “hundred” series of AK features three calibers and two basic configurations, standard and compact. In all three calibers, standard-size guns are similar in most respects to AK-74M, save for parts that depend on the ammunition type, such as barrel, bolt, or magazine. 5.56mm AK-101 uses proprietary, 30-round magazines made from black polymer, with steel-reinforced feed lips and locking lugs. 7.62mm AK-103 can accept all types of magazines, compatible with 7.62x39mm AK and AKM type rifles of Soviet manufacture – steel, aluminum, or plastic. They are normally issued with new production black plastic magazines with steel-reinforced lugs and feed lips. All standard-size guns are equipped with AK-74M type muzzle brakes- compensators, and all can be fitted with knife-bayonet or underbarrel grenade launchers.

Compact guns feature shorter barrels but retain standard-length gas systems and all internal parts. Their barrels are provided with screw-on flash hiders, and compact rifles cannot be fitted with a bayonet or a grenade launcher.

There were also two alternate versions of all “Hundred” series rifles, concerning their trigger systems. Versions, marked “dash one”, e.g. AK-101-1 or AK-104-1, featured semi-automatic only triggers and were intended for sale mostly to police and security forces. “Dash two” versions, i.e. AK-101-2, featured three-position safety/selector levers with added three-round bursts mode, placed between single shots and fully automatic modes. Neither version was popular, because most clients, both domestic and foreign, preferred standard variants with semi- and full-automatic capabilities.

Due to the very low and irregular orders from the Russian government, some weapons were completely lost from the picture, such as the AKS-74U, which was completely discontinued by the Tula arms factory in 1997.

Despite its official adoption in 1997, the Nikonov AN-94 rifle was ordered by the Russian army in very small numbers, usually only about a hundred or two per year. As a result, prices for this rifle were much higher than for AK-74. For example, in the year 2000 Russian government purchased AN-94 rifles at the unit price of 20 120 rubles, while the newly made AK-74M was priced at only 4 140 rubles. Per the average exchange rate of the US Dollar to the Russian Ruble in 2000 these prices correspond to roughly US $750 and US $150, respectively. As a result of extremely low sales, in 2008 IZHMASH decided to stop making AN-94. Through 10 years of very limited production, AN-94 rifles went mostly to several elite units within the Russian army. Also, several small quantity export contracts for AN-94 were reported, including sales to Special Forces of Belorussia and Kazakhstan, as well as even smaller sales to government organizations of Poland and Canada. These purchases were obviously made with the intent to study the newest Russian rifle.

[the section on various experimental and limited-issue weapons is withheld and reserved for a future printed book]

Chapter 19. 9x39 goes mainstream

[the section is withheld and reserved for a future printed book]

Chapter 20. 2010 – present

Following the results of a relatively brief conflict with Georgia in 2008 over the self-proclaimed republic of Southern Ossetia, which was started (and lost) by Georgia[1], the Russian government initiated massive efforts to upgrade and modernize its Armed forces. Among many new research and development programs was the well-funded and publicized effort called "Ratnik" (*Ратник*, medieval Russian warrior). It was aimed at upgrades in uniforms, personal equipment, communications, body armor, and, last but not least, small arms for the Infantry and other forces of the Russian army. Following the trends of the previous decade, new requirements for next-generation Avtomat for the Russian army were written with balanced action in mind. As a result, those requirements included such specific items as two- or three-round limited burst modes of fire in addition to single shots and "unlimited" full automatic fire. Accuracy and full auto dispersion requirements also were written to be best achieved by balanced action rifles. That is, full-auto dispersion limits were slightly larger than those set during "Abakan" trials but about 20% smaller than those of a standard-issue AK-74 rifle. Other requirements included capabilities to mount quickly detachable tactical sound suppressors and advanced day and night sights. All accuracy and combat effectiveness tests were to be performed in two configurations, first with integrated iron sights and second with Red Dot sights, which also were to be tested and selected for adoption during the same R&D program. An interesting aspect of these requirements was that the military sought two rifles of the same design, but firing different ammunition – one in standard-issue 5.45x39mm and another using old but still popular 7.62x39mm. The former was intended as a general issue military rifle, while the latter was destined for Special Forces, for its capability to be used, when necessary, with subsonic 7.62mm ammunition and effective sound suppressors.

Early tests of "Ratnik" commenced in 2012, with three major contenders submitting their rifles for a preliminary round of tests. Those included IZHMASH with their AK-107 and AK-109 balanced action rifles, ZiD with their modified AEK-971 and AEK-973 rifles, initially designated as A-545 and A-762, and the KBP with A-91M bullpup rifles. However, for some undisclosed reason KBP soon voluntarily withdrew from trials, and IZHMASH, following changes in its management, decided to replace balanced action rifles with completely new AK-12 rifles of traditional design.

An official photo from the early phase of the "Ratnik" trials, showcasing the AK-107 rifle in the front and a prototype sniper rifle in the back

[1] https://www.reuters.com/article/us-georgia-russia-report/georgia-started-war-with-russia-eu-backed-report-idUSTRE58T4MO20090930

It must be noted that by 2011 IZHMASH was in a rather dire economic situation and at the edge of bankruptcy. Years of limited sales and serious issues at the top management level[2] resulted in the Russian Government taking charge of the situation in 2011. Following restructuration, in 2012 the IZHMASH, already a public company, was reformed and rebranded as Kalashnikov concern, with part of the company stocks sold to a small group of private investors. Among other changes, its new management decided to invite an outsider as a new chief designer. It was Vladimir Zlobin, an experienced small arms engineer from TSKIB SOO, Tula. In 2013 Kalashnikov Concern submitted its newest 5.45mm AK-12 rifle, designed by Zlobin, for the next round of Ratnik trials. Since the 7.62mm version of the AK-12 was not ready yet, the 7.62mm part of the family was represented by an upgraded AK-103-3 rifle, which featured new stock (side-folding and adjustable for length) and a new top cover with an integrated Picatinny rail. For several years between 2012 and 2015, the Zlobin's AK-12 was widely publicized as the next generation of Kalashnikov, with many ergonomic upgrades and better effectiveness. However, the real story was different, and despite all those years that passed it remains unclear. There was no official explanation for subsequent events, but most official or semi-official publications suggested or hinted that the "original" AK-12 somehow failed in the trials. On the other hand, a knowledgeable source who preferred to remain anonymous recently has told this author that Zlobin's AK-12 has successfully passed initial tests, and was recommended for the troop trials. However, this source also did not explain what happened next.

