A soldier of the Long Range Reconnaissance Team, 2nd Battalion, 502nd Infantry Regiment, carries an M-16A1 rifle near Tuy Hoa, Vietnam, 27 February 1966. (Photo by Robert C. Lafoon)

Speed versus Quality

A Cautionary Tale of the M-16 in Vietnam

Maj. Dallas Durham, U.S. Army

In April and May of 1967, young marines fought desperately against elements of the People's Army of Vietnam in the famous Hill Fights near Khe Sanh. During the battle, marines carried a relatively new rifle known as the XM-16E1. Although invented ten years prior, the XM-16E1 had only recently entered combat, first with the 173rd Airborne Brigade in March 1965 and later with the 1st Cavalry Division

in the Ia Drang Valley.[1] While official reports shone a glowing light on the new rifle, letters sent home from soldiers and marines told a different and horrifying tale. These letters soon became public, documented in the hearings of a congressional investigation:

> The M-16 rifle—it is a miserable piece—cheap and unreliable—we used the rifle in every engagement since I returned from Okinawa. In every instance … the weapon has failed us at crucial moments when we needed fire power most. In each case, it left Marines naked against their enemy. Often, and this is no exaggeration, we take counts after each fight, as many as 50% of the rifles fail to work. I know of at least two marines who died within 10 feet of the enemy with jammed rifles … the day found one Marine beating an NVA with his helmet and a hunting knife because his rifle failed—this can't continue—32 of about 80 rifles failed yesterday.[2]
>
> Our M-16s aren't worth much. If there's dust in them, they will jam. Half of us don't have cleaning rods to unjam them. Out of 40 rounds I've fired, my rifle jammed about 10 times … these rifles are getting a lot of guys killed because they jam so easily.[3]

How could a country as technologically progressive as the United States, which produced arguably the world's best infantry rifle during World War II (the M-1 Garand), issue a weapon that resulted in countless American deaths? What decisions in the acquisitions process resulted in, as one marine's letter described, a dead infantryman "found with his rifle torn down next to him where he had been trying to fix it?"[4] The answers to these questions lie in the story of the M-16's invention and development. Plagued by Army bias against this toy-like plastic rifle and cheated out of a comprehensive development process, the original M-16 models fared poorly on the battlefields of Vietnam. The causes of its high malfunction rate are numerous and complicated and have been the focus of much debate in the years since. Considering that the U.S. military and others throughout the world still carry rifles that trace their ancestries directly back to Eugene Stoner's original M-16 prototype known as the AR-15, this topic is still interesting to many firearms buffs. However, although the controversial rifle is a popular topic for internet discussion boards and gun magazines, the resulting lessons from the M-16's flawed acquisition process and the possible applications for today's military are far less frequently discussed. To understand the lessons, one must first understand the M-16 story, an unfortunate incident at the intersection of Army traditions, civilian political leadership, and commercial manufacturing.

From the earliest days of the Revolutionary War through World War II, the U.S. Army cultivated a strong sense of individual, long-range marksmanship. Beginning with Revolutionary War rifle companies such as that of Daniel Morgan, the American Army developed a unique marksmanship culture that contrasted with European armies, specifically the British and French. Author and analyst Thomas McNaugher observed that the British Army downplayed the individual soldier's ability to shoot accurately under combat conditions, while both the British and French trained their riflemen to operate as a collective rather than as individuals, capable of putting a "wall of lead as far in front of advancing or defending soldiers as was possible."[5] As American territory expanded westward in the 1800s, marksmanship was often critical to both civilian and military survival, whether for self-defense or putting food on the table. Additionally, great distances between supply points made ammunition conservation necessary, meaning pioneers and Army cavalrymen alike could ill afford to waste ammunition.

