Exhibit 17

To Defendants' Memorandum in Support of Motion for Summary Judgment

THE COMPLETE AR-15/M16 SOURCEBOOK

What Every Shooter Needs to Know

REVISED AND UPDATED EDITION

Duncan Long

Introduction

I can still remember the first time I held an AR-15. Remember it like it was yesterday. This was unlike any other rifle I'd ever held: there was no wood and blued metal as with the traditional guns I'd owned; this shooting machine resembled something from a sci-fi movie with its plastic and matte black metal and a pistol grip that might be found on a ray gun. Even the balance was different—in the center of the weapon instead of along the barrel somewhere. And the plastic handguard had ventilation holes in it. It wasn't just that the firearm's looks were weird. The AR-15 was foreign to my grasp, a new type of gun that seemed confusing to hands used to cradling a wooden stock.

Equally odd were the contrasting stories I'd read and heard about the AR-15. An army recruiting manual off a dusty high school library bookshelf told in glowing terms how a bullet fired from the M16, the military counterpart to the gun I now held, could pierce a car's engine block, travel through the passenger compartment, and exit through the back bumper with power to spare. Right. . . . At the other end of the scale were the "war stories" of GIs coming back from Vietnam about dead U.S. soldiers with M16s lying jammed beside them, as well as tales recounting the failure of this rifle's bullets to stop an enemy even though he was "pumped full of lead." Some of the stories, I would later learn, were true and could be attributed to the incompetence of military planners. However, I would also learn that the yarns about the bullets lacking potency were totally false and could be attributed to panic and poor marksmanship.

So there I was, holding this controversial rifle in my hands and wondering what it was really capable of. I shouldered the AR-15 and was pleasantly surprised at the clear picture presented by its peep sight and natural aim. (The safety under my thumb seemed to be at just the right place and worked with a positive feel.) I dry-fired the gun; the trigger pull was crisp and short. Nice. Shooting proved a revelation as well. The rifle seemed to put bullets right on target, about as far as I could see on the hilly Kansas field where I did this first test. And the 30-round magazines I'd bought along chugged ammunition like there was no tomorrow. Very quickly I fired several hundred rounds, and the barrel became scorching hot, oil smoking from it. Yet the handguard kept my fingers cool, and the point of impact didn't seem to wander despite the enormous heat buildup. Nor did the gun jam or malfunction, which would have happened with a hunting rifle had I put that much ammunition through it so fast.

I knew then that I was holding a very different firearm. And after that first session, I came home knowing that I had found *the* rifle that was everything I had ever hoped for. That feeling hasn't changed since then, even though I've traded, built, and tested more variants and models of this gun than anyone has the right to enjoy while I wrote one book or article or another about it. This amazing firearm will one day be bested, but it has set a standard that has so far proved impossible to beat and will remain the gun against which new weapons are measured for some time.

Chapter 1

Beginnings

Because of its checkered past, as well as a design very different from what Americans had carried in the past, the AR-15 sparked more controversy than any other rifle in recent history. It has inspired both hatred and love among those who have carried it on the battlefield, into the field to plink, or in the back of a patrol car.

In part, these emotional reactions stem from the rifle's design. Where walnut and polished blue steel normally are found, the AR-15 boasts waterproof plastics and an aluminum receiver. And even though the gun is becoming old (as military firearms designs go these days), its styling and good human engineering continue to give it a space-age appearance that traditionalists view with horror, even though the gun is now pushing the half-century mark.

The AR-15 was among the first firearms of the 20th century designed to take advantage of modern industrial methods. This allowed for streamlined production without a lot of special milling while also giving the shooter a lightweight, durable weapon that didn't look like it had been cobbled together by a plumber and sheet-metal worker. The use of plastics and aluminum in major assemblies along with castings and steel stampings allowed many machining operations to be done away with, which also made the gun less expensive to manufacture, an important factor in the marketplace.

At the same time, nothing was sacrificed in quality. Employing modern industrial machinery to fabricate rifle parts also allowed tight enough tolerances to permit ready substitution of parts when repair or replacement is necessary, a real plus for military users and a boon to gunsmiths. Likewise, the tight tolerances made off-the-shelf AR-15s as accurate as any highly modified target version of previous military rifles.

The AR-15 was conceived as a light and handy gun chambered for a cartridge that would produce a light recoil while shooting a bullet that took advantage of the high-velocity wounding potential of a small projectile. The overall result was a very potent battlefield weapon.

Despite the initial adverse reactions, it wasn't long before the excellence of the AR-15's design became apparent to everyone. In fact, its design features have been copied by manufacturers of many other military rifles, and more than a few knockoffs can be found in such diverse places as the People's Republic of China and the U.S. civilian market.

Like the rifle itself, the .223 Remington cartridge (also known as the 5.56x45mm and the 5.56mm NATO) that was developed for it has greatly influenced military thinking and has proven to be the most effective rifle cartridge ever created for combat. While the future will undoubtedly see the fielding of a more lethal round, the .223 Remington is going to be a hard act to follow. Little wonder, then, that many countries have adopted the round for their battle rifles and that the former Soviet Union switched to a very similar round for its AK-74 assault rifles. Little by little, the cartridge (or one virtually identical to it) has been adopted by all the major military powers of the world.

ARMALITE'S BETTER IDEA

The lineage of the AR-15 can be traced to the 1950s. Interested in creating a small business, engineer and attorney George Sullivan, then the chief patent counsel for Lockheed Aircraft Corporation, initiated plans for creating rifles that departed radically from previous civilian firearms as well as those used by the U.S. military. Some brainstorming with firearms inventor and international arms broker Jacques Michault produced sketches and plans for rifles that would use aluminum receivers, fiberglass stocks, and straight-line, high sight layouts with a rear sight that doubled as a carrying handle—all of which later found their way to the AR-15.

Feeling that such firearms had a great potential in the civilian marketplace as well as with the U.S. military, Sullivan soon invested in a machine shop in Hollywood with the intention of fabricating experimental rifles

German rifles like this Sturmgewehr MP44, built cheaply by using modern industrial techniques, paved the way for later "assault rifles" that would be developed through the last half of the 20th century.

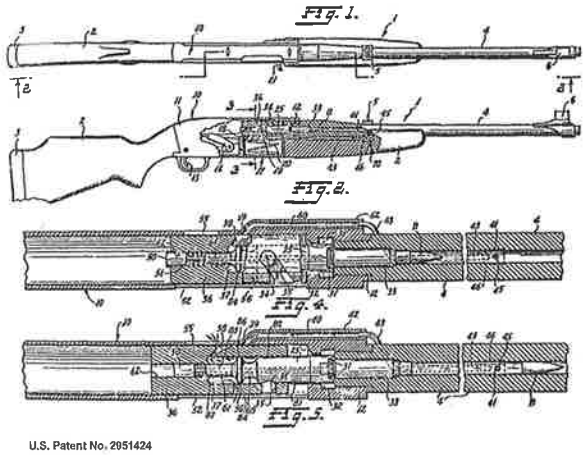
around the proposed designs. A short time later at a luncheon conference, Sullivan found himself sitting next to Richard S. Boutelle, president of Fairchild Engine and Airplane Corporation, and took the opportunity to tell the executive about the new rifle ideas and designs. Boutelle quickly became interested in the project, and on October 1, 1954, the Armalite Division of Fairchild Engine and Airplane Corporation opened its doors in California.

The first rifle created by the fledgling company was the AR-1 (Armalite Rifle number 1), based on a design of Sullivan and his brother-in-law, Charles Dorchester (who later became the plant manager for the new company). The two had actually started working on the rifle in 1947, so it was quickly completed once the new company started operation. The result was Armalite's Parasniper Rifle, a scoped, bolt-action sporting rifle that could double as a military sniper rifle. The rifle was chambered in .308 Winchester round (7.62mm NATO) and incorporated three features that would be seen in later rifles of the series: a fiberglass stock (filled with foam), an aluminum receiver, and an aluminum barrel with a steel lining.

Armalite's charter required that it develop prototypes and, when the designs were perfected, license the manufacturing rights to other companies. It was hoped this would quickly generate money for the fledgling company while minimizing capital outlays. Consequently, since there were no buyers for the design, the AR-1 never got beyond the prototype stage. The rifle did show the potential for creating a firearm with modern materials and techniques, however, and opened the door for the designs that would soon pour from the company.

Eugene Stoner

A former marine and army ordnance technician,

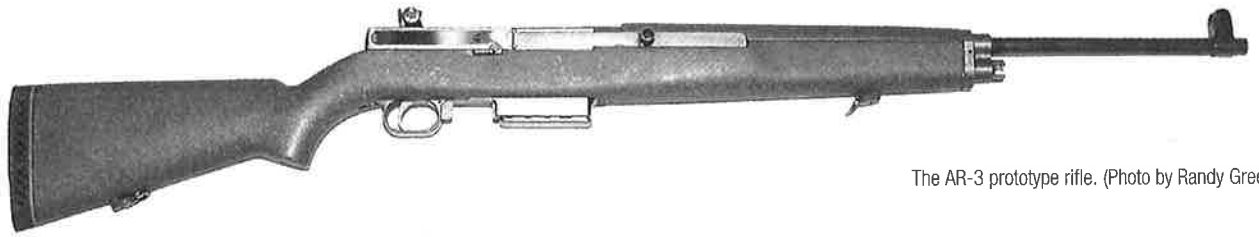


U.S. Patent No. 2951424

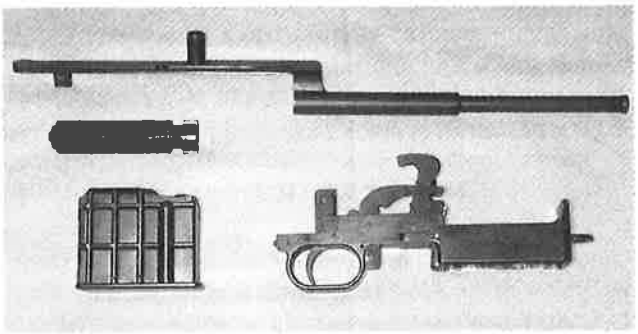
Stoner patent drawing for the rifle design he brought with him to the Armalite company.