The early version of the Zlobin's AK-12 rifle during the tests, 2012

So, without access to the internal documentation of the Kalashnikov concern, one can only speculate why its management suddenly decided to abandon this project in favor of its shadow assistant, the AK-103-3, and its derivatives. The most plausible explanation seems to be the simple fact that "the first" AK-12 has been designed with little regard to the existing manufacturing facilities, and thus would have required a lot of additional investment in terms of time and money to re-tool the factory for the new design. Another anonymous source provided a further possible explanation, as the expected unit cost of the gun would be too high for a potential buyer because this weapon was intended to be a mass-issue item, produced and procured by hundreds of thousands.

[2] Vladimir Gorodetsky, the CEO of IZHMASH since 1996, has been fired from his position in 2011 for failing to fullfil state military orders and bringing the factory to the state of bankruptcy. Next year he was arrested on charges of multi-million fraud. He died from the heart attack in the confinement prior to the start of the trial.

The “first AK-12”, also known colloquially as the “Zlobins’ AK-12” also spawned an almost unknown and equally unsuccessful offspring, the ASh-9 (*АШ-9, Автомат Штурмовой, 9мм* – 9mm Assault Avtomat). It was almost indistinguishable from the AK-12, as made in 2014, except for markings and bore diameter, and chambered for experimental 9x41mm rounds, optimized for close combat. 9x41 cartridge, in turn, was based on 9x39mm subsonic ammunition but available both in subsonic and supersonic versions and with a case slightly stretched in length to avoid loading the supersonic ammo in the older 9x39mm subsonic-only guns. This project was intended for law enforcement use, and it was quietly sacked in 2015 along with the entire “first generation” AK-12 design.

AK-12, version of 2014

Specifications:
Ammunition: 5.45x39
Overall length: 940-990 mm (720 mm with stock folded)
Barrel length: 415 mm
Weight, with empty magazine: 3.55 kg
Magazine capacity: 30 rounds
Rate of fire: 750 rounds per minute

The “first AK-12”, also sometimes referred to unofficially as “Zlobin’s AK-12”, is a gas-operated, select-fire weapon. It uses a traditional long-stroke gas system with a piston located above the barrel and a conventional rotary bolt with dual locking lugs that engage forward trunnion inside the stamped steel receiver. The bolt carrier is redesigned, so its right side completely covers the ejection port, made in the top cover. The charging handle is a separate Z-shaped part, permanently attached to the gas piston rod so it can be swung to either side of the gun after partial disassembly. The upper handguard has horizontal channels on either side for the charging handle. This way there are no open slots in the top cover on either side of the gun for the handle. When the gun was fired handle reciprocated back and forth along with the bolt carrier. The top cover is also of the original design, with an integrated Picatinny rail. It is held in place with three dovetails, one above the front trunnion in the receiver, another above the gas block on the barrel, and the third one above the rear trunnion. The entire top cover, made from stamped steel, is held in place by a cross-pin at the rear and is pulled rearward and up during the disassembly. The trigger unit is designed to provide three modes of fire – single shots, 2-round bursts, and full-automatic fire. Safety/selector levers are located at either side of the receiver, above the pistol grip, and feature a relatively short throw between positions, making tactile recognition of its current position rather complicated. Ammunition is fed from standard 30-round magazines, compatible with AK-74, but the magazine release lever was enhanced with IPSC-type extended levers that can be actuated by the index finger of the shooting hand, and with “magazine ejector” arm, which allowed dropping empty magazines free upon activation of a magazine release. Most unusually, it also contained a bolt hold-open mechanism, which required specially modified magazines. A manual bolt catch lever was located at the front of the trigger guard, above the magazine release lever. The barrel is provided with a

relatively long muzzle brake – compensator. The new side-folding stock is adjustable for the length of pull and folds to the left side of the gun. Iron sights consist of the hooded front post, mounted on the gas block (on later models) or on the AK-style front sight base (on earlier variants), and an interesting adjustable rear sight, installed on the detachable base and featuring a rotating blade which allowed two different options. One option was a traditional U-type notch with two horizontal luminous marks built into the blade on either side of the notch. When pulled back, rotated for half of the turn, and then replaced, the rear blade offered a small aperture (diopter), apparently intended for more precise daytime shooting. Range adjustments on the rear sight were made from 100 to 800 meters, in 100-meter increments.

In early 2014 the position of the CEO of Kalashnikov concern was assumed by Alexey Krivoruchko, and in the summer of the same year, he hired Sergey Urzhumtsev as the new chief designer. Urzhumtsev, unlike his predecessor, was quite familiar with all the nuances and intricacies of the venerable AK platform and its manufacturing processes. Before starting work at Kalashnikov he worked as a chief designer and then as a CEO at the VPO Molot factory, which for decades produced the RPK and RPK-74 light machine guns of Kalashnikov design, and a broad range of civilian "Vepr" rifles and shotguns based on RPK design. March of 2015 saw the initiation of the new crash development program at Kalashnikov, provisionally designated as the AK-400. Using AK-103-3 from earlier stages of the Ratnik trials as a starting point, plus several upgrades designed during the "Obves" program (more of which are below), the small design team managed to create a new rifle in just six months.

The experimental 7.62mm AK-103-3 rifle which served as a basis for the AK-400

Submitted to official trials in late 2015, the new AK-400 rifles proved themselves rather well, and in early 2016 official commission, led by the Ministry of Defense, approved both families of rifles (from Izhevsk and Kovrov) for field trials. The new Kalashnikovs received official designations AK-12 (5.45mm) and AK-15 (7.62mm), and GRAU indexes 6P70 and 6P71, respectively. ZiD rifles received GRAU indexes 6P67 (A-545) and 6P68 (A-762). In June of 2016 test batches of all rifles, about 30 of each, were issued to troops for extended field trials. Those field trials lasted until 2017 and were performed in different climatic zones and with different troops – infantry, airborne, naval infantry, and Spetsnaz. Official results of the field trials were publicly announced in December of 2017 – the trials commission reported to the Ministry of Defense its recommendations to adopt both families of rifles. More sophisticated balanced action rifles from the ZiD factory were recommended for adoption by the Russian Special Forces, while the Kalashnikov rifles, which were generally much more liked by troops, were recommended for general issue. The full results of the trials were not released to the public. However, several semi-official reports in the press stated that the ZiD rifles were found to be more effective than the new Kalashnikovs by a factor of roughly 1.1 (ten percent) at ranges of up to 300 meters. At longer ranges the edge went to the new AK-12 and AK-15 family, which displayed the same 10% advantage in overall effectiveness over A-

545 and A-762. No official explanation was given to these results, but the author's observations led him to the conclusion that the better long-range effectiveness of the Kalashnikov rifles probably stems from their better accuracy (smaller dispersion) in single shots, while at shorter ranges smaller full auto (2-round controlled bursts) dispersion of the A-545 and A-762 made them somewhat more effective.

