

# EUGENE M. STONER DESIGNS AND GUNS BEFORE THE M16

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deployed to the South Pacific and later to Northern China. It was here that Stoner would first encounter the small arms that would heavily influence his early designs, particularly the M1 Garand, M1918 Browning automatic rifle (BAR), and the M1941 Johnson rifle and light machine guns (LMG) in use by the Marines around him. Working around these weapons led him to a nascent fascination for small arms. After being honorably discharged by the Marines at wars end, he began working for Whittaker, an aircraft parts manufacturer in 1945. Here Stoner would befriend the head machinist, and learned how to operate the manufacturing machines of the time, especially tooling for aircraft grade aluminum.

While Stoner was in the Marines, he began to experiment with his own designs. By 1943, he had developed two .30 carbine rifles, the M-1 and M-2, though these were only partially developed and no examples exist. Stoner was particularly fascinated by the rotary-bolt of the Johnson rifle and LMG (Figure 1), and in 1944 devised the M-3. This was a .30-06 rifle with a rotary bolt very similar to that of the Johnson, though it was never built and no plans exist today. In 1945 the M-4 came, with a Johnson-style bolt and, a primer-actuated recoil system in the style of the early Garand prototypes. Unfortunately, like the M-3, no plans or examples survive today.



Figure 1. 1941 Johnson bolt carrier group.

## Early Life

Eugene Morris Stoner was born on November 22nd, 1922 in Gosport, Indiana. After graduating high school in 1939, he began working for the Vega Aircraft Company, a subsidiary of Lockheed, as an armament installer. Like many young men of the 1940s, Gene Stoner answered the nation's call of duty during World War II, enlisting in the Marine Corps. He would serve with the legendary 1st Marine Division as an Aviation Ordnance Specialist, being

## M-5 Rifle

Stoner would continue his fascination with small arms into his civilian career and continued to tinker on his own designs. In 1951 Stoner became a design engineer at Whittaker, giving him much more leeway and resources to continue his experiments. With the assistance of the chief machinist, Stoner would bring his idea of



Figure 2. Stoner M5 rifle.



Figure 3. Stoner M-5, disassembled.



Figure 4. Stoner M-5 bolt carrier group (left) and M1 Garand op rod (right).

what he envisioned to be a lightweight hunting rifle to life. Called the M-5 (Figures 2 and 3), this rifle would make extensive use of aircraft-grade aluminum. While this material had been used in aircraft production for some time, it was only during the Second World War that it became ubiquitous, but had rarely been used in small arms design before. Stoner used this material in the heart of the weapon, the receiver, but many of the details were influenced by other designs. Most notably the rifle features an eight-lug rotary bolt much like a Johnson rifle and with the op-rod assembly of the M-1 (Figure 4). Likewise, it featured a two-stage trigger (Figure 5), as Stoner was impressed with the two-stage triggers of the Garand and Johnson rifles (Figure 6). Lastly, like many experimental

autoloaders of the time, it used a modified BAR magazine. At the time these were cheap, plentiful, and most importantly, reliable bases to use for experiments. However, further improvements to the rifle would continue to be made.



Figure 5. Stoner M-5 trigger group.



Figure 6. Trigger mechanism for a Johnson 1941 rifle (left) and M1 Garand trigger group (right).

Figure 7. Trigger assembly, bolt carrier group, and the M-6 disassembled.



### M-6 Rifle

The M-6 (Figure 7) was a further refinement of Stoner's designs. Most notably, it features an integrated optic, showing that Stoner was interested in equipping rifles with optics as a standard feature, something we might take for granted today but was very forward-thinking at the time. It also disassembles differently than the M-5. This rifle was further improved upon with the M-7, which would be the last conventionally configured rifle in .30-06. Unfortunately, the current whereabouts of M-7 are unknown, and as such we do not know the extent of the changes between the M-6 and the M-7.