Eugene Stoner is the man whose name most often comes to mind as the designer of the AR-15. And rightly so, since it is obvious the lion's share of features found on the guns leading up to the AR-15 were his ideas. Stoner was not with Armalite from the start but joined the fledgling operation as Armalite's chief engineer, winning this position with a semiautomatic rifle design he had brought with him to the business. Stoner continued working on this rifle, which would eventually become the company's AR-3.

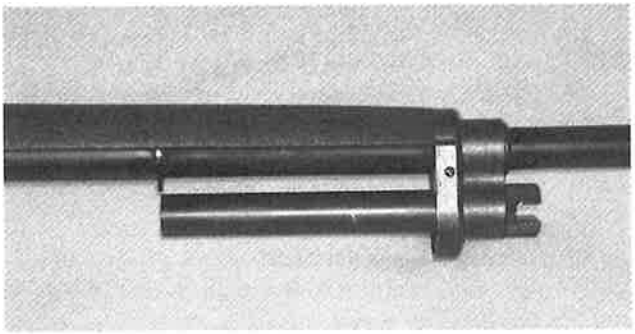
So although the AR-3 never went into large-scale production either, it embodied many of the features that later found on the AR-15, including an aluminum body and a fiberglass stock. And it too demonstrated the practicality of Armalite's goals and blazed the path for subsequent rifles.



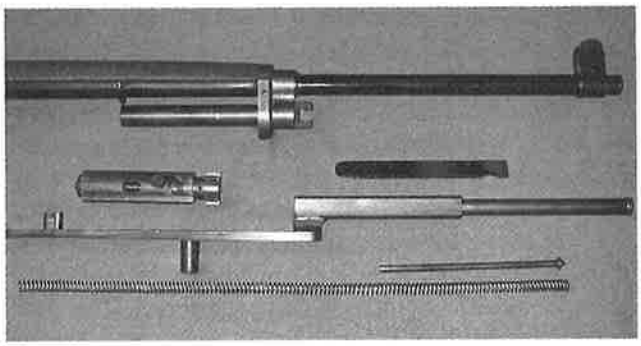
The AR-3 prototype rifle. (Photo by Randy Green.)



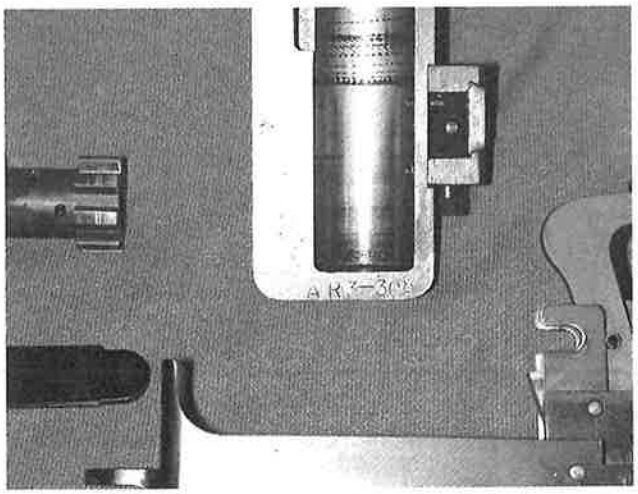
The AR-3 trigger group and bolt assembly. (Photo by Randy Green.)



AR-3 barrel and gas tube. (Photo by Randy Green.)



The AR-3 barrel, bolt assembly, and carrier above recoil spring. (Photo by Randy Green.)



"AR-3" stamp inside receiver. (Photo by Randy Green.)

View of AR-3 receiver. (Photo by Randy Green.)

Two other talented workers were soon teamed up with Eugene Stoner: L. James Sullivan (no relation to George Sullivan), who worked as a designer/draftsman, and Robert Fremont, who supervised prototype manufacture and led studies that determined whether the tolerances needed for rifles would be practical from a mass-production standpoint. These three men worked on a number of the Armalite weapons and became the driving forces behind the company's design work (as well as such work worldwide in the decades to come).

Both Stoner and Sullivan would later go on to

While working on this book, I was contacted by Randy Greenfield, who happened to have bought the AR-3 prototype. The pictures shown here are possibly the only ones ever to appear in print. The gun was well machined and looks like a production firearm. And while the layout and many of the components are not consistent with the design that would eventually be adopted for the AR-10 and AR-15, they point to the route the designers were taking that would eventually lead to these guns. As such, this makes this a very interesting bit of history. As Greenfield wrote,

I used a magnet to test the rifle and the following parts are non-magnetic and presumably were machined aluminum blocks:

Receiver
Trigger housing
Magazine housing
Front sight

The magazine itself has a stamped aluminum housing and machined aluminum follower block. The assembly is similar to the M14 with the barrel fitting into the stock and the trigger group locking it from the bottom. The trigger group is held to the stock with two screws, a machine screw forward of the magazine and a wood screw behind the trigger. I weighed the complete rifle on a reasonably accurate scale and it is in the 6-7 pound range.

create a variety of new firearms and related products. Sullivan is credited with extensive work on such firearms and products as the AT-22, Ultimax 100 LMG, Hughes Chain Gun, Ruger Models 77 & Mini-14, and C-Mag, as well as many other designs that haven't met with as much success and recognition as these have enjoyed.

By the Numbers

It should be noted that several Armalite firearms were being developed during the same period rather than just one after another as might be suggested by the numbers the company gave the various models. Apparently, such designations were assigned to rifles as new models were put into development, and so it's probable that several firearms were in various stages of development at any one time. The numbers only indicate to some extent the order in which the firearms were offered to licensing companies, but not when they actually went into production.

Many of the guns never even got into production—and some hardly got off the drawing boards. The AR-2, AR-4, AR-6, and AR-8 never went into production or were even offered for licensing as far as anyone knows. Exactly what these "missing" models might have been is unknown, and they may or may not have been similar to the company's other firearms (for example, the AR-13, according to company officials, was a "hyper-velocity aircraft gun"). And some of the models, such as the AR-16, were limited to prototypes because no manufacturers expressed interest in purchasing the rights to them.

THE AR-5

Armalite's first brush with commercial success came in 1957 with the AR-5 rifle, which was designed for the U.S. Air Force's requirements for an aircrew survival weapon. Work on the AR-5 was apparently initiated by the friendship between Boutelle and Gen. Curtis LeMay, who headed the U.S. Strategic Air Command.

The AR-5 was a bolt-operated rifle chambered for the .22 Hornet. The rifle used a detachable magazine, designed for the Harrington & Richardson (H&R) M4 survival rifle being built for the air force, and a barrel that was held to the front of the receiver by a threaded ring; the rifle was 30 1/2 inches long when assembled and 14 inches when broken down, making it short enough to meet the air force's length requirements.

The rifle's receiver/action, barrel, and magazine could all be stowed in the A-5's hollow fiberglass stock when the firearm was broken down for storage. The materials used to make the rifle were so light that the rifle could float on water because of the buoyancy of the hollow stock (undoubtedly a strong selling point for a survival rifle, which might conceivably see use in a life raft or near the water). In addition to holding the rifle components, the hollow stock had a small storage compartment for a kit of matches, needles, fishhooks, and so forth, making it a survival package in itself.

Twelve AR-5s were fabricated for air force testing and, with some minor modifications, accepted for use on military planes. The AR-5 was designated the MA1 by the air force, but Armalite never saw any great monetary results from the rifle because the air force's large inventory of M4 and M6 Survival Guns precluded the purchase of significant numbers of the AR-5 (MA1).

Nevertheless, the experience of dealing with the military and the enthusiasm shown for the gun by those testing it suggested to those running Armalite that there might be a market for military firearms. Thus the company adjusted its initial marketing thrust, which

AR-5 survival rifle.

focused on civilian buyers while considering later advancement into military sales, and embarked on a two-pronged development course that would produce guns aimed at civilian as well as military buyers.

THE AR-7

To take advantage of the work it had done on the AR-5 as well as create a viable moneymaker, Armalite created the AR-7 with an eye toward the commercial market in the United States. The rifle had the basic layout of the AR-5 but was chambered for the more popular .22 LR and changed to a semiauto blowback action (which was inexpensive to manufacture). The detachable aluminum barrel (with steel lining) was lengthened to 16 inches to conform to the U.S. Bureau of Alcohol, Tobacco, and Firearms (BATF) regulations for civilian rifles. The ability of the rifle to be broken down and stored in the hollow stock was retained, as was its ability to float on water.

AR-7 Explorer Pistol.