the 'new' AK-12 during the official trials in 2016

The official decision to adopt the AK-12 and AK-15 as next-generation standard-issue rifles was announced by the Kalashnikov group in January 2018. The first batches of production AK-12 rifles were delivered to the Russian Ministry of Defense in December of the same year, and in April 2019 Kalashnikov Group received the first contract for 150 000 AK-12 rifles, to be delivered within the next three years. The first official foreign buyer of AK-12 rifles was Armenia, which purchased a test batch of 50 rifles in January 2019, and there were reports of significant interest from other potential foreign customers. In August 2020 Kalashnikov Group presented an upgraded version of the AK-12, which featured a new, improved shoulder stock, pistol grip, and new rear sight, which allowed for more rail space for optics. Same year Kalashnikov also presented an export version of the AK-12 platform, the 5.56mm AK-19, which also features the latest ergonomic improvements and uses AK-101-type magazines. It is interesting to note that while there are hundreds of thousands of AK-12 rifles in active service with the Russian army, no 7.62mm AK-15 rifles were yet spotted in the hands of the troops.

[the section on the ZiD rifles is withheld and reserved for a future printed book]

AK-12, AK-15, and AK-19

The 5.45mm AK-12 rifle as adopted in 2018

The 7.62mm AK-15 In its original configuration, with a sound suppressor

The 5.56mm AK-19, as shown in 2022. Note the new polymer 'Evo' stock, new pistol grip, more compact rear sight, and a new,non-removable muzzle device with integral mounting interface for a tactical sound suppressor

Specifications:
Ammunition: 5.45x39, 7.62x39 and 5.56x45
Overall length: 862-922 mm (688 mm with stock folded)
Barrel length: 415 mm
Weight, with empty magazine: 3.5 kg
Magazine capacity: 30 rounds
Rate of fire: 650 rounds per minute

Kalashnikov AK-12 and AK-15 assault rifles have traditional Kalashnikov-type gas-operated action with rotary bolt locking and use magazines compatible with previous generations of 5.45mm AK-74 or 7.62mm AKM and AK103 rifles respectively. In all other respects, these two rifles are similar.

The receiver, gas block, gas tube, and barrel of AK-12 are redesigned to achieve better accuracy under all conditions. The new front trunnion now hosts a captive cross-pin for the top cover and has no separate rear sight block. The gas tube is permanently attached to the front trunnion and has a removable plug at the front for inspection, cleaning, and maintenance. The rear trunnion now has two hooks for a cross-pin which is mounted inside the top cover. The return spring guide is not compatible with previous generations of AK as it has a slightly different slot interface to the rear trunnion, and no locking lug for the top cover. The new top cover is fully detachable. Its mounting interface includes a cross-hole in the front lug, which is used to connect it to the forward trunnion via captive cross-pin, and the spring-loaded cross-bar at the rear, which engages hooks on the rear trunnion. The rather powerful leaf spring at the rear of the top cover is used to tension the cover in its locked position and thus eliminate any play or wobble that might creep in after extensive use and field wear. As a result, the new

top cover with its integrated Picatinny rail on top provides a stable and repeatable base for sighting equipment.

The trigger and safety/fire selector unit are redesigned to provide three modes of fire, including single shots, 2-round burst, and fully automatic fire, with a familiar Kalashnikov-style safety/selector switch equipped with an "index finger pad" to ensure faster and more convenient operation.

The forend/handguard is made from two polymer halves, upper and lower. The lower part is attached to the receiver using a cross pin. The upper part is dovetailed to the lower handguard and also connects to the gas tube. As a result, the barrel is relieved from any stresses that might be applied to handguards, from different holding positions, use of various hard or soft supports, or attachment of accessories like vertical foregrips, tactical lights, or grenade launchers.

As adopted in 2018, AK-12 was equipped with a side-folding shoulder stock which is also adjustable for length of pull. It looks like a typical "US M4 style" stock, but its tube diameter is proprietary and it is not compatible with commercial or Mil-Spec M4 / AR-15 type stocks. This shoulder stock is of a very strong design, allowing the extensive use of an underbarrel grenades launcher such as a GP-25 or GP-34, further increasing combat effectiveness. Its hollow tube is used to store a cleaning kit, and the ribbed buttplate can be adjusted vertically to provide more comfortable support for shooters of different stature. The pistol grip is made from polymer and has a storage compartment inside. It contains a small container with a built-in small oil bottle and two compartments for cleaning supplies or spare AAA batteries. Since 2020, a new, improved all-polymer 'Evo' stock has been introduced, along with a new pistol grip, made integral with an enlarged trigger guard.
Iron sights consist of a shrouded front post, mounted on the gas block, and an adjustable rear aperture sight, installed on a removable base using the upper Picatinny rail. The rear sight can be manually adjusted for windage and elevation (range), and the front sight can be adjusted for zero using a special tool. The second generation rear sight, introduced along with the AK-19, uses a horizontal drum adjustment mechanism for range; the windage adjustment mechanism is more compact and requires the use of a special tool from the kit, issued with each rifle.
The barrel is provided with an effective detachable compensator/muzzle brake. Removal of the muzzle device requires depression of the spring-loaded pin and rotation of the device for roughly a quarter of a turn. Depending on the tactical situation, a bayonet or quick-detachable "tactical" sound suppressor can be mounted on the barrel. Standard sound suppressors, which are designed specifically for AK-12 and AK-15, are designed for use with standard, supersonic velocity ammunition. In the case of using a 7.62mm AK-15 rifle with a suppressor and subsonic ammunition, the weapon will not cycle automatically and would require manual charging after each shot.
AK-12 rifles are compatible with all types of magazines, originally designed for AK-74, but a new type of 30-round plastic magazine was adopted in 2018. AK-15 is compatible with all earlier AK / AKM / AK-103 magazines.

Besides the "Ratnik" rifle program, several other developments were running in parallel, which we will cover in brief below.

Back in 2007, the IZHMASH began experimental work on evolutionary upgrades for its hundred series of AK rifles. Those upgrades included new top covers with integrated Picatinny rails, improved furniture, muzzle devices, and so on. However, work on these upgrades was stopped in 2011, because new management decided to concentrate all efforts on the new AK-12. However, evolutionary work on the hundred series was resumed in just two years in an attempt to produce a modern 7.62mm AK-103-3 rifle to complement the Zlobin's 5.45mm AK-12 for "Ratnik" trials. This upgrade work was split into two parallel developments – one which resulted in the creation of the AK-400 / AK-12, and the other, less radical, which resulted in the creation of KM-AK upgrade kits and 200-series factory-made rifles. The key

difference between those two branches of development is that the “new” AK-12 features a redesigned receiver and gas system, while KM-AK and AK-200 are based on a classic, unchanged receiver and gas system of the AK-74M.