### The M-8 Rifle

After a number of years of experimenting, Stoner would create his last M-series rifle, the M-8 (Figures 8 and 9). This was the first direct impingement gun made by Stoner using the bolt and carrier as a piston, and the direct predecessor to the AR-10 and AR-15. The M-8 operates by harnessing barrel gas pressure ported through a hollow tube then directed into the side of the bolt carrier. The bolt carrier and buffer assembly is a one-piece assembly in the first three AR-10s. The M-8 had an inline recoil system, similar to the M1941 Johnson, which reduces muzzle climb and keeps the rifle on target (Figure 9). This is especially useful in fully automatic with its stout .30-06 cartridge. The M-8 was also Stoner's



Figure 8. Stoner M-8 Rifle.



Figure 9. M-8 rifle disassembled.

first select-fire rifle and had a much larger magazine capacity than his previous designs, indicating a shift of interest from sporting to military arms.

### ArmaLite and the AR-10

Stoner left Whittaker to join ArmaLite, a division of Fairchild Aircraft on Oct 4th 1954. This occurred after a chance meeting with George Sullivan, president of ArmaLite, at the Topanga Gun range in California. Stoner was testing his M-6 rifle at the range when Sullivan noticed his unique rifle. Sullivan took an immediate interest in Stoner's ability to turn a gun from theory to physicality, and Stoner was eventually offered a job to work at ArmaLite.

Before Stoner, ArmaLite had worked on lightweight bolt action marksman rifles incorporating aluminum and foam-filled fiberglass stocks. Stoner's arrival would mark a change in focus to autoloaders. The first series of semi-automatic rifles developed under Stoner at ArmaLite were the AR-3, a copy of Stoner's previous M-7 rifle in the new T65 cartridge, which would be developed into the .308 Winchester.

The second AR-10 prototype (Figure 10) would be the first AR-10 produced at ArmaLite as well as the first in T65 (.308) Though made out of stamped steel and weighing a surly 8 lbs. 4 oz., the production rifle was intended to be made out of aluminum and



Figure 10. Stoner's second AR-10 prototype.