Although Armalite actually produced a few of these firearms and sold them to the public, rather than tie up its production equipment with the rifle it sold the rights to the AR-7 to Charter Arms Corporation in mid-1973. Charter Arms produced the firearm for a number of years as the AR-7 Explorer and later sold a pistol version called the Explorer Pistol. (This pistol version may have been created earlier by Armalite, although Charter Arms has generally received credit for this design; a photo of Sullivan surrounded by Armalite's firearms shows him holding a Golden Gun shotgun in one had while holding what appears to be a pistol version of the AR-7 in the other.)

In 1990, Survival Arms, Inc. took over production of the AR-7, working under a license agreement with Charter Arms. In the late 1990s, AR-7 Industries, LLC also commenced production of the AR-7. In 1998, the design came full circle and was introduced into the product line of the newly reorganized Armalite company. (For a more detailed look at the AR-7 and its many variations, spin-offs, and accessories, see *AR-7: Super Systems*, available from Paladin Press).

THE AR-17 GOLDEN GUN

Armalite's AR-9 was a semiautomatic shotgun with an aluminum barrel and body incorporating a number of design features that later found their way into the AR-10 and AR-15 rifles (including a rotating bolt design). Rather than market the 5 1/2-pound shotgun, Armalite decided in 1955 to shelve the design and instead exploit many of its features for a commercial shotgun that was

AR-7 Industry rifles.

AR-17 Golden Gun.

Three AR-10 prototypes created by Stoner.

eventually marketed as the AR-17 Golden Gun. This two-cartridge semiauto shotgun met with limited success and was in many ways ahead of its time, with a polycarbonate stock and an anodized aluminum barrel and receiver (both of which normally had a gold-colored finish).

THE AR-10

Development of the AR-10 can be traced back to 1953 to a design Stoner created before joining Armalite. Stoner's rifle was originally chambered for the .30-'06 cartridge (feeding off a Browning Automatic Rifle magazine) and was later modified for the new 7.62mm NATO cartridge, which appeared to be on its way to becoming the standard round for much of the free world.

As with most modern firearm designs, Stoner's work built upon earlier systems. Much of the bolt and receiver-mounted recoil tube of the AR-10 (and later the AR-15) can be traced to the original design of the Johnson light machine gun, which had been created at the end of World War II by American inventor Melvin M. Johnson Jr. While this automatic rifle saw only limited use during

World War II, it did prove to be a successful and forward-looking design, and it is obvious from a casual inspection of the AR-10 that Johnson's gun had a strong influence on Armalite's designers.

In fact, it's possible that Johnson himself had a hand in some of the developmental work with the AR-10 because he was on Armalite's payroll as "military rifle consultant and publicist"—perhaps one of the odder job descriptions of the century. At any rate, one of the most important features of the light machine gun to find its way into the AR-10 was the cam-controlled rotary bolt, which locked into the barrel, rather than the receiver, of the new gun. This made it possible to use a lightweight aluminum receiver with the firearm since the barrel supported all the gas pressure produced when the weapon was fired.

Another feature that enabled the AR-10's light weight was a simplification of its gas system. In lieu of a complex rod and spring assembly, a blast of gas was diverted through a gas port in the barrel and routed down a tube to unlock the firearm's chamber shortly after a round was fired. This, too, was borrowed from a previous firearm design, the Swedish Ljungman Gevar 42, which, in turn, was later employed with the 1944 and 1949 MAS rifles.

Even today, Armalite is a bit touchy about the suggestion that it built upon past designs, arguing that the AR-10 gas system is not the same as that of the Ljungman. In a sense this is true, since the gas system of the AR-10 and subsequent Armalite designs based on it employ a camming bolt and carrier, which are unlocked by gas pressure pushing against the bolt carrier key. However, it should be noted that the Ljungman system, like the later AR-10, has a tube that ports gas from the barrel to a cavity in the bolt carrier, thereby causing the gun to cycle. This in no way takes away from the genius of Stoner in building on the past to assemble a system that was greater than the sum of the parts borrowed from past firearms.

Trials and Tribulations

A version of the AR-10, the AR-10A, was submitted to the U.S. Springfield Armory in 1956 for testing as a possible replacement for the M1 Garand rifle. The AR-10 was able—unlike the M14—to shoot in the automatic mode while remaining easy to control due to its straight-back design and a special titanium muzzle brake. The rifle met with success, and soon the army expressed an interest in more rifle trials with the new weapon.

Unfortunately, Armalite switched from the first prototype guns with their had steel barrels to a new design that used a steel liner surrounded by an aluminum jacket (similar to that developed for the earlier Armalite survival guns); during military tests early in 1957, the barrel burst just ahead of the soldier firing the weapon. Even though no one was injured, the potential for harm to testers was obvious, and the rifle was immediately pulled from the trials.

Stoner—with the assistance of armorers at the U.S. Springfield Armory—quickly fabricated an all-steel, conventional-style barrel for the rifle so the testing could be resumed. Ironically, it was later discovered that milling longitudinal cuts into the steel barrels allowed the rifles to remain as light as those with aluminum-and-steel barrels.

One of the main features of the rifle, an efficient muzzle brake that had originally been made of "duralumin," was replaced by an equally efficient but more durable—and also more expensive—one made of a titanium alloy. This added considerably to the expense of the firearm. And the "Buck Rogers" look of the rifle undoubtedly met with some negative reaction from conservative forces in the military. Add the minor malfunctions, part breakage, and the barrel failure, and the U.S. Army's enthusiasm for the new Armalite rifle quickly dropped off. A short time later, the army chose the M14 rifle over the Belgian Fabrique Nationale (FN) FAL and the AR-10.

The Dutch AR-10

Even though the AR-10 was still being redesigned by Stoner and L. James Sullivan, Fairchild had actively promoted the rifle worldwide. In 1957 Armalite licensed the government-owned arsenal of Artillerie-Inrichtingen of Hembrug, Holland, to manufacture the new rifle with an eye toward sales to the Dutch military as well as to other buyers around the world.

For a time the Dutch military seemed poised to purchase large quantities of the AR-10; Artillerie-Inrichtingen quickly invested $2.5 million to tool up for producing the new rifle, undoubtedly with a hope of some large initial sales at home. During this period the AR-10A design was modified, with the gas tube being moved from the side of the barrel to run instead from the front sight/gas port assembly and down along the top of the barrel to a "gas key" coupled to the bolt carrier.

Since the Dutch military wanted the capability to launch rifle grenades from any rifle it adopted, the efficient muzzle brake of the original AR-10 was sacrificed for a more conventional flash hider that could accommodate a rifle grenade. This was an unfortunate trade-off because it sacrificed much of the lightweight rifle's ability to handle full-auto fire without loss of control by the shooter.

Because Fairchild executives expected large sales of the AR-10, the Artillerie-Inrichtingen arsenal was licensed to build, but not sell, the new rifles. Worldwide sales rights were broken down and sold by Armalite to Interarms (which was to handle sales to Norway, Sweden, and

"Family" of AR-10s created by Artillerie-Inrichtingen.

The Cuban-Sudanese version of the AR-10.

Finland, as well as all South American sales and African sales south of the Sahara) and Cooper-Macdonald, Inc. (which was to handle Southeast Asian sales).

The first AR-10s Artillerie-Inrichtingen produced were plagued with problems, including poor accuracy due to improper heat treatment of the cold-forged barrels. By the time these problems were solved, countries shopping for a 7.62-caliber battle rifle had adopted the FN FAL or weapons offered by other manufacturers. The nail in the coffin for the AR-10 came when the large Dutch contract that had been expected fell through.

In the end, Artillerie-Inrichtingen manufactured fewer than 6,000 AR-10s. Cuba, Mexico, and Panama purchased only a handful of the guns for testing; Venezuela chose to buy only 6; Finland asked for 10, and Guatemala purchased from 200 to 500. The "large numbers" went to Sudan, which acquired from 1,500 to 1,800; Portugal, which procured from 800 to 1,000; and Nicaragua, which bought 7,500.

In short, the AR-10 was a commercial failure.

Artillerie-Inrichtingen finally halted production of the rifle in 1959, and Colt's Patent Firearms was licensed to manufacture the improved version of the AR-10A. By this time the weapon had seen major improvements in the form of a stronger extractor, a more reliable magazine system, and a cocking handle that had been moved from inside the carrying handle to the rear of the receiver. It had become an excellent weapon with no interested buyers, since both the Fabrique Nationale and Heckler & Koch now were offering similar rifles in the same chambering that had had the advantage of extensive military testing by some of the major armies of the world. In short, no one wanted to take a chance on the AR-10 when there were other "safe" choices that had been adopted by Germany, Britain, and other large military powers.

AR-10 Innovations at Armalite

While developing designs for the Artillerie-Inrichtingen, Armalite devised several innovative versions of the AR-10, including a short-barreled carbine, several light machine gun (LMG) variations, and a sniper model. Included were belt-fed guns as well as a clever high-capacity magazine that utilized a spring-lifter that enabled a standard AR-10 to feed hundreds of cartridges without the need to reload or modify the gun for belted operation. Later, Colt's went on to modify the gas tube and spring-load it for use with quick-change barrels and developed a belt-fed model of the rifle. But, as with later firearms families, none of the variations attracted much interest among military buyers.