The KM-AK kit (*Комплект Модернизации АК* – Modernization kit for AK) was developed under the government-sponsored R&D program called “Obves” (*Обвес,* which means something like an “external tuning kit”). It is believed that there were two major competing participants in this program, the Kalashnikov concern and the Zenitco, a relatively small private firm specializing in custom tactical accessories for firearms. It is also believed that the Kalashnikov upgrade kit was somewhat lighter than the one provided by Zenitco, and thus preferable for military customers.

an old, soviet-era AK-74 fitted with the Kalsshnikov KM-AK modernization kit

Some of the KM-AK major features, including a hinged top cover with integral Picatinny rail, and adjustable side-folding stock, were direct descendants of the previous AK-74M upgrade design program, conducted in 2007-2011. Rifles equipped with the KM-AK kits were tested in parallel with the “Ratnik” program. This kit allows a relatively inexpensive upgrade of existing AK-74M and even older AKM and AK-74 rifles to modern standards of handling, allowing the use of the newest sighting equipment (Red Dot sights, Night and IR sights) and other useful tactical accessories. KM-AK was publicly announced by the Kalashnikov group in 2015, and in 2017 it was officially adopted by the Russian military under the GRAU index of 6Ch63 (*6Ч63*). The key feature of the KM-AK is that it can be installed by end-users or local unit armorers with relatively little effort and minimum use of standard tools (pliers, punches, and screwdrivers). The upgraded rifles are officially designated in service as AK-74 RMO.

KM-AK

The KM-AK modernization kit can be installed by an end user or unit armorer. The complete installation process can take about an hour or less. The kit consists of the following main subassemblies:

- New, ergonomically shaped plastic pistol grip with an accessory container inserted from below. The container has a built-in small oil bottle and two compartments for cleaning supplies or AAA batteries
- New top cover with integrated Picatinny rail, new return spring kit (return spring with captive spring guide), and top cover hinge. Installation of the top cover requires the removal of the original rear sight from the rifle, which is replaced by a top cover hinge and a new, flip-up rear sight. The new rear sight is a simple L-shaped setup, with settings for 100 and 300 meters. The top cover is locked to the base of the return spring guide via a captive cross-pin
- New safety/fire selector lever with index finger "pedal"
- New, elongated "birdcage" type flash hider - compensator. This new muzzle device was required by the military who wanted better flash suppression for nighttime operations when rifles are used in conjunction with image-intensifying or infra-red night sights and night vision equipment.
- New polymer forend with integrated Picatinny rails at 3- 6- and 9-o'clock positions
- New upper handguard with Picatinny rail on the top
- New retractable and side-folding shoulder stock with the adapter. Shoulder stock uses an aluminum alloy tube as its base and has four variable positions for the length of pull. Rubber-covered butt-plate can be adjusted for vertical position. The stock folds to the left.
- Detachable vertical foregrip which can be mounted to the Picatinny rail. Grip has an internal compartment for an AA-type battery
- Optional cheek rest, adjustable for height
- Optional quick-mounted tactical sound suppressor (issued only to Special forces)

A KM-AK kit (or some of its parts) can be installed on any standard Kalashnikov AKM, AKMS, AK-74, as well as 100-series rifles. When installed in full, it adds about 300 grams to the weight of the host rifle, compared to the stock version of the AK-74.

It must be noted that while the KM-AK upgrade kit is the only one officially approved for the military use, there are many similar options and upgrade kits available for private purchase. Different units may have different policies on use of non-approved upgrades, but in most cases the Law Enforcement and military Spetsnaz have a lot of leeway in this regard while regular conscript units in Military are limited

only to the standard issue stuff. Among many kits popular with Russian shooters, both civilian and LE / Military the one that usually is mentioned as the 'top tier' is the AK chassis system produced by the private company SAG – Sureshot Armamaent Group Ltd. These kits offer enough rail space for any type of optics and other tactical accessories and ensure proper zero retention. While not cheap, SAG upgrade kits and scope mounts offer excellent quality and thus are quite popular among more seasoned shooters, including many Spetsnaz officers.

SAG Mk.3 AK chassis

The SAG Mk.3 chassis is a modular upgrade kit which can be installed by the end user on most AKM and AK-74 based rifles, either government-issued (select-fire) or civilian (semi-automatic only). Installation usually takes about 10 minutes and requires only basic tools .
The SAG AK MK3 Chassis kit consists of:

Precision CNC machined from a solid billet of high strength aircraft grade aluminum upper which comes in several versions:

- 1913-MIL-STD rail from gasblock to the rear end of the top cover without break for rear iron sight post, Slim AK105 handguard length.
- 1913-MIL-STD rail from gasblock to the rear end of the top cover with break for rear iron sight post, Slim AK105 handguard length.
- 1913-MIL-STD rail from gasblock to the rear end of the top cover with break for rear iron sight post. Slim AK74 handguard length
- 1913-MIL-STD rail from gasblock to the rear end of the top cover with break for rear iron sight post, AK105 handguard length. Bushmaser ACR Compatible handguard (MK3 US Version)

The upper stays in place during assembly disassembly of the rifle for maintenance and cleaning. Upper serves as a mounting block for foreend and gas tube and freefloats the barrel. Rear portion of the topcover is removable for cleaning of the rifle and provides 1913-MIL-STD base fot non-zeroed optics (Magnifiers, NV and so on)

- Lightweight gas tube precision made from steel. Mounts on the gasblock and into the upper
- Precision CNC machined steel insert into the Rear sight base which together with upper base forms solid clamp-on around the barrel chamber area which ensures chassis stays in place no matter how you beat the rifle.
- Precision CNC machined base for the upper + CNC machined freefloat Bushmaster ACR compatible foreend with M-LOK interface – MK3 US Version

or

- Precision CNC machined lower handguard which serves as base for the upper.

Chassis doesn't block the iron sights and does have a space for AK rear sight block when installed. Full 1913-MIL-STD Top version comes with a backup aperture (diopter) rear sight.

Taking the concept of the KM-AK a step further, in 2017 the Kalashnikov group officially introduced a new line of AK-74M-based rifles, factory-fitted with KM-AK furniture, and featuring some changes and improvements thanks to its industrial capabilities. Most noticeable of these upgrades were differences in the rear sight and top cover fixture arrangements. Originally these rifles were displayed during the Army-2017 expo in Moscow as AK-74M1, AK-101M, AK-102M, and so on, but in 2018 these rifles received official designations of AK-200, AK-201 … AK-205. The first Russian customer to receive 200-series AK, specifically 5.45mm AK-200 and AK-205 was the recently founded Rosgvardia, a Gendarmerie-style paramilitary law enforcement agency. In September 2018, it issued an official tender for 476 AK-200 rifles and 60 AK-205 short rifles, worth roughly 31 million rubles, or slightly less than US $1,000 per rifle, including accessories, cleaning kits, and spare magazines. In May 2019 first AK-200 rifles were officially issued to selected SWAT-type units of Rosgvardia, which include regional OMON and SOBR.