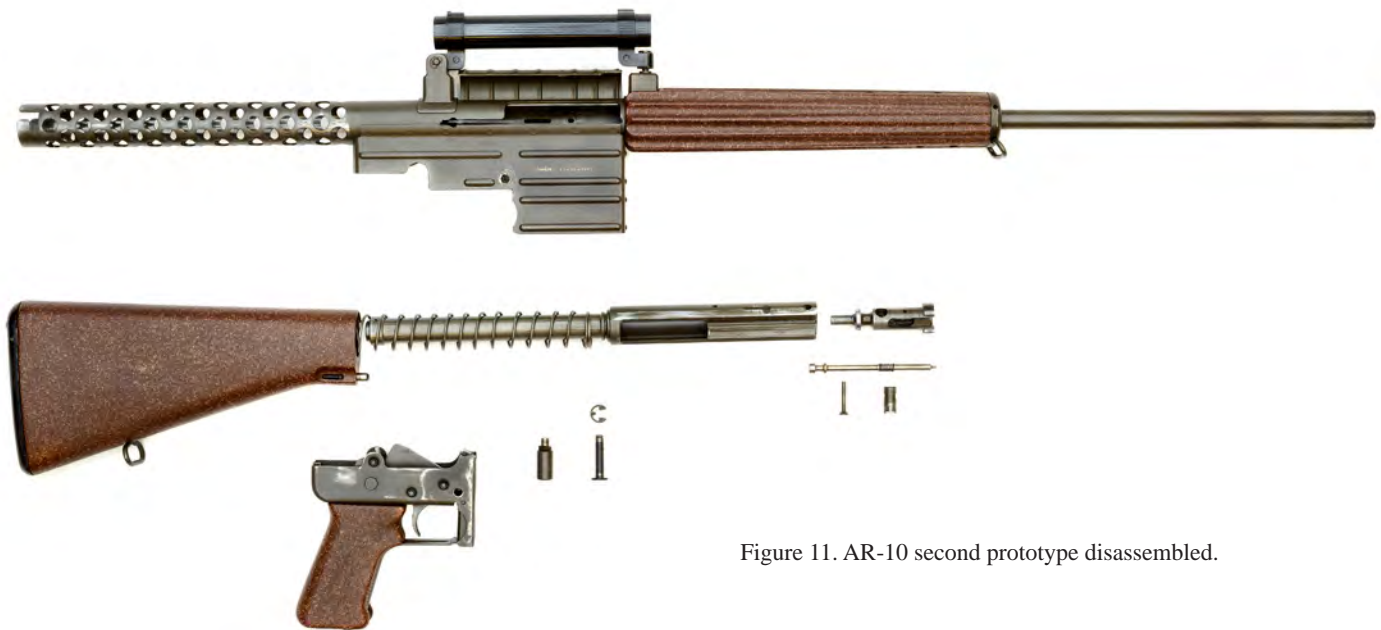


Figure 11. AR-10 second prototype disassembled.



Figure 12. AR-10A,



Figure 13. third AR-10A prototype disassembled.



Figure 14. AR-10B disassembled.

weigh two pounds less. It also incorporated a redesigned magazine release, rotating fire selector and like the M-6, an integrated optic. The fire control group is now in a separate lower receiver along with the magazine well. The basic design of the AR-10 had taken shape (Figure 11).

#### AR-10A Rifle

While the second prototype is the AR-10 matured in a technical sense, it is the third rifle the AR-10A (Figures 12 and 13) where the lines of the AR-10 and AR-15 start to form, and is the last stepping stone to the production AR-10's. First, and probably most importantly, the rifle receiver is made entirely of aircraft grade aluminum. This resulted in a rifle with an airy 6 lbs. 11 oz. weight. Secondly, it's fitted with a combination flash hider/recoil compensator, further reducing muzzle climb. Lastly, it now has the iconic combination carry handle sights and steel-lined aluminum barrel.

#### AR-10B

Finally, the AR-10B, also known as the "Hollywood AR-10" (Figures 14, 15), was the first pre-production model AR-10B serial number 1001, and formed the basis for the AR-15. The AR-10B has a hinged receiver design, right-hand side magazine release, bolt hold open/release on the left side and was the first weapon to use the standardized ArmaLite AR-10 pattern disposable magazine. Internally, the AR-10 now featured a separate bolt carrier group and buffer system. As well, it featured an aluminum jacket with a steel barrel, though this would be substituted for an all-steel barrel on later variants and models after more than one barrel separated during U.S. Army testing. In addition to the redesigned bolt came a separate, non-reciprocating charging handle as well as a spring-activated dust-cover. After serial number 1005, the "B" was dropped, and the rifle simply became the AR-10, along with a font change and ArmaLite Pegasus branding roll mark. (Figure 16).



Figure 15. AR-10B 1001, the first gun.

With the AR-10B, later simply renamed AR-10, came a flurry of development on the weapons system, ranging from sniper, squad automatic weapons and even belt-fed variants of the rifle (Figures 17, 18). When the overseas rights to the AR-10 were sold to Artillerie-Inrichtingen in the Netherlands, even more variants were produced, though that is a story outside the scope of this article. ArmaLite would produce one more prototype AR-10 known as the AR-10A serial number 1048, this gun incorporated many of the

lessons learned during the development of the AR-15. This was the last AR-10 ever to be made by ArmaLite (Figure 19).

ArmaLite also designed the AR-12 (Figure 20), meant to be a lower-cost version of the AR-10 using steel stampings versus expensive aluminum. Though initially developed with the direct-impingement gas system, later licensing agreements would cause it to be redesigned with a Stoner gas piston design to avoid legal issues, eventually turning into the AR-16 (Figure 21).



Figure 16. AR-10 1006 (top), the switch in markings from AR-10B to AR-10 (bottom; AR-10, right).