Today most authorities see the AR-10 as an excellent weapon that missed its place in history because of poor timing and marketing. And despite rumors of manufacturers tooling up to construct a version of the AR-10 for the public, such civilian models have all been AR-15 variants chambered for the .308 round. A true AR-10 built to the specs of the original design has never materialized. The problem with creating a new AR-10 is one of economics; it will always be cheaper to produce an AR-15 chambered for the .308 than to completely retool for a true AR-10 rifle that is not much different and has little to offer other than historic interest to the buyer.

While exact figures aren't known, it appears that the numbers of AR-10 rifles sold by Armalite and its contracts during this original organization of the company (not to be confused with the current operation covered later in this book) were quite small. Among these were a few apparently chambered for the Soviet/Russian 7.62x39mm cartridge, which were tested by Finland as a possible alternative to its AK-47-style Valmet rifles.

Most of these AR-10s were simply for testing and evaluation. Additionally, Nicaragua ordered 7,500 AR-10s but canceled the order when one of the test weapons allegedly blew up. The total numbers produced are as follows:

Country	Quantity
Cuba	1
Finland	6–10
Guatemala	200–500

The "family" of AR-10s created by Armalite.

Mexico	1
Panama	1
Portugal	800–1,000
Sudan	1,500–1,000
Venezuela	1

LESS WELL-KNOWN ARMALITE RIFLES

Armalite also created the AR-11, which boasted a conventional stock and resembled the AR-3 (and was chambered for the .222 Remington cartridge that eventually would be modified to become the round used in the AR-15). The company's AR-12 was a steel-stampings version of the AR-10, the basic design of which was modified to make it easy to mass-produce in Third World countries; the AR-12 was chambered for the 7.62mm NATO and might have been made at about half the cost of the AR-10 but never went beyond the prototype stage. The AR-14 was the sporting version of the AR-10 with a conventional Monte Carlo stock (without a pistol grip) and iron sights. It was chambered for .308 Winchester/7.62mm NATO, .243, and .358.

The AR-16 rifle appeared during 1959 and was notable because it exploited the inexpensive manufacturing techniques pioneered by the AR-12. Chambered for the 7.62 NATO/.308 Winchester, the AR-16 wasn't commercially successful; only three of the guns were ever made. But the rifle did break ground for the development of the AR-18, which would eventually become a competitor with the AR-15 for use among the militaries of the free world.

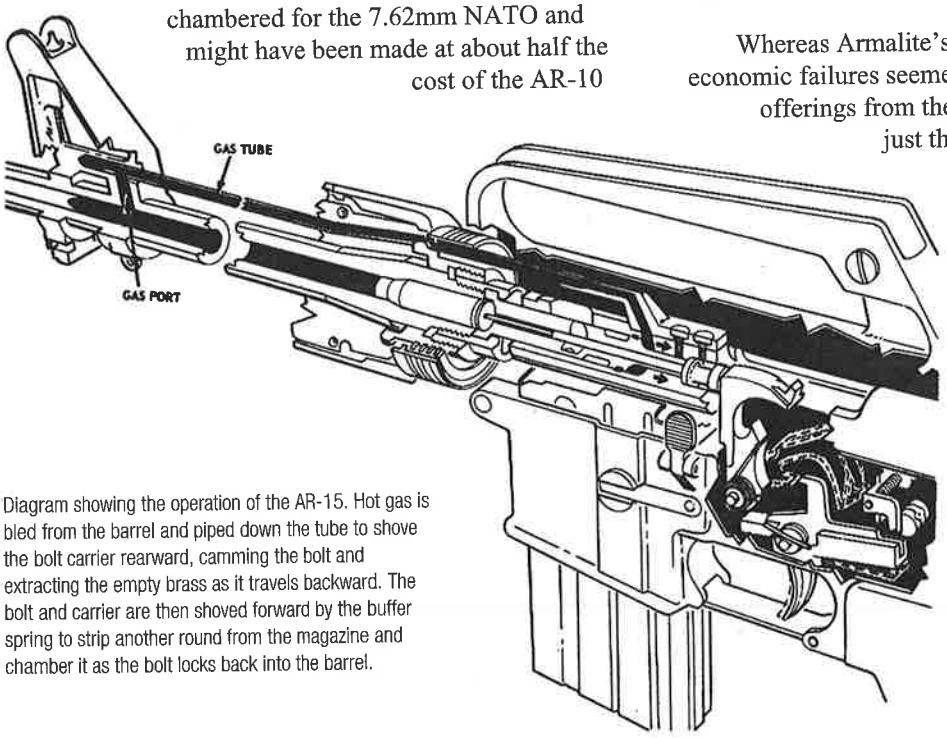


Diagram showing the operation of the AR-15. Hot gas is bled from the barrel and piped down the tube to shove the bolt carrier rearward, camming the bolt and extracting the empty brass as it travels backward. The bolt and carrier are then shoved forward by the buffer spring to strip another round from the magazine and chamber it as the bolt locks back into the barrel.

THE AR-15

Whereas Armalite's timing had been all wrong and economic failures seemed to be the norm for previous offerings from the company, the AR-15 enjoyed just the opposite. The rifle captured the imagination of buyers and had several lucky breaks that made the sales of the gun skyrocket.

One could conclude that this was to be expected, however, considering all the work Armalite had put into the design of the guns that led up to the AR-15. Add to that the fact that company officials, salesmen, and other personnel had by now created a lot of good contacts within the industrial-military complex as well as becoming more savvy marketers of firearms in general. Having gained valuable experience with

The XAR1501 prototype that would eventually lead to the AR-15 design.

Early AR-15, identifiable by its lack of flash hider.

Armalite's AR-15.

previous rifles, the company now had an excellent weapon as well as the ability to laud its capabilities to potential buyers.

Developed from 1956 to 1959, the AR-15 made use of a number of principles and features of the AR-10 and in many ways was simply a scaled-down AR-10. Like the AR-10, it used the same type recoil/buffer system in the stock, a gas tube to unlock the chamber and operate the bolt of the rifle, and lightweight aluminum receiver halves with the bolt locking into a barrel extension.

Placing the recoil spring in the stock of the rifle and dispensing with the heavy gas rod found in most similar guns shifted the balance of the rifle toward the stock. While traditional shooters may dislike this arrangement, many shooters find the rifle even easier to carry than might be the case with another firearm of its weight because of this shift in balance toward the rear of the gun. And many also find it easier to hold on target because of this.

The basic design of the AR-15 is generally credited to Stoner because he headed the AR-10 project, but the actual work on the AR-10 was started before he joined the company, and some features date back to the rough sketches created by Jacques Michault and George Sullivan. However, because Stoner perfected and debugged the AR-10 and later picked out and refined the cartridge that would be used in the AR-15, he is generally credited with the AR-15, even though his contributions were only a part of the developments that eventually led to the rifle.

Much of the actual scaling down of the AR-10 to create the AR-15, as well as the perfection of the new rifle, was done by Robert Fremont and L. James Sullivan, while Stoner apparently worked to perfect the AR-10 for Dutch manufacture. "Scaling down" a firearm is no minor task, since it involves changing the parts of the rifle to accommodate a smaller cartridge while retaining the length and size of the grip, stock, and barrel to fit the human body. Adding to the complexity of the process was the fact that the pressure of the gases that would be contained in the smaller chamber were actually higher than with the large 7.62mm cartridge, so some parts of the firearm actually had to be scaled up somewhat.

Because the new smaller cartridge of the AR-15 had a flatter ballistic arc than the AR-10's round had enjoyed, Fremont and Sullivan adopted a simplified two-position "L" rear peep sight to replace the complicated screw mechanism of the AR-10. The new system moved the elevation adjustments to a spring-loaded detent on the screw-in front sight.

Perhaps to stay within the later military weight requirements, the first AR-15 prototypes had fluted barrels under the handguard and dispensed with the foam reinforcement inside the stock and handguard in favor of simply using fiberglass shells with an

aluminum heat shield under the handguard. The greatest change in the new design was in the trigger group, where the disconnector was replaced by a completely new design and modified trigger and hammer layout (the auto sear design and selector remained pretty much the same).

A MORE POTENT ROUND

The cartridge created for the AR-15 was the result of many years of testing by the U.S. military and varmint hunters alike. The military work dates back to the 1920s when army ordnance personnel created a lightweight .22-caliber bullet for the M1 rifle cartridge with an eye toward a long-range machine gun round. This work was revised in the 1950s when the army started sifting through information garnered from ALCLAD.

The ALCLAD study had started out to learn the requirements for better body armor (some of which had proven highly effective when tested in the field during the Korean War). But the study got into areas of interest to small-arms experts when it examined such things as the range at which casualties occurred, the effects of bullets or shell fragments on the human body, the frequency and distribution of wounds, and so forth. To obtain these data, The army's Continental Army Command Operations Research Office (ORO) conducted a large statistical study involving the 3 million casualty reports from the first two world wars and the Korean conflict.

The results of this study flew in the face of most military thinking. It found the following:

- In combat, nearly random shots produced more casualties than did aimed fire.
- Rifle fire was seldom used effectively at distances greater than 300 yards.
- The majority of rifle casualties were produced at ranges of 100 yards or *closer*.
- Even expert marksmen could seldom hit targets beyond 300 yards because of terrain features or the marksmen's need for cover.