200-series AK rifles also met significant export success. In May 2019, Russian officials reported the completion of the sale of 50,000 7.62mm AK-203 rifles to India, as well as a licensing agreement to produce 750,000 more rifles of this pattern locally in India at the new factory “Indo-Russian Rifles Private Limited” in Amethi. It must be noted that the Indian contract AK-203 differs from the Russian version by having a non-adjustable side-folding stock from the earlier AK-103 rifle.

The Indian contract 7.62mm AK-203 is unique as it features an old-style non-adjustable side-folding stock

Author of this book shoting a 5.45mm AK-205 equipped with an experimental “flow-through” tactical sound suppressor made by the private Russian company “Hexagon”

Older AK-74 rifles with KM-AK installed were observed in the hands of Russian troops, but so far there is no information about newly-made 200-series AK rifles being purchased by the Russian military, even though all of those were assigned proper GRAU indexes. It appears that the military prefers lighter and slightly more expensive AK-12 rifles, while various law enforcement services settle on less expensive and somewhat heavier 200-series rifles in 5.45mm (Rosgvardia) or 7.62mm (FSIN - Federal Correction Service and FSO – Federal VIP Protection Service).

200 series AK

the original version of the 5.45mm AK-200, as shown in 2018

the 5.45mm AK-205

	AK-200	AK-201	AK-202	AK-203	AK-204	AK-205
Ammunition	5.45x39	5.56x45	5.56x45	7.62x39	7.62x39	5.45x39
Overall length	880-940 mm (705 mm with stock folded)	880-940 mm (705 mm with stock folded)	775-835 mm (590 mm with stock folded)	880-940 mm (705 mm with stock folded)	775-835 mm (590 mm with stock folded)	775-835 mm (590 mm with stock folded)
Barrel length	415 mm	415 mm	314 mm	415 mm	314 mm	314 mm
Weight, with an empty magazine	4.1 kg	4.1 kg	3.7 kg	4.1 kg	3.7 kg	3.7 kg
Magazine capacity	30 rounds					
Rate of fire	600 rounds/minute					

The “Two Hundred” series of Kalashnikov assault rifles are mechanically similar to the previous “Hundred” series, with the major exception of the design of the top cover, return spring guide, and rear sight. The rear sight base is redesigned to provide a hinge point for the top cover with an integrated Picatinny rail. The new return spring guide has locking recesses for a rotating lock, mounted at the rear of the top cover. A lock is operated via the lever, located on the right side of the cover. To open the cover lever must be rotated down to a vertical position; to lock the cover in a closed position lever must be rotated to a horizontal position, pointing forward.

The rear sight is similar in design to the one used on the AK-74M but is shortened and marked for a range between 100 and 800 meters. Other upgrades, such as a new handguard and forend with Picatinny rails, new side-folding and adjustable shoulder stock, new safety lever, pistol grip, and flash hider are the same as used in the KM-AK kit, described above.

As if this was not enough to keep designers at Kalashnikov Concern busy, there were several other relevant developments. The first of those is the RPK-16, a squad automatic/light support weapon, based on the AK-12. Originally known as RPK-400, it was publicly announced in 2016, and during 2018 and 2019 it went through field testing with the Russian army and Rosgvardia. Some RPK-16 machine guns were spotted in the hands of Russian Spetsnaz operators in Syria. Compared to its parent, RPK-16 features a heavier and sturdier receiver and detachable barrels. Many users who tested RPK-16 in its short-barrel "CQB / Assault" configuration noted that it makes a very useful multi-purpose weapon for an urban environment. Its closed bolt operation and heavy barrel offer good single-shot accuracy, and the same heavy barrel, increased weight and optional large-capacity magazine offer significant suppressive fire capability. Being about 1 kilogram (2+ pounds) heavier than AK-12, it is very controllable when fired in bursts from off-hand positions. Conceptually and tactically RPK-16 is the closest equivalent to the 5.56mm M27 Infantry Automatic Rifle, fielded by the US Marine Corps. However, its future is unclear, as in 2020 Kalashnikov Concern introduced a belt-fed RPL-20 light machine gun, chambered for the same 5.45x39mm ammunition. Compared to RPK-16, the new RPL-20 squad automatic is more complex and expensive, but it also offers greater firepower, thanks to its open-bolt firing and belt feed. So, we have yet to see which one of those light support weapons will see the light of the day as a mass-produced and issued item, if any.

the experimental 5.45mm RPK-16 light machine gun, with a short 'assault' barrel and a 95-round polymer drum magazine

Another offshoot of the AK-12 project is the AK-308, a prototype rifle first announced in 2018. As its name suggests, this weapon is designed to fire 7.62x51 NATO ammunition and is intended primarily for export sales. Mechanically an AK-308 is similar to an AK-12 but features stronger and heavier construction, necessary to handle a much more powerful 7.62mm NATO cartridge. According to the interview with Sergey Urzhumtsev, Chief Designer at Kalashnikov Group, AK-308 was developed for licensed production at undisclosed clients' country facilities, which, most probably, means India. This

broad new family is complete with the two smallest siblings, AK-12K and AK-15K, which feature shorter barrels and otherwise are similar to their full-size parents.

An interesting insight into the popularity of the Kalashnikov platform is the official report of the Rosoboronexport, the Russian state agency that handles arms and other military-related export sales. Published in late 2020, it, among other things, stated that between 2000 and 2020 more than one million Kalashnikov assault rifles were sold from Russia to more than 30 countries worldwide.

AK-308

Specifications:
Ammunition: 7.62x51 NATO
Overall length: 885-945 mm (705 mm with stock folded)
Barrel length: 415 mm
Weight, with empty magazine: 4.3 kg
Magazine capacity: 20 rounds
Rate of fire: 700 rounds per minute

The AK-308 is mechanically similar to the standard-issue AK-12 rifle. Key changes include a slightly longer and sturdier, RPK-type receiver with an enlarged forward trunnion, both necessary to hold noticeably more powerful 7.62x51 NATO ammunition. Other changes include a simplified trigger unit with a three-position safety/fire selector lever. The gun can fire single shots or fully automatic. Like every other Russian-made AK, it features a chrome-lined bore and chamber. The barrel is fitted with a flash hider that has a NATO-standard outer diameter, so it can be used to launch rifle grenades. An optional bayonet adapter can be mounted onto the barrel. Ammunition is fed from proprietary 20-round box magazines, made from impact-resistant polymer with steel-reinforced feed lips and locking lugs.