The American focus on individual marksmanship manifested most visibly at the firing range, where target distances nearing half a mile were not uncommon. For example, Brevet Maj. Gen. Emory Upton prescribed firing ranges of eight hundred yards in an 1875 infantry manual.[6] Naturally, considering the technology of the time, soldiers used iron sights and the naked eye to engage such targets. By 1904, Capt. H. C. Hale would describe marksmanship as a "religion," noting that "to be a poor shot was a misfortune if not a disgrace."[7]

The American marksmanship tradition perhaps reached its zenith with the M-1 Garand rifle of World War II, chambered for the .30-06 cartridge and praised for its reliability, accuracy, and range. The M-1 Garand became synonymous with the Second World War GI, and Gen. George Patton described it as "the greatest battle implement ever devised."[8] However, it had

A rifleman of 2nd Battalion, 502nd Infantry Regiment, fires an M-16A1 rifle 8 September 1967 near Saigon. (Photo by Robert C. Lafoon)

shortcomings, too; it was heavy and big, especially for troops in tight confines such as vehicles or airborne transports. It was also semiautomatic, meaning one bullet fired for every pull of the trigger. On a battlefield where doctrine increasingly favored volume of fire rather than individual shots, this was an important factor. For example, Lt. Col. John Kelly recalled the tactic of "marching fire" prescribed by Gen. George Patton for his infantry echelons. The key goal of marching fire was to advance on the enemy "with all guns blazing … covering with a blanket of fire all possible or known enemy positions within range."[9] Kelly argued that the primary benefits of this technique included prevention of being pinned down, suppression of enemy resistance, and enormous psychological damage to the defender while boosting the morale of the attacker. While these troops were predominantly armed with the semiautomatic Garand, one can imagine the value a fully automatic rifle would have provided.

Thus, the United States began the search for a new rifle following World War II. Though the Army's Ordnance Department considered several foreign models and calibers, it officially adopted the T-44 rifle and the T-65 cartridge, soon known as the M-14 and the NATO 7.62 x 51mm, respectively. Unfortunately, the M-14 proved to be only a marginal improvement over the beloved M-1 Garand. One inch longer and only slightly lighter than the Garand, most M-14s were semiautomatic only; in fact, only certain designated squad automatic riflemen received an automatic version.[10] However, it retained the long-range capabilities of its predecessors, therefore satisfying many senior Army leaders who clung to traditional views of individual marksmanship.

Not all senior leaders were enamored with the M-14, however. Soon after the M-14's standardization in 1957, Gen. Willard C. Wyman, commanding general of the U.S. Continental Army Command, created his own specifications for a new lightweight infantry rifle. Specifically, the weapon would be .22 caliber, weigh less than six pounds, possess a full automatic and semiautomatic capability, and be capable of penetrating a steel helmet out to five hundred yards.[11] Wyman sent these specifications to Eugene Stoner, a firearms designer for the ArmaLite company. Stoner soon had a prototype

based on his older AR-10 model, which he designated the AR-15. Unlike every previous American military firearm, this revolutionary rifle featured metal alloys and black plastics instead of the traditional wood and blued steel to meet the six-pound requirement. In every way, it met Wyman's specifications perfectly.[12]

The AR-15 presented a direct threat to the M-14, whose development and standardization had been a long, painful process complete with international irritation. The United States had all but forced its 7.62 caliber cartridge on NATO allies in 1953, particularly angering British representatives who advocated for a smaller .276 cartridge. The United States won the caliber controversy, but at a cost. It was now tied strongly to the 7.62 cartridge, and any admission that the AR-15's smaller 5.56 caliber could be superior would be highly embarrassing.

The Americans further upset European partners during a competition to select a replacement infantry rifle for the famed M-1 Garand. Although the British EM2 and the Belgian FAL proved worthy competitors to the M-14, the Army standardized the M-14 in 1957.[13] However, the M-14 soon experienced troublesome manufacturing problems. By 1960, Springfield Armory had produced just 4,245 rifles, a fraction of the five million required to field the Army.[14] Two additional commercial producers, Winchester and Harrington & Richardson, also experienced severe technical manufacturing delays. If the Army expressed any preference for the commercially developed AR-15 so early in the M-14's life, it would draw unwanted criticism of Springfield Armory's very existence.[15]

The Springfield Armory, the Army's long-standing small arms development and production facility, therefore had much at stake with the M-14. Except for the M-1 Garand, every American rifle since 1892 had been based on foreign designs. The M-1 was a major success for the armory, having been developed by armory employee John Garand, and the M-14 was an opportunity to build on that success. The AR-15 challenged this opportunity; although not a foreign design, it originated in a commercial firm, which was equally troubling in the opinion of the armory and the Army's Ordnance Department.