This study was buttressed by research done by the military writer and historian, Gen. S.L.A. Marshall, who discovered that nearly four-fifths of all foot soldiers in World War II never fired a round in any given battle—with one exception. The soldier charged with carrying the Browning Automatic Rifle (BAR) almost always fired his weapon, apparently because he could dominate his enemy through automatic fire. And to some extent his firing also encouraged the soldiers next to him to engage the enemy as well. This finding also laid the groundwork for development of the AR-15 as the U.S. military searched for a lighter alternative to the BAR—a rifle capable of controlled automatic fire that would enable troops to fight aggressively in battle.

SALVO

The above facts led to the Operations Research Office SALVO project in the early 1950s. In turn, the project made a number of findings that would affect later small-arms design and basically send military small-arms development in the United States in two very different directions. The two major points made by SALVO were these:

- A lightweight projectile was adequate for a soldier's needs at normal combat ranges.
- Long bursts of fire tended only to waste ammunition, while three- to five-round bursts were the most effective automatic fire in small arms.

The principal thrust of the SALVO project was to outline the requirement for a small-caliber rifle that was capable of automatic fire. To achieve these ends, designers took two routes. One was toward the use of smaller bullets in more compact cartridges, the route that would finally prove to be most effective. The other was the basis of the Special Purpose Individual Weapon (SPIW) project, carried out during the early 1950s with the aim of creating a weapon with a superfast projectile that would satisfy the requirements for an effective weapon put forth by the ALCLAD and SALVO research. SPIW was principally directed at producing a weapon that could create a multiple projectile pattern of shots through the use of flechettes packaged in one round, similar to a shotgun shell. (Later the thrust of the program shifted to single flechettes packaged in separate cartridges and fired serially or several at a time in multibarreled guns.)

After some experimentation, flechette configuration was more or less settled: a small rocket-shaped steel dart weighing only around 10 grains (0.65 gram). This permitted packing a number of the darts into one payload package without producing excessive recoil, while putting a number downrange on the target to increase the chances of hitting it, even if the shooter's aim was somewhat off the mark. Generally this basic configuration is credited to Irwin Barr, who commenced work toward perfecting the flechette as a modern weapons projectile in 1950. His Cockeysville, Maryland, company, Aircraft Armaments Incorporated (AAI), handled much of the work and eventually landed a number of government contracts to develop the flechettes and weapons to fire the projectiles.

Barr conducted his early project without funding, contacting the Department of Defense (DOD) to let it know what he was doing in the early days of his project. His work was received with great interest, and in 1952 AAI was offered a contract to produce some demonstration shotgun shells loaded with Barr's flechettes.

Work progressed, and in May 1956 AAI received another contract to study the effectiveness of flechettes. Nine months later, AAI concluded that the 10-grain flechette was the optimally sized flechette and that a speed of 4,000 fps would make it as effective as the much larger but slower 150-grain bullet in a .30-'06 cartridge fired from the M1 rifle.

By now it seemed like flechettes were the fast track to the future, so the U.S. Army awarded a contract to AAI to carry the concept forward with a test gun that would be employed in a variety of tests. Toward this end, AAI employed 10 Winchester Model 70 bolt-action rifles, which were rechambered to accommodate flechette ammunition. Tests with these guns further suggested that the flechette load held promise, so in October 1962 the army asked for rifles that could both fire at specific targets like a rifle and hit a large area with a barrage of projectiles.

This time AAI had some competition, with bids being submitted not only by AAI but by nine other firms as well. Of these, AAI, Harrington & Richardson, and Winchester received development contracts early in 1963, with work to also be done at the U.S. Army's Springfield Armory. These three companies and Springfield Armory each presented 10 test rifles in March 1964 for evaluation. Army test personnel decided that the Springfield Armory and AAI prototypes had the most going for them and provided more funds to develop each system, hoping one or the other would prove viable.

The Springfield Armory design was quite futuristic for its day and in many ways blazed the trail for the modular systems that more or less became the norm in the last decades of the 20th century. The gun could be converted into several configurations, including a bullpup rifle or standard rifle. The AAI design was more conventional in its layout, departing from the basic rifle concept only in its use of a flechette payload.

Springfield Armory and AAI each submitted 10 rifles in August 1966 to the U.S. Infantry Board at Ft. Benning, Georgia, for testing. Things didn't go well in the tests, with both systems proving faulty; however, it was felt that AAI rifle showed promise, so the company received more funding to continue development of its system through a 35-month research-and-development program.

Although by this time the AR-15 had made its way to the scene and voices were calling for its adoption (more on this story in a bit), some felt the flechette gun was the best bet. One of these was General Electric's Armaments Division, which submitted a proposal to refine and perfect Springfield Armory's modular design. The company was issued a contract for this in January 1969, and AAI again had competition.

To carry out its work, General Electric leased the Springfield Armory complex from the government (the armory having recently been closed) and hired Richard Colby, who had been working at the armory on SPIW. Ultimately, the work would reach a dead-end: no practical system was ever developed from the project before funding ran out.

Meanwhile, AAI had four different projectile packages in the works by mid-1969. But the work toward perfecting its rifle had reached an impasse: the gun was far from reliable. Hoping to get the bugs out of the rifle system so that work with the flechette testing could go forward, the U.S. Army transferred the work to its Small Arms Systems Agency at the Rock Island Arsenal in Illinois.

The latest version of the AAI design at this point was the XM70, which went through many modifications and design changes to make it reliable, as well as testing its ammunition as the work progressed. This continued through the early 1970s, with the rifle ultimately becoming viable.

But there was a growing realization that the flechette concept itself was far from promising. In fact, the projectiles weren't nearly as effective as had been hoped. The fin stabilization proved to be very inaccurate over long ranges, and the area coverage afforded by groups of the projectiles was haphazard at best, with a large percentage often hitting the ground well before the target range, thereby being totally wasted. Additionally, there were some doubts about how effectively it would actually wound a soldier, the fear being (apparently based on animal tests) that the wound would be small and penetrating but perhaps not debilitating in many instances.

In addition the AR-15 was by then becoming established in the U.S. military—the army having decided to adopt the rifle as its M16— so the decision was made to pull the plug on all funding for SPIW.

This wasn't the last of the flechette, however; AAI would be submitting a gun chambered for a flechette round in the mid-1990s for consideration by the U.S. military. But today the program is generally seen as a technological failure. Ultimately, military planners decided to stick with conventional but scaled-down rifle ammunition rather than adopt the shotgun-shell-style or single-flechette cartridges created by SPIW.

Conventional Bullets

Running counter to SPIW were several programs that would actually lead to viable weapons systems. Some of

the tests involved were conducted using necked-down M1 carbine cartridges firing .22-caliber bullets. These proved that such weapons were practical and effective (and the rifle was liked by the troops due to its low recoil and light weight). The end result was the suggestion that an ideal combat weapon would fire a conventional, but smaller than currently employed, .22-caliber bullet weighing 55 grains and traveling at 3,300 fps.

Armalite learned about the army tests and proposed switching to the smaller caliber during the AR-10 testing. Much of the AR-10's failure had been due to the new system's not having been tested long enough to uncover all the bugs. Thus, Armalite set out to make a new rifle that would conform to the military's needs by building on the AR-10 system, which had by then seen a lot of refinements and was close to being perfected.

The new AR-15 was originally chambered for the .222 Remington used in the AR-11, since it came closest to the type of cartridge the army would be asking for. This round was then topped with a 55-grain boattail bullet developed for Armalite by the Sierra Bullet Company. Because the original cartridge case was not large enough to create the velocity desired, it was lengthened slightly, and the new round was named the .222 Special.

The first ammunition manufactured for use in testing was made by Remington and bore the head stamp of .222 Special. Later, when Remington began marketing the .222 Magnum, which was very similar, Armalite renamed the .222 Special the .223 Remington to avoid confusion (the .223 round would fit and fire in rifles chambered for the .222 Magnum — with potentially disastrous results). Ironically, the bullet for the .223 Remington is .224 inch in diameter, making the ".223" label misleading to many novices.

The gas system of the AR-15 was tied into the basic design of the rifle and the military's velocity requirements. Through experimentation, Armalite engineers discovered that for the gas system to work properly, a fast-burning powder had to be used; a slow-burning powder would not be completely burned by the time it entered the gas system to propel the bolt open and to operate the reloading mechanism. In fact, repeated firings with a slower powder created major fouling in the bolt of the rifle until jamming finally developed. Because of this, one of original design specifications for the new rifle was for fast improved military rifle (IMR) powders rather than the slower ball powders traditionally used by the U.S. military.

As will be noted later, the specifications for this cartridge would later create problems for the AR-15, due to bureaucratic blundering and lack of proper training of troops in Vietnam.

THE CONARC TRIALS

As Armalite had expected, the U.S. Continental Army Command (CONARC) announced that it was searching for a lightweight, small-caliber weapon to replace some or all of its rifles and submachine guns. Interested manufacturers and individuals submitted their proposals, and in 1957 the Infantry Board in Ft. Benning officially asked Winchester-Western (a division of the Olin Mathieson Corporation) and Armalite to develop candidate rifles and ammunition to be tested as possible replacements for the M14 and 7.62mm NATO round. These had been developed by the military itself and were failing to perform as well as had been hoped. A third rifle was to be created "in house" by the U.S. Springfield Armory to compete against the two commercial designs and serve as a standard against which the other two rifles would be compared.