[the section on non-AK weapons is withheld and reserved for a future printed book]

Chapter 21. Conclusion

This book, while probably the most extensive and detailed source on the history of the Russian assault rifle, is far from being complete. Many very interesting prototypes still rest somewhere in arms rooms and collections of various factories and museums, waiting for their discovery and description. Unlike, say, the American business model, where almost everything related to military small arms is made public and widely advertised from the very beginning, Soviet and Russian developments are usually carried out without any publicity. During Soviet times many developments were officially classified as "Secret" or even "Top Secret". Today, while most developments receive no official classification beyond "confidential", the release of information is still limited and often subject to approval from the party that pays for the work, such as the Ministry of Defense or Federal Security Service – FSB. Therefore, some latest weapons that are in development at present are not covered there. There are numerous R&D projects concerning new types of ammunition, new and improved firearms, and advanced sighting solutions for small arms, and it seems that the Russian small arms industry is looking into the future with at least some optimism.

Thanks for your time!
If you want to know more about the Russian guns,
make sure to subscribe to the Russiag Gun writer blog

And if you want the best custom upgrades to your AK rifle,
check out the Sureshot Armament at
www.sureshot-armament.com or www.sureshot-usa.com

Appendix 1. Major small arms research, development, and manufacturing centers

[the section is partly withheld and reserved for a future printed book]

Izhevsk machine-building factory – IZHMASH – Kalashnikov concern

Izhevsk arms factory is the second oldest Russian gun maker. It was founded in 1807 near existing ironworks at River Izh, far from the state borders and safe from any potential invasion. Originally known as IOZ (*ИОЗ, Ижевский Оружейный завод,* Izhevsk Weapons Plant), it officially changed its name to "Izhevsk machine-building plant" (*Ижевский машиностроительный завод, ИЖМАШ*, IZHMASH in short) in 1939, although it was usually referred in all documentation as the factory Number 74. Through the Great Patriotic War, it produced more than 10 million M1891/30 bolt action rifles, plus hundreds of thousands of aircraft machine guns, automatic cannons, and other important defense articles. In 1948 it became the first and foremost producer of the new weapon, Kalashnikov Avtomat. All further original versions of Kalashnikov were designed there, and most were also produced in Izhevsk, except for AKS-74U, which was made in Tula, and RPK and RPK-74 light machine guns, which were made in Vyatskie Polyany by the VPO "Molot" factory.

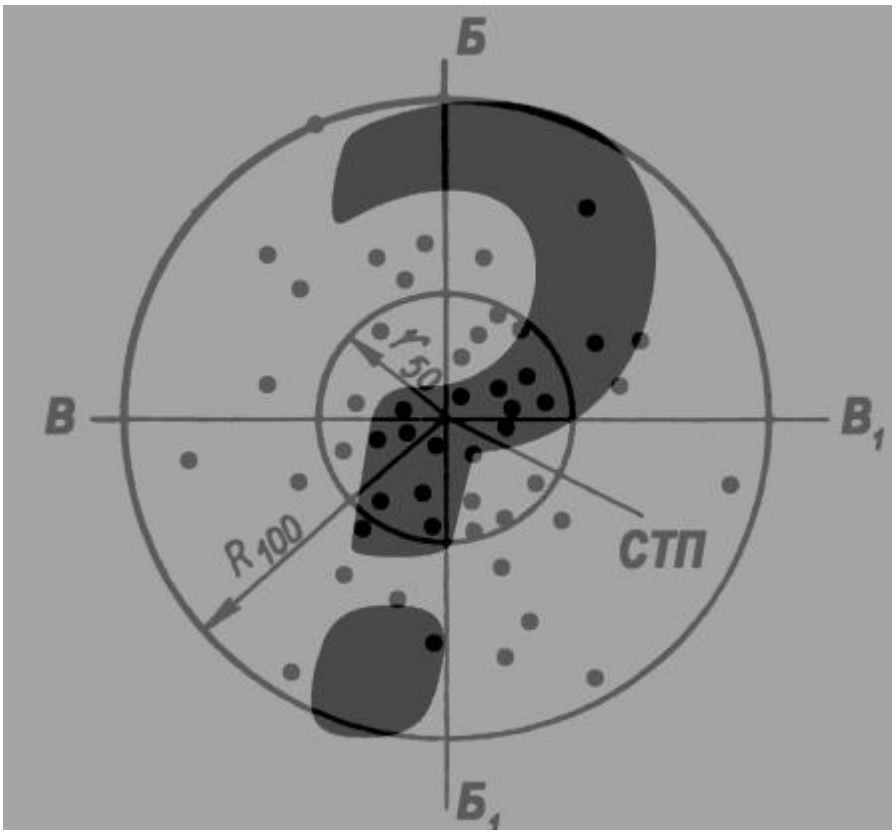
The IZHMASH, unlike other factories, kept its design bureau "in-house" since its inception in 1933. Originally designated as "Bureau for the design of new armament objects" (*Бюро конструирования объектов нового вооружения*), it later changed names several times, and finally became the "Design and Technology center" (*Конструкторско-технологический центр*). Besides Mikhail Kalashnikov, this design and development center housed other highly experienced and talented engineers such as Evgenij Dragunov and Yu. Alexandrov. As time passed, sons of Kalashnikov (Viktor) and Dragunov (Mikhail and Alexey) also joined the ranks of firearms designers at IZHMASH. Besides continuous work on improvements and evolution of the basic AK platform, designers at IZHMASH worked on a broad spectrum of other designs, including sniper rifles, various experimental assault rifles, machine guns, hunting and target rifles, and so on. For example, IZHMASH developed and manufactured one of the world's most successful small-bore biathlon rifles, the famous BI-7. Designers from IZHMASH actively participated in the "Abakan" program, which was eventually won by a rifle, designed here by Gennadij Nikonov.