## The AR-15 Prototype

While ArmaLite would continue experimenting with 7.62x51mm, a new program that would have a profound impact on small arms design was afoot in 1956, the Small Caliber, High Velocity Program (SCHV). A part of Project SALVO, was an attempt to drastically increase hit probability and lethality of infantry weapons. The SCHV program used a very fast, small projectile to enable lower recoil, faster trajectory, and quicker time on target, while also enabling the soldier to carry much more ammunition. These factors certainly complimented the ArmaLite design, and Stoner, along with Jim Sullivan and fellow ArmaLite engineer Robert Fremont, began work on downsizing the AR-10 to what was initially the .222 Special, a modified .222 Remington cartridge. In 1958, the original AR-15, with its top-mounted charging handle (Figure 22) was demonstrated to the U.S. Air Force, with

ten rifles and 100,000 rounds of ammunition being provided. With a fully loaded magazine, the AR-15 weighed only 6.12 lbs., an absolutely featherweight amount, especially for the time period. One of the chief mechanical changes from the AR-10 to the AR-15 include a top-mounted gas tube and gas key. The sights were also simplified and standardized to what would become the M16's "field sights". While there were other competitors to the AR-15 in the SCHV trials, chiefly the Winchester Lightweight Military Rifle based on the Winchester G30R, the AR-15 was by far the most modern and advanced design.

## Enter Colt

Various changes were made to the AR-15 while at ArmaLite, which would be sent on to Colt as a part of the Technical Data Package. Every AR-15 made at Colt would have these features. Chiefly, the charging handle was moved from inside the carry han-



Figure 17. Belt-fed AR-10, serial number 1023.



Figure 18. AR-10 serial number 1047, the last AR-10 made at ArmaLite



Figure 19. AR-10A serial number 1048.



Figure 20. ArmaLite AR-12 gas piston is clearly visible.



Figure 21. ArmaLite AR-16.



Figure 22. ArmaLite AR-15 serial number 1.



dle to the back of the upper receiver. Contrary to popular belief, this had nothing to do with mounting optics, but instead was done to prevent excessive heating of the charging handle due to it being directly linked to the bolt carrier group. The caliber was also slightly modified to what would become the .223 Remington, with a 1:14 twist barrel. With AR-15 serial number 100 (Colt didn't know exactly how many AR-15s had been made at ArmaLite but knew it was less than 100), serial production at Colt began (Figure 23).

At ArmaLite, other weapons research continued with the AR-17 "Golden Gun" 12 gauge shotgun and the AR-18 (Figures 24 and 25), a scaled-down version of Stoner's AR-16 by Arthur Miller in .223 Remington. The AR-18 did not meet military or commercial success, but the system has been adapted in many modern rifles.

## Legacy of Stoner

As we celebrate the 100th year anniversary of Eugene Stoner's birthday, we also celebrate his technological innovations that have withstood the test of time. His AR-15 was adopted by the U.S. military as the M16 in 1963, the first of many Stoner rifles used in combat by American soldiers for the next 60 years. Though it had a rocky start, the M16/M4 series of rifles has had the longest service life of any American service rifle. This is a testament to the genius of the design. Eugene Morris Stoner rightfully earns his place as one of the greatest firearms designers of the 20th century.

Authors note: My 22 years long relationship with Gene Stoner was both as a personal friend, as a mentor in mechanical designs and as a business associate. We both shared a passion for exploring new technologies.



Figure 23. Serial number 100, Colt's first production rifle.



Figure 24. AR-17, lightweight shotgun.



Figure 25. AR-18, economical alternative to the AR-15 using Stoner gas piston.

## Acknowledgement

Photos by Michael Fullana

## Endnotes

- <sup>1</sup> Evans, Joseph Putnam, and Stevens, R. Blake. *The ArmaLite AR-10: World's Finest Battle Rifle*. 1st ed., Collector Grade Publications, 2016. p. 43
- <sup>2</sup> Ibid, p. 54
- <sup>3</sup> Stevens, R. B. and Ezell, E. C. (2004). *The Black Rifle: M16 retrospective*. Collector Grade Publications. 2004.