The requirements set forth by the Infantry Board for a small-caliber high-velocity rifle were as follows: (1) the rifle would weigh less than 6 pounds when fully loaded; (2) the rifle would need to be capable of automatic fire; (3) the round the rifle fired would be capable of penetrating body armor, a steel helmet, or a 10-gauge steel test plate out to 500 yards; (4) the round would be equal in lethality to the M1 Carbine within 500 yards; (5) the weapon would have a detachable 20-shot magazine; and (6) accuracy and trajectory would be equal or better than the M1 rifle out to 500 yards.

The range requirements in two of these specifications were 200 yards greater than the ranges ALCLAD had shown were needed. Those privy to the requirements have admitted that the range was raised from 300 to 500 yards simply to make the specifications look better to superior officers. Later, when the military decided to use meters rather than yards to conform to other NATO countries, the specifications were changed to 500 meters, making the final cartridge have to perform at twice the range ALCLAD had found was actually needed. Some of this added range might have been justified if the army ever mounted a scope offering magnification of distant objects on its rifles so that the longer range potential might be utilized by troops. But as long as rifles are going to be issued with iron sights, range requirements greater than 300 yards are unsupported by any known studies (and there is no sign that other research or testing to prove otherwise has ever taken place).

On March 31, 1958, Armalite delivered 10 AR-15s, 100 magazines, and 100,000 rounds of ammunition to the Infantry Board for the trials. Because no manuals had been created for the new rifles, Eugene Stoner accompanied the guns and served as a "living manual,"

Lightweight rifle candidates: the gun submitted by Winchester-Western (top), the gun created by Springfield Armory (center), and Armalite's AR-15.

The M1 carbine in many ways served as the yardstick against which the AR-15 was measured. Like the AR-15, the M1 carbine was light and handy, firing a cartridge that produced little recoil and was easy to manage during automatic fire.

showing army personnel how to operate the firearm and helping with minor repairs necessitated by the wear incurred during the tests.

The tests at Aberdeen Proving Ground in Maryland and Ft. Greely, Alaska, suggested a number of modifications and improvements to the AR-15, most of which were subsequently made. The barrel was strengthened (to allow for firing with small amounts of water in the bore of the rifle) and a flash hider was added to it; the cocking handle was moved from the inside of the

carrying handle to the rear of the receiver (probably due to problems with the lever becoming overheated with extended firing and to allow those wearing arctic mittens to operate the mechanism); the single-piece handguard was replaced with a clamshell design held in place with a knurled (later ribbed) spring-loaded ring; a rubber butt was added to the plastic stock (probably to help prevent the stock from breaking); the rear sight's size was increased; the selector was modified so that the safe setting was forward rather than the original setting pointing upward (since dragging the rifle could set it to the fire position); and the trigger pull was reduced to 7 pounds and its return spring strengthened.

Additionally, to improve the mechanism's tolerance for dirt, the clearance between the magazine and receiver was increased, the clearance around the buffer increased, and the bolt carrier's lands reduced. Since the dust cover had a tendency to come loose, a cam was added to it. To increase reliability of the rifle, the feed ramp angle was also altered and the capacity of the magazine reduced from 25 to 20 rounds. All these changes made the rifle about a pound heavier than the original specifications of the Infantry Board but resulted in a better rifle as far as the military testers and Armalite were concerned.

Winchester's rifle, designed by Ralph Clarkson, proved to be very similar to the M1 carbine and sported a traditional walnut stock coupled with the look of a miniaturized M14 rifle. By fluting the rifle's barrel, Winchester was able to keep the weight of the gun to only 5 pounds with an empty magazine. However, the Winchester rifle had a major problem: in order to beat Armalite in delivering rifles for testing with the army, the company had started chambering its rifles for the .222 Remington before the range requirements for the new rifle were upped from 300 to 500 yards. Winchester made some frantic efforts to modify the gun and cartridges, but the end result was less than ideal reliability of both rifle and ammunition, so the AR-15 came out looking better after the trials than might otherwise have been the case.

BIGGER IS NOT BETTER

During 1959, the army conducted tests involving the AR-15 and Winchester's .224 Lightweight Military Rifle but reached no decision on adopting the Armalite cartridge or either of the rifles for actual military use. However, during the tests one thing became very apparent: the lighter weight of the AR-15 coupled with its more controllable recoil made it popular with troops testing it as well as highly effective in putting aimed fire on target. During the trials the soldiers noted how the smaller rifles (the Winchester and especially the AR-15) handled. Nearly all preferred the smaller caliber weapons to the heavier M14 rifles.

During this same period, the Combat Development Experimentation Center (CDEC) discovered that a 7- or even 5-man squad armed with AR-15s could do as well or better in hit-and-kill potential in combat-style tests than the traditional 11-man squad armed with M14 rifles—something that undoubtedly didn't sit well with military planners because the U.S. Army had just elected to arm its soldiers with the M14.

During the tests, it also became very clear that the heavy recoil of the M14 rifle was almost impossible for an average soldier to control under actual combat conditions (as opposed to target-style shooting). And the AR-15 proved to have an overall malfunction rate of only 6.1 per 1,000 rounds fired. This was amazingly good for a nonproduction gun and outperformed the M14, which was averaging a failure rate of 16 per 1,000 during these same tests.

The army CDEC's report concluded that the army should develop a lightweight, reliable rifle "like the AR-15" to replace the M14 and also suggested that the increased firepower afforded by such a weapon would allow a reduction in squad size—all of which undoubtedly displeased more than a few generals in the Pentagon. No contracts were offered to either company for new rifles; the military "stuck to its guns," keeping the M14.

The M14 rifle proved heavy and awkward at best and was almost unmanageable when fired in the automatic mode.

Changing the Results

What happened next during U.S. military tests involving the AR-15 is clouded in controversy. Supporters of Armalite would later claim that efforts had been made to sabotage the AR-15. Certainly this appears to be the case, though as with most historic occurrences that are less than open to public scrutiny, it may be that a series of blunders and mishaps created the problems. Whatever the cause, the outcome was that the AR-15 came out of the tests looking bad.

The problems started when three of the AR-15s the U.S. military was employing in testing were sent to Ft. Greely to check their functioning under arctic conditions. (Today the need for a standard weapon that functions in all climates may be questioned; however, in the middle of the Cold War the need for this capability was not far-fetched. Although the United States had never really seen battlefield conditions as extreme as those at Ft. Greely, with Soviet territory just a few miles from Alaskan shores, there was serious concern about the potential need for such a rifle. In addition, considering the stalemate of the Korean War and the growing tensions in Vietnam, having to repel an invasion of Alaska by Chinese or Soviet troops was seen as a possibility if not a probability.

It wasn't until Armalite officials received a call for replacement parts from Ft. Greely that they even knew some of their firearms had been sent to the base. Unsure of what was going on, the company sent Stoner with the parts, both to replace the parts himself and to determine what exactly was behind the somewhat unusual breakage problems, since the parts called for were normally not subject to failure.

What the inventor found was later described as appalling: some of the guns had been improperly disassembled. Worse, parts had been lost and replaced—with handmade parts of dubious quality.

After repairing the rifles, Stoner test-fired them and found that the AR-15s functioned well in the arctic conditions at the base. Thinking the problems were cured and knowing that the firearms were functioning properly, Armalite officials undoubtedly heaved a corporate sigh of relief and figured the testing would again give their rifle high marks.

Only months later did the shock come. The rifle appeared to be the proverbial "jammatic," with numerous failures, according to the data that emerged from Ft. Greely. As company officials looked into the matter, they discovered what must have been infuriating: the problems created by the substitute parts were included in the test results and conclusions, with no mention of the alterations or near flawless performance after Stoner had placed the proper parts in the guns.

The M16A2 functions reliably in temperature extremes. Here a U.S. Marine uses his ski poles to steady his M16A2 rifle in preparation for a live-fire exercise. (Courtesy of U.S. Department of Defense.)

DIVESTING THE AR-15

Although it is hard to know what insiders at Armalite and Winchester thought of the testing done by the U.S. military, many historians feel that the army had intended to use the tests as a vehicle to show off its own designs while giving the illusion of the tests' being open and fair. As more than one critic of the trials has suggested, the U.S. military had a long history of creating its own firearms designs. The thought of a civilian operation's developing a weapon that would be adopted as the standard-issue rifle was not one that many military leaders cared to entertain. The key criteria for the tests, as this argument goes, were that rifles from outside sources

be rejected by the military while in-house designs received every benefit of the doubt. Given the Ft. Greely tests, as well as subsequent rigged tests that would come, this argument seems plausible. If so, then the tests were all just window dressing designed to justify the army's selection of the M14 rifle as its new firearm.

After army brass announced the decision to adopt the M14 rifle, officials at both Armalite and Winchester realized they had invested a lot of time and money in the military trials of their rifle with little to show for it. Soon Winchester discontinued work on the weapon and the model was shelved, never to go into production.

Likewise, Armalite (whose parent company, Fairchild, was having financial difficulties keeping the firearms branch going) found itself struggling because of the lack of any military contracts and the black eye given by the Ft. Greely tests. What had looked like a promising start on a major sale to the U.S. military had fallen flat. Thinking it was simply throwing away good money after bad if it continued to market the design, Armalite sought to divest itself of the AR-15. What had appeared to be a goose that would lay golden eggs was, as far as company officials at Armalite could tell, dead. The firearm that had looked so promising was placed on the auction block.