During the post-WW2 decades, IZHMASH became a large and multi-faceted industrial organization, producing not only military small arms and sporting guns but also various optical devices (including day and night sights), aircraft guns, atmospheric research rockets, precision-guided weapons, motorcycles, passenger cars and so on. Hoverer, with the fall of the Soviet Union the IZHMASH, which was converted to an open stock joint company, gradually fell on hard times. Lack of military orders resulted in attempts to sustain production by designing and manufacturing civilian guns, based on the AK (Saiga line of rifles and shotguns), but even with the help of the export sales, it was not enough to keep the large factory afloat. By 2011 IZHMASH was on the edge of bankruptcy. To save this important defense asset in August of 2013 IZHMASH JSC was reorganized into Kalashnikov concern, and one month later decision was made to sell 49% of new company stocks to private investors. Changes in top management along with significant investments from new private shareholders brought new life to the company, which began restructuration and upgrade of its production facilities. In short order, the newly founded Kalashnikov group accumulated several industrial manufacturers under its umbrella, including two very important small arms manufacturers from Izhevsk – the aforementioned IZHMASH and the Izhevsk Mechanical Plant (*Ижевский механический завод – ИМЗ*). The latter is most famous for its manufacture of handguns for the Russian military and law enforcement, as well as for a broad line of hunting and sporting guns, produced under the "Baikal" trademark. Rapid changes allowed successful participation

in the “Ratnik” trials, and today Kalashnikov group accounts for more than 90% of total small arms manufacture in Russia, including all segments - military, law enforcement, and civilian guns. Today Russian government holds a blocking share of Kalashnikov group stocks via the “Rostech” holding, while private investors own 75% minus one share of the enterprise.
Besides small arms, the Kalashnikov group now makes unmanned ground and air vehicles, remotely controlled weapon stations, aircraft guns, guided weapon systems and missiles, fast patrol and assault naval and riverine crafts, and so on.

Most important assault rifles, designed and produced at IZHMASH / Kalashnikov group include all generations of the Kalashnikov Avtomat – AK, AKM, AK-74, AK-74M, Hundred and Two Hundred series, and, finally, AK-12 and AK-15, as well as the Nikonov AN-94.

Appendix 2. Accuracy, dispersion, and effectiveness of small arms fire



[the section is withheld and reserved for a future printed book]

Appendix 3. Ammunition

5.45x39

Development of the small-bore, high-velocity assault rifle cartridge commenced in the USSR in 1960, in an attempt to keep up with American developments that led to the adoption of the 5.56x45mm ammunition and M16 rifle. Early research work was conducted using 5.6x39mm cases for sporting ammunition, which in turn were based on 7.62x39 cases necked down. The original caliber designation for new ammunition was 5.6mm, according to the diameter of the bullet, but it was later changed to 5.45mm, according to the bore diameter by the lands of the rifling. A new, smaller-diameter cartridge case, designated 13MZhV, was developed in 1964-65. It still offered necessary ballistics, but the new case became lighter and slightly more compact. It also precluded accidental chambering of the 7.62x39 ammunition in 5.45mm weapons. The design of the new cartridge was more or less finalized by 1969. It featured a bullet with a mild steel core, a steel jacket, a long ogive, and a boat tail. The bullet weight was 3.17 – 3.42 grams. Velocity from an assault rifle barrel, measured 25 meters from the muzzle, was standardized at 875 – 880 meters per second. Cases were made from steel and initially loaded with ball powder. New cartridges were officially adopted in 1974 as 5.45x39 mm 7N6 (ball) and 7T3 (tracer). 7H3 blank round with plastic frangible bullet was adopted a little bit later. The earliest manufacturers of the 7N6 cartridge include factories number 539, 17, 60, and 270. Tracer ammunition was initially loaded by factories number 3 and 711.

Below is the list of major versions of the 5.45mm cartridge, officially used in the USSR and Russia.

- **7N6**: standard-issue “ball” (*ПС - пуля со стальным сердечником*) round, bullet core originally was made from untreated mild carbon steel. The steel core has a flat nose and is surrounded by a layer of lead at the front and from the sides. Bullet has a hollow cavity in the nose to achieve the desired balance and weight within an optimized aerodynamic shape. Since 1987 steel cores have been manufactured from heat-treated carbon steel to improve penetration.
  Nominal data
  Bullet weight: 3.3 – 3.55 g

Muzzle velocity: 870 - 890 m/s
Identification: none

- **7T3**: tracer round
  Nominal data
  Bullet weight: 3.1 – 3.35 g
  Muzzle velocity: 870 – 895 m/s
  Identification: green bullet tip

- **7T3M**: improved tracer round, with longer trace; also, visible trace burn starts not immediately, but at about 50-100 meters from the muzzle. Adopted in 2000.
  Nominal data
  Bullet weight: 3.1 – 3.35 g
  Muzzle velocity: 870 – 895 m/s
  Identification: green bullet tip

- **7U1**: subsonic load (*УС – Уменьшенная скорость*) for use with suppressed AKS-74UB rifle. Jacketed bullet with a combination of tungsten alloy and lead core. Manufactured only by the Lugansk ammunition plant. Adopted circa 1985, production stopped in 1991. Circa 2005-2006 Lugansk ammunition factory, then in an independent Ukraine, began production of simplified subsonic ammunition for the Ukrainian army. This round was loaded with a commercial-type, lead core bullet weighing circa 4.5 grams.
  Nominal data
  Bullet weight: 5.1 g
  Muzzle velocity: 295 – 310 m/s
  Identification: black tip followed by a green ring on the bullet
  Notes: to be fired only from AKS-74UB; firing it from AK-74 and especially RPK-74 is unsafe due to the possibility of the bullet not leaving the barrel due to low powered charge.

- **7N10**: Improved penetration (*ПП - повышенной пробиваемости*) load. The bullet core is made from heat-treated steel. The core shape is different from 7N6, being longer and with a smaller diameter of the flat tip at the front. The nose cavity was made smaller in volume. Adopted in 1992. Since 1994 7N10 bullet design was improved by filling the nose cavity with lead, and the forward end of the steel core was made with an even smaller diameter flat on the tip, improving penetration against hard obstacles (steel and titanium plate).
  Nominal data
  Bullet weight: 3.49 – 3.74 g
  Muzzle velocity: 870 – 890 m/s
  Identification: Violet lacquer ring around case neck/bullet junction

- **7N22**: armor-piercing (*БП – бронебойная пуля*) load. The bullet core is made from hardened tool-grade steel and has a pointed nose. Adopted in 1998.
  Nominal data
  Bullet weight: 3.54 – 3.83 g
  Muzzle velocity: 870 – 890 m/s
  Identification: black bullet tip

Notes: 100% penetration of 5mm thick steel armor plate “5P” at ranges of up to 250 meters

- **7N24**: armor-piercing (*БС – бронебойный сердечник*) load. The bullet core is made from tungsten carbide. Adopted in 1999.
  Nominal data
  Bullet weight: 3.93 – 4.27 g
  Muzzle velocity: 820 -840 m/s
  Identification: none
  Notes: 100% penetration of 5mm thick steel armor plate “5P” at ranges of up to 350 meters