Additionally, it did not look like an infantryman's rifle. As noted above, all previous American rifles, including the M-14, utilized traditional wood stocks, not entirely different from those dating back to the Civil War. The AR-15 was a radical departure from this lineage, featuring a black plastic stock and with a pistol grip similar to that of the German Sturmgewehr 44 and the AK-47, then in full production. The small .223 caliber bullet was an equally radical break with tradition, resulting in reduced range and power when compared with the M-14 and M-1 Garand. Finally, the AR-15's caliber conflicted with the NATO standardized caliber of 7.62. This fact alone provided excellent justification for Springfield Armory and the Ordnance Department to resist the onslaught of the black rifle.

Following Stoner's invention in 1957, the next five years would see the AR-15 subjected to numerous tests and evaluations conducted by various Army groups in dispersed locations from Fort Benning to Aberdeen Proving Ground and California to Alaska. Some of these evaluations yielded resounding victories for the AR-15, both as a standalone weapon and in competition with the M-14. For example, the Combat Developments Experimentation Center at Fort Ord, California, reported that the AR-15 surpassed the M-14 in volume of fire and number of targets hit, and that "a 5- to 7-man squad armed with the AR15 would be as effective as a 10-man squad armed with the M14."[16] However, it also suffered numerous setbacks, many of which appeared to stem from the testing agencies' biases against the nontraditional AR-15. Such biases resulted from a combination of factors described above: the rifle's unconventional appearance, its small caliber, its automatic fire capability, and its commercial origins. An inspector general investigation conducted in 1962 identified specific examples of bias against the AR-15, which undoubtedly skewed certain reports.[17] For example, during one meeting

Maj. Dallas Durham, U.S. Army, is the executive officer of 3rd Assault Helicopter Battalion, 4th Combat Aviation Brigade, at Fort Carson, Colorado. He holds a bachelor's degree in history and a master's degree in organizational leadership from Vanderbilt University, and a master's in military art and science with a concentration in military history from the U.S. Army Command and General Staff College. He is a senior Army aviator qualified on OH-58D, CH-47F, and LUH-72A aircraft.

in 1962, an unidentified Army colonel noted in his memorandum for record of meeting notes that "the U.S. Army Infantry Board will conduct only those tests that will reflect adversely on the AR-15 rifle plus other tests that may be considered appropriate."[18] Other examples included improper evaluation methods, such as the utilization of specially selected, match-grade M-14 rifles versus stock AR-15s.[19]

"ARPA wanted a new rifle for the South Vietnamese army, which was armed at the time with surplus M-1 Garands and M-1 carbines. The M-1 Garand proved too cumbersome for the small-statured Vietnamese soldier, and the M-1 carbine was never meant to be a primary infantry weapon."

Perhaps the most significant evaluation of the AR-15's suitability as a combat infantryman's rifle was a study conducted by the Advanced Research Projects Agency (ARPA, the original title of the modern Defense Advanced Research Projects Agency). ARPA began assessing ways to assist U.S. allies in a 1961 program known as Project Agile, whose goal was to develop new tactics and weapons for use in counterinsurgency operations against Communist forces.[20] To this end, ARPA wanted a new rifle for the South Vietnamese army, which was armed at the time with surplus M-1 Garands and M-1 carbines. The M-1 Garand proved too cumbersome for the small-statured Vietnamese soldier, and the M-1 carbine was never meant to be a primary infantry weapon.[21] ARPA, therefore, secured one thousand AR-15 rifles, which South Vietnamese troops and American advisers used in combat over six months in 1962.[22] The results were a resounding success. In short, the study claimed, the AR-15 was "the best 'all around' shoulder weapon in Vietnam."[23] ARPA's report lauded the AR-15 for its light weight, reliability, and most of all, extreme lethality. By describing the gruesome wounds inflicted on enemy personnel in great detail, ARPA endorsed the AR-15's superior ability to damage tissue and bone.