By now, having failed to generate any significant revenue despite creating so many excellent rifle designs, Armalite saw key personnel leaving the company, headed for greener pastures. Fremont left for a more secure job with Colt's in 1959 and was followed by Stoner two years later. Sullivan left in 1960. Thus the firearms team that had created so many innovative designs disintegrated.

Chapter 2

Colt Firearms

Too many times, excellent firearms designs have gone into the dustbin of history simply because there was no market for the gun. This might easily have been the case with the AR-15 had Colt's Firearms Corporation not also been having economic problems at the same time that Armalite was. Instead, what appeared to be the death knell for the AR-15 became the chain of events that would make this firearm one of the success stores of the 20th century and put it into the hands of troops around the world (as well as those of numerous civilian and police users).

Colt's Firearms Corporation was created in the mid-1800s by Samuel Colt, who secured a patent for the first successful revolver mechanism in 1836. Although his business was not as successful as sometimes pictured (in part due to the intense competition for business from Smith & Wesson and other gunmakers), Colt guns have always captured the imagination. They even inspired the post-Civil War slogan, "Abe Lincoln may have freed all men, but Sam Colt made them equal." Colt guns did just that, doing away with the brawn that was often called for when a single-shot weapon failed to do its work, instead giving a shooter several follow-up shots to deal with a single enemy, or even a band of outlaws or renegades.

Colt died at the early age of 47, but his business continued, flourishing in large part through military sales of firearms created by and licensed from John Moses Browning. Business was especially good during World War I, World War II, and the Korean War, thanks to the military contracts needed to win these conflicts.

Following the Korean conflict, the company began doing some serious belt tightening. Although civilian sales were a major part of Colt's operation, its bread and butter often came through major sales to the U.S. government. The firm had seen money roll in from military contracts almost from the day Samuel Colt had started his firearms operation. At one time or another, Colt had made Gatling guns, single- and double-action revolvers, various automatic pistols (including the 1911 adopted by the U.S. military), the BAR, and several styles of Browning machine guns.

This came to an abrupt halt when the U.S. Army decided to adopt the M14 rifle and Colt failed to obtain the contract to make the new guns. Meanwhile, orders for the weapons it had been making were cut back with an eye toward phasing in guns like the BAR. Colt undoubtedly realized it was hurting and things were only going to get worse if it didn't add a new product that could add military sales to its lineup.

In September 1955, Colt's management had formed a conglomerate with Leopold D. Silberstein's Penn-Texas Corporation, becoming a wholly owned subsidiary of the holding company based in New York. This arrangement continued until 1959, when a group of investors gained control of the company, dismissed Silberstein, and renamed his company Fairbanks Whitney.

When it learned that the license to build the AR-15 was up for grabs in 1959, Colt's management jumped at the chance to obtain the rights and, in the process, secured the rights for manufacturing the AR-10 as well.

SELLING THE PRODUCT

After Colt signed the contract with Armalite, its aggressive sales techniques enabled it to sell a number of the rifles to several small Southeast Asian countries. (The rifle was much easier for Asian soldiers to control since it was lighter and offered less recoil—both important considerations for the smaller physique of the average oriental trooper.)

Eugene Stoner, who was soon working for Colt in marketing, accompanied gun exporter Bobby Macdonald through Southeast Asia, demonstrating the AR-15 and AR-10 to potential governmental buyers in Burma, India, Indonesia, Malaya, Australia, and the Philippines. While none of those who saw the AR-10 were much interested, the AR-15 was loved by nearly every government representative who fired it. When word of the AR-10's

failure to attract a potential buyer reached Colt, the company suspended all plans to produce the larger-caliber rifle, even though more than $100,000 had been spent in tooling for it.

(NOTE: The AR-10 nearly got another lease on life as the U.S. Army's sniper rifle when it was one of six rifles tested at the Aberdeen Proving Ground in 1977. The Rock Island Arsenal modified the rifle, removing the front sight assembly and the rear sight/handle and incorporating a scope base and ART scope. But the tests were inconclusive and only pointed to the need for a better ranging system and more accurate ammunition. Again, the AR-10 failed to be adopted for military use.)

In December 1959, Colt produced its first run of 300 AR-15 rifles, which was broken into small lots and sent for testing to many of the countries Stoner and Macdonald had visited. Some of the governments expressed interest, but sales were blocked to most of them because the mutual-aid funds the U.S. government was offering required that firearms be standard issue with the U.S. military. The AR-15 wasn't issued to U.S. troops, so the U.S. government wouldn't provide funds for its purchase. With funds running low and a lack of actual buyers, Colt was getting close to serious problems and Armalite was not receiving the royalties it had been hoping for from AR-15 sales.

Then both companies had a stroke of luck.

RIVALRY TO THE RESCUE

Boutelle, president of Fairchild, had maintained his friendship with General LeMay during the years since the development of the AR-5 survival rifle. During a skeet shoot on his farm, Boutelle demonstrated an AR-15 to the general, firing at a ripe watermelon, which exploded spectacularly when struck by the burst of high-velocity bullets. LeMay was very impressed with what he saw, thus setting in motion a chain of events that would eventually bail both Armalite and Colt out of their financial woes.

Problems had been brewing between the air force and the army since the former had rejected the latter's M14 as too heavy and awkward. The army then turned around and refused to supply parts for the M1 Garand the air force had retained, claiming the spare parts for the World War II-vintage rifle had been scrapped when the M14 was adopted. Consequently, air bases with nuclear weapons were being guarded by security forces armed with the outdated M1 carbine, a weapon never noted for the effectiveness of its cartridge or reliability with automatic fire. Thus the air force was forced to either make due with the M1 carbine or adopt a rifle it viewed as being no great improvement on World War II-vintage rifles.

And then LeMay saw the demonstration of a rifle that fit the bill for the air force's needs, firing a potent little bullet while still being almost as lightweight as the M1 carbine and pounds lighter than either the M1 Garand or the M14.

At LeMay's prompting, the U.S. Air Force started its own tests of the AR-15 at Lackland Air Force Base in Texas. The tests suggested the new rifle was everything the service had hoped for. In 1960, the air force asked for an analysis of the weapon by the Army Ordnance Corps in order for the AR-15 to be granted candidate rifle status for more air force tests.

The army's test and evaluation was conducted at Aberdeen Proving Ground, and the AR-15 proved nothing short of phenomenal. The rifles fired by army personnel proved capable of 10-round groups of 1.5 inches at 100 yards using iron sights and 10-shot groups of 1.1 inches with scopes—as good as many target rifles.

It didn't end there, however. The rifle not only was accurate, it was tough and reliable. During endurance tests of 18,000 rounds fired, only 10 parts broke and the average malfunction rate was only 2.5 rounds per 1,000—an excellent figure for a gun that had hardly gone into production. Of course, the "not-invented-here" syndrome appears to have been alive and well during the tests; the army final report begrudgingly concluded that the AR-15 was "reasonably satisfactory"—an understatement if ever there was one.

The air force followed up with more tests of the AR-15 at Lackland, this time comparing it with the M14 (perhaps to show the army how well a reasonably satisfactory gun would do in contrast to the army-designed M14). When the smoke cleared, 43 percent of the shooters firing the AR-15 could qualify as expert marksmen, whereas only 22 percent of those shooting the M14 could reach this level of skill.

The air force had found its rifle.

But there were hurdles to be jumped before the acquisition process could be started to get the rifles. Most important was the need for appropriations from Congress, which routed funds to what it felt were more urgent needs (at least in terms of constituents). Only after fighting for 2 years to get approval for the purchase was the air force finally able to procure 8,500 AR-15s in 1962.

GOOD NEWS, BAD NEWS

Ironically, the air force order for the firearms would pave the road for future sales of the guns to both the air force and foreign countries but would fail to bring financial success for Colt and Armalite employees involved in laying the groundwork for the deal. During the 2-year wait for the deal to be finalized, both Colt and Fairchild were taken over by larger corporations. During the

Although the AK47 family of weapons are tough and reliable, the cartridge they were chambered for was definitely second best when compared with the .223 Remington.

reorganization of the two companies, Boutelle got fired, and both companies' personnel who had been involved in marketing sample guns to foreign companies, which would soon be buying quantities of the rifles, were also laid off.

Yet a few AR-15s continued to be sold to various military users around the world; and those guns were gaining users who had nothing but good words for what was becoming known as "the little black rifle." Limited testing in Asia, especially in the South Vietnamese combat arena, showed just how lethal the lightweight rifle and the .223 bullet it fired were (and proved the ALCLAD requirements for an ideal combat rifle had been on the mark). Wanting to put the best weapon possible in the hands of its troops, Army of the Republic of South Vietnam (ARVN) placed an order for 1,000 AR-15s in December 1961, and, since the rifle had been approved for use by the air force (even though it hadn't been funded), the way was cleared for sales to Vietnam.

Meanwhile, U.S. army troops were slugging it out with communist guerrillas in Vietnam. And just as the its tests had suggested in 1959, the army was finding that the M14 was too heavy for easy handling and that automatic fire was so haphazard that most guns were being modified to fire only in the semiauto mode. Compounding the problem was an occasional blowup of an M14 receiver that had apparently been improperly

The AK47 was heavier and less user friendly than the M16; it also had inferior sights, but most important, its ammunition was inferior ballistically to that of the AR-15.

heat-treated. Although the latter event was rare, soon Colt representatives were pointing out such problems to potential buyers and paving the way for the future sales of the AR-15 and rejection of the M14.