- **PRS**: low-ricochet load for law enforcement use. Jacketed bullet with soft lead core. Bullets easily deform or fragment upon impact on a hard surface. Adopted by MVD (Internal Affair Ministry) in 2005, official use and production were discontinued in 2009 due to unsatisfactory results.
  Nominal data
  Bullet weight: 3.85 – 3.9 g
  Muzzle velocity: 850 m/s
  Identification: “PRS” (*ПРС*) letters were added to the headstamp on the case

- **7N39**: improved penetration armor-piercing (ПП*БС – повышенной пробиваемости, бронебойный сердечник*) load. The bullet core is made from tungsten carbide and has a pointed nose. Adopted in 2013
  Nominal data
  Bullet weight: 4.3 g
  Muzzle velocity: 820 -840 m/s
  Identification: black bullet tip
  Notes: 100% penetration of 5mm thick steel armor plate “5P” at ranges of up to 500 meters

- **7BT4**: Armor-piercing Tracer load. Features hardened stool-grade steel core with thin lead wrap. Adopted 2005
  Nominal data
  Bullet weight: 4.4 g
  Muzzle velocity: 879 - 895 m/s
  Identification: green bullet tip
  Notes: 100% penetration of 5mm thick steel armor plate “5P” at ranges of up to 70 meters

- **7N40**: improved accuracy load. Introduced 2016. Tandem core, constructed from hardened tool-grade steel at the front with lead plug in the back
  Nominal data
  Bullet weight: 4.04 – 4.26 g
  Muzzle velocity: 810 – 830 m/s
  Identification: None
  Notes: claimed accuracy from test barrel, at 100 meters: R100 = 3.2 cm (for 7N6 claimed accuracy is R50 = 3 cm).

5.45x39 PSP (underwater)

[the section is withheld and reserved for a future printed book]

7.62x39

Development of the 7.62x39 cartridge commenced in 1943; early versions featured a steel case of rimless bottlenecked design, 41 mm long. The standard load was a pointed, flat-based bullet with steel jacked and lead core, weighing 8 grams. By 1947 this round evolved with the introduction of the slightly longer, boat-tailed bullet of the same weight, with a mild steel core, intended to decrease costs and slightly improve penetration. This round is one of the world's most popular modern military cartridges for small arms and is produced almost everywhere, in a multitude of military and civilian loads. Only Soviet and Russian military issue loads are listed below. It also must be noted that there were many minor differences even in Soviet-manufactured loads. Early military issue ammunition was assembled using brass-coated steel cases. Later on, the Soviet ammunition industry switched to steel cases, coated with tombac (so-called bimetallic cases). Starting in 1956 metal coating for steel cases was gradually replaced with a specially developed lacquer coating, which became most prevalent over the following decades. The latest version of coating for steel cases is a special polymer, introduced in 2010. Several attempts were made to develop lightweight aluminum alloy cases, but none were successful. Besides standard 7.62x39 ammunition, its cases were used to make a wide variety of special loads, such as propelling blanks, or served as a base for new cartridges, i.e. 9x39 or recent .366TKM (a purely civilian sporting cartridge, peculiar to Russia and its gun laws).

The most important versions of the 7.62x39 are as follows:

- 57-N-231: standard issue ball load, with steel-jacketed projectile (*ПС - пуля со стальным сердечником*). The projectile core is of composite design, with a mild steel center part surrounded by a layer of lead. Over more than 70 years since its adoption, there have been numerous changes in the type of powder, case coatings, etc.

Nominal data
Bullet weight: 7.75 – 8.05 gram
Muzzle velocity: 710 – 725 m/s
Identification: none

- 57-BZ-231: armor-piercing and incendiary load, adopted along with the standard ball. The pointed core is made from heat-treated tool-grade steel. Small incendiary charge at the base of the projectile, behind the steel core. Mass manufacture of this version ceased circa 1961.
  Nominal data
  Bullet weight: 7.47 – 7.87 g
  Muzzle velocity: 725 -740 m/s
  Identification: black tip followed by a red ring on the nose of the bullet
  Notes: 100% penetration of one side of US M12 steel helmet at the range of 650 meters

- 57-T-231: Tracer load, adopted in 1949 along with the ball and AP-I. Longer flat-based bullet, with a lead core at the front and a cup with tracer load at the rear. T-45 tracer bullet gave a visible bright red trace out to 800 meters. The new T-45M bullet introduced in the late 1970s features a new tracer compound that burns 30% brighter
  Nominal data
  Bullet weight: 7.45 – 7.7 g
  Muzzle velocity: 710 – 725 m/s
  Identification: Green tip

- 57-N-231U: reduced velocity load for use with sound suppressors. Standard steel case, loaded with "US" (*УС – Уменьшенная скорость*, Reduced Velocity) projectile. In outer shape US bullet is similar to a tracer, that is, it is longer than the ball and has a flat base. Bullet has a two-part core under the standard bimetallic jacket – the front is machined from tool-grade hardened steel, and the rear is a plug of lead. Crates with US ammunition also contained cartons with replacement rubber wipes, necessary for reliable automatic cycling of AK guns fitted with PBS and PBS-1 suppressors. Normally, each tin case with 600 or 660 57-N-231U rounds contains one carton with three rubber wipes.
  Nominal data
  Bullet weight: 12.5 grams
  Muzzle velocity: 285 – 300 m/s
  Identification: black tip followed by a green ring on the bullet
  Notes: Requires special rear sight to be installed on AKM or AKMS for accurate shooting

- 7N23: this is a relatively new armor-piercing load, developed during the late 1990s and adopted in 2002. It has a pointed core, made from heat-treated tool-grade steel, wrapped in a thin layer of lead, and covered by a standard bimetallic jacket.
  Nominal data
  Bullet weight: 7.9 grams
  Muzzle velocity: 725 – 740 m/s
  Identification: black bullet tip; red lacquer around case neck and primer pocket
  Notes: 100% penetration of 5mm thick steel armor plate "5P" at ranges of up to 200 meters

9x39

[the section is withheld and reserved for a future printed book]

12.7x55

[the section is withheld and reserved for a future printed book]

Appendix 4. Operating systems

[the section is withheld and reserved for a future printed book]

Appendix 5. Firearms culture in USSR and Russia

[the section is withheld and reserved for a future printed book]

Appendix 6. Rife is fine? Customizing assault rifles in Russian service

[the section is withheld and reserved for a future printed book]

Appendix 7. Civilian versions of military assault rifles

[the section is withheld and reserved for a future printed book]

Special thanks

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Sergey Urzhumtsev
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Kalashnikov concern

Tula State Museum of Weapons

TSNII TochMash

IZHMASH museum

St.Petersburg Museum or Artillery, Engineering and Communications corps

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