Noting that there existed a severe discrepancy between the reports of ARPA, the Army's Ordnance Department, and various external agencies, Secretary of Defense Robert S. McNamara questioned how the AR-15 could be so loved by one agency and so hated by the next. Presumably, these conflicting opinions were based on generally comparable studies with the same objective: to identify the most effective combat rifle. The issue even earned the attention of President John F. Kennedy, already familiar with the rifle due to Air Force Chief of Staff Curtis LeMay's efforts to purchase quantities for his security forces. McNamara, therefore, commissioned his own study into the matter and instructed the Army to conduct renewed testing on the AR-15, both of which were completed by late 1962. A number of issues arose during this new round of testing, such as the inability of evaluators to duplicate the AR-15's shocking lethality, as noted in the ARPA report.[24] Additionally, the AR-15 exhibited an alarming malfunction rate which, although likely attributable to a lack of quality control in manufacturing rather than design defects, should have caused greater concern.[25] The report recommended three possible courses of action available to McNamara: continue with the M-14 program exclusively, terminate the M-14 and proceed with the AR-15 exclusively, or continue with the M-14 program while purchasing a limited quantity of AR-15s for special units such as air assault, airborne, and Special Forces. Ultimately, McNamara chose the third option: proceed with M-14 acquisitions while purchasing 104,000 AR-15s, redesignated as the XM-16E1.

Based on this decision, McNamara directed the formation of a joint services Technical Coordinating Committee (TCC) in April 1963 to oversee "only such modifications [to the XM-16E1] as are absolutely necessary" and whose goal was to expedite rifle standardization and production.[26] Believing the XM-16E1 to be essentially ready for combat, McNamara placed great pressure on the TCC to streamline the process and minimize delays. However, McNamara overlooked the fact that in the five years preceding his decision, the AR-15 underwent extensive testing but almost no

development or modifications based on that testing. Perhaps McNamara's assessment that the rifle was combat-ready is understandable since ARPA strongly endorsed the AR-15 for combat. However, he failed to grasp the complicated balance of evaluation, modification, and reevaluation that was critical in the development of firearms and ammunition.

Alternatively, perhaps McNamara made his decision in view of the approaching conflict in Southeast Asia. McNamara had a strong desire to expedite the new rifle's production, for soon after announcing the one-time purchase of XM-16E1s, he reversed his decision to continue the M-14 program. To cut costs and focus efforts on the futuristic Special Purpose Individual Weapon (SPIW) then in development, McNamara announced that all M-14 production would cease at the end of fiscal year 1963.[27] This decision to purchase limited quantities of M-16s while canceling the M-14 program depended entirely on hopes that the SPIW program would soon bear fruit.[28] The Army lacked enough M-14s to arm the entire force, so it faced a tumultuous period of possible conflict in the same condition as it had entered every other major conflict since the Civil War: with insufficient quantities of its standard infantry rifle.[29] Kennedy and McNamara did not want to see the Army so ill-prepared for another conflict that it must equip itself with the 1930s technology of the M-1 Garand. Even during Kennedy's first year in office, American troops in Berlin were carrying M-1s.[30] Therefore, McNamara conveyed a sense of urgency to the TCC in preparing the M-16 for production.

Despite McNamara's guidance to consider only "absolutely necessary" modifications, the TCC spent the next seven months considering 130 adjustments to the M-16, implementing many without subjecting the rifle to additional testing to determine possible repercussions. Additionally, the TCC failed to consult Eugene Stoner's opinion, further disobeying McNamara's guidance that all proposed changes "should be accomplished by request to the manufacturer concerned in consultation with the weapons designer," in other words, Eugene Stoner.[31] Many changes were relatively minor, but a few would have significant consequences. Perhaps two decisions were most fateful in the M-16 story. The first was to change the propellant (also known as gunpowder) used in the rifle's cartridges. The original "stick" powder, while performing flawlessly in Stoner's original design, tended to exceed chamber pressures while delivering bullet velocities about fifty feet per second less than desired. The Army created both requirements, which were somewhat artificial, after Stoner completed his design. The TCC, therefore, replaced stick powder with "ball" powder. While both stick and ball powders had been used extensively for military ammunition, ball powder was known to cause increased fouling during the firing sequence. It also caused the rifle's cyclic rate to increase from approximately 650–750 rounds per minute to 900–1,000 rounds per minute. This rise led to increased wear on the rifle and potentially contributed to malfunctions on the battlefield.[32]