PLAYING THE GOLDEN ARPA

Perhaps recognizing the problems the M14 would present in jungle warfare, the U.S. Army purchased 8,500 AR-15 rifles to test in 1961. In 1962 Colt persuaded the DOD's Advanced Research Project Agency (ARPA) to test an additional 1,000 in its Project AGILE, which was aimed toward finding a better weapon for use in Vietnam.

The ARPA tests again silenced many critics of the AR-15. Among the findings were the following:

- A squad armed with AR-15s had five times the level of overall kill potential than a squad armed with M14s.
- AR-15s could be produced at a lower cost and with a higher degree of quality control than the M14.
- The AR-15 was more reliable, durable, rugged, and easier to care for than the M14 under the adverse conditions often found in combat.
- Soldiers learned to shoot better and more quickly with the AR-15 (than with the M14).
- Three times as many rounds could be carried by a soldier with an AR-15 (in contrast to the M14) when the weight of both the weapon and the ammunition was taken into account.

Equally arresting findings came from the AGILE tests involving Vietnamese troops and U.S. advisors who used the rifles in actual combat. Here again, the AR-15 proved extremely durable and reliable. Not only that, the round used by the rifle showed itself to be highly potent against enemy targets.

Up until the time the AR-15 was fielded in Vietnam, the wounds created by small-arms fire tended to be through-and-through wounds resulting from the bullet's momentum and stability. This was true of the AK47 and SKS used by the Vietcong and North Vietnamese as well as the M14 and M1 carbine. Such penetrating wounds were the most common unless bullets were deflected somewhere in their paths by obstacles or through a collision with hard tissue in the target.

This situation changed with the AR-15, whose bullet was light, fast moving, and unstable—a combination that proved deadly in the battlefield.

One of the U.S. advisors who had seen the AR-15 used in combat wrote,

> At a distance of approximately 15 meters, one Ranger fired an AR-15 full automatic, hitting one VC with 3 rounds with the first burst. One round in the head took it completely off. Another in the right arm took it completely off, too. One round hit him in the right side, causing a hole about 5 inches in diameter.

Another soldier in the field gave an equally graphic account of the effectiveness of the new rifle:

> On 9 June a Ranger Platoon from the 40th Infantry Regiment was given the mission of ambushing an estimated VC Company. . . . Back wound, which caused the thoracic cavity to explode. . . . Stomach wound, which caused the abdominal cavity to explode. . . . Heel wound; the projectile entered the bottom of the right foot, causing the leg to split from the foot to the hip. . . . These deaths were inflicted by the AR-15 and all were instantaneous except [for a] buttock wound. He lived for approximately five minutes.

As another reported, "Range was 50 meters. One man was hit in the head; it looked like it exploded. A second man was hit in the chest, his back was one big hole."

But it didn't end there. Troops in Vietnam also discovered that rifle grenades fired from the AR-15 enabled them to lay down what was similar to their own mortar fire. Furthermore, troops cared for the weapon and treated it more carefully than the M1 carbine because they had greater respect for it.

In short, the little black rifle fielded in Vietnam was everything its designers had promised—and more. The troops not only liked the rifle, they also were chalking up serious body counts with it. The weapon enabled those using it to "own the battlefield," not only becoming deadly opponents to Vietcong troops, but also becoming more aggressive as they learned the capabilities of the rifle they carried.

CHANGES AT COLT

Colt continued to do well turning out AR-15 rifles for the U.S. military as well as reviving a number of older guns, such as its black-power revolvers and Sharps rifle, as Western movies and TV fueled the civilian market for guns of the Old West. However, changes came again in 1964 when the company reorganized under the name Colt Industries and the firearms section became a subsidiary called Colt's Inc., Firearms Division.

Colt aggressively sought to broaden its market by continuing to sell revolvers of all and the .45 semiauto 1911 pistol to the public through the 1960s and 1970s and into the 1980s. In addition, it created its Colt Custom Gun Shop, which made special target handguns as well as offering engraving on all of its firearms. Nevertheless, the company's bread and butter continued to be sales of its AR-15 rifle to military, police, and civilian buyers around the world.

The M16 rifle version of the AR-15 proved popular among U.S. troops—when it functioned properly—not always a given due to ammunition that wasn't formulated for it and lack of cleaning kits. (Courtesy of U.S. Army.)

MEANWHILE, BACK AT ARMALITE

With its engineers gone and large sales of the AR-10 and other rifles failing to materialize (except for the AR-15, the rights to which Armalite had sold to Colt's Firearms without realizing as much profit as could have been, given later sales), Armalite and its parent company, Fairchild, were in financial trouble in 1961. This led Sullivan and the other original owners of Armalite to buy the company back from Fairchild along with the rights and title to all

firearms designs except the AR-10 and AR-15, which had been licensed to Colt. The goal of this reorganized company was still to create firearms, but with an eye toward actually making some serious money in the process; finding financial backing was not impossible due to the track record of Armalite. Funding was supplied by Capital Southwest Corporation of Dallas (with Charles Dorchester and Richard Klotzly later acquiring the majority common stock position in Armalite by buying out Capital Southwest Corporation late in 1971).

This new business entity became "Armalite, Inc." and except for the change of ownership was run by the same key personnel. Armalite worked from 1962 through 1971 without meeting with any great financial success.

Since Armalite had failed to experience any great wealth flowing in from its deal with Colt, the company needed a new rifle that might gain acceptance by those not interested in the AR-15 and thereby bring in much-needed capital. Since Colt now owned the rights to the gas system used on both the AR-10 and AR-15, this new rifle also could not employ this or other features found on the AR-15.

This task wasn't as daunting as it might otherwise have been because a rifle design meeting this criterion was actually on the shelf at Armalite. All that was needed was some modifications to the design. Thus, from 1962 to 1964, engineers at Armalite worked on modifying the AR-16 rifle to the .223 Remington cartridge in much the same way that the AR-10 had been modified to create the AR-15. This new rifle was designated the AR-18, and Armalite pinned nearly all of its hopes for financial success on the new gun. (Although the AR-18 was marketed after Stoner had left the Armalite Company, according to Burton T. Miller, who was the vice president of Armalite during this time, Stoner was nevertheless responsible for much of the development of the AR-18 before its introduction, having taken part in the development of the AR-16.)

Due to its being chambered for the more compact .223 cartridge, the AR-18 was slightly shorter than the AR-16. But it continued the overall construction design of mostly sheet-metal stampings that were easy and cheap to produce. Internally, the gun employed a gas piston similar to that of the Soviet Tokarev to move the bolt and its carrier rearward, in the process keeping the trigger group clean of powder residue, a fact that gave the AR-18 the potential to be slightly more reliable than the AR-15, and most certainly making cleaning and maintenance of the rifle easier. Unlike the AR-15, which had a large recoil spring in the stock, the AR-18 used twin recoil springs and guides located within the rear of the receiver; this made possible a folding stock (and later bullpup designs when this system was adopted by other rifles).

Soon this new rifle was in competition against its AR-15 sister in military trials around the world. Although it is arguable whether the AR-18 was a better rifle than the AR-15, one thing is almost certain: the AR-18 never really got a fair trial against its competitor during U.S. military trials. This was because of a disastrous business arrangement Armalite made in selling the manufacturing rights of the new rifle to the Howa Machinery Company of Nagoya, Japan.

Sadly for both companies, this coincided with the Japanese government's efforts to force an end to the war in Vietnam. To bring pressure on those involved with the conflict, the Japanese government refused to grant an export license to Howa for the shipment of AR-18s to any country even remotely involved in the fighting. What appeared to be a lucrative market was suddenly out of reach to those wanting to sell and demonstrate the AR-18.

This problem was compounded when the U.S. Army started searching for a gun that would be even more reliable than the AR-15. One potential choice was the AR-18. The Japanese government's refusal to allow the guns out of the country left Armalite no choice but to supply the army with hand-built AR-18s from the Armalite factory, which were undoubtedly less reliable than those produced at the Howa plant. Thus both firms both missed yet another chance. The U.S. Army became committed to purchasing the more expensive—but readily available—AR-15 manufactured by Colt. (And by the time the Vietnam War was over, the U.S. military was fully committed to the AR-15, which pretty well had all the bugs worked out of its design and was as reliable as anyone could ever have hoped for, far outperforming most similar rifles that were available.)

Testing the AR-18

Exactly why the few AR-18s produced by hand at Armalite for limited testing by the U.S. military failed to live up to expectations is a matter of some debate. Armalite had earlier arranged for exhaustive tests by the independent H.P. White Laboratory in Belair, Maryland, which verified Armalite's claims that the AR-18 was both tough and reliable. Yet this wasn't the result seen in the military tests subsequently conducted by the U.S. Army. What was going on?

Some Armalite officials later claimed these tests were less than fair, again suggesting that the army was protecting its new rifle just as it had earlier done with the M14. According to Burton T. Miller, some tests the army conducted with the 10 available AR-18s employed the wrong type of ammunition and a defective magazine. If so, this undoubtedly resulted in failures of the rifle because ammunition was fed poorly into the chamber.

To make matters intolerable, the Japanese