The second critical decision involved chrome-lining the chamber and barrel of the rifle. Since the M-14's adoption in 1957, the Army had chrome-lined the chambers of all automatic weapons, and the process was relatively simple.[33] However, the TCC concluded that the M-16's existing chrome moly-vanadium alloy was sufficient, and that "further chrome plating would simply be gold plating."[34] This decision proved to be fateful because M-16 chambers quickly succumbed to the humidity of Vietnam through corrosion and pitting. Such corrosion caused increased friction between the walls of the rifle's chamber and the cartridge shell.

As the XM-16E1 reached Vietnam battlefields in significant quantities, serious problems surfaced. The most common malfunction was the "failure to extract." After firing a bullet, the rifle attempted to extract the spent cartridge, which would stick in the chamber. The only resolution for this malfunction required the firer to insert the cleaning rod into the muzzle, punch out the spent cartridge, and resume firing. Often, this malfunction occurred repeatedly, reducing the automatic M-16 to a "magazine fed, air cooled, single shot, muzzle ejecting shoulder weapon," more resembling a Revolutionary War musket than a twentieth-century automatic rifle.[35] From 1965 to 1968, untold numbers of infantrymen would die with their M-16s broken next to them, a cleaning rod stuck down the muzzle in a futile attempt to return the rifle to service. The resulting scandal triggered a major congressional investigation and multiple service investigations.

Unfortunately, despite numerous official investigations and books written on the topic, the exact cause of the malfunctions has never been pinpointed. However, based on the evidence at hand, the most reasonable conclusion is that the primary cause of jamming was

A U.S. Army rifleman engages the enemy with an M-16 rifle circa 1970 in Vietnam. (Photo by the Department of Defense via Wikimedia Commons)

corrosion in the rifle's chamber, which was caused by extreme humidity in Vietnam and the TCC's decision not to chrome-plate the chamber. Corrosion caused increased friction, which resulted in a failure-to-extract malfunction. Contributing to this root cause was the increased fouling from ball propellant, which added another layer of friction to the chamber and thus more difficulty in extractions.[36] Ball propellant also caused an increased cyclic rate, which likely contributed by causing the extraction sequence to occur prior to contraction of the spent cartridge casing.[37] Whether the rifle's woes were due to a single cause or a combination, the results were genuinely tragic and could have been avoided.

While the M-16 story is complicated and has received much attention over the years, it continues to provide lessons that should be heeded for future acquisitions programs. Some lessons may seem obvious but are no less complex to implement. This article certainly falls short of making any definitive conclusions such as "if we avoid doing 'X,' then acquisitions will be successful." However, certain points of the M-16's story warrant consideration to avoid future tragedies.

The first lesson is that we must strive to acquire the best quality materiel possible. Again, this seems self-evident, for no one wants equipment of subpar quality. However, put in perspective of the life cycles experienced by many American defense systems, the requirement for long-lasting equipment becomes critical. Such warhorses as the B-52 Stratofortress bomber and CH-47 Chinook helicopter, while highly modified and upgraded, are often built around the same basic engineering designs from the earliest days of the Cold War. Today's M-4 systems are not far removed from this, for while the modern infantryman's rifle is loaded with optics, rails, and grips unknown to the infantryman in Vietnam, the M-4 can trace its direct lineage back to the XM-16E1.

When McNamara decided to purchase the first major order of M-16s, both he and the Army intended the purchase to be a one-time buy. This decision satisfied many senior Army leaders who remained committed to the traditional M-14 while giving continued hope to supporters of the developing flechette-firing SPIW. Ultimately, however, the SPIW proved nothing more than a concept. McNamara's decision to cancel the M-14 left the Army with a rifle it had decided would be a limited, interim

weapon. Nearly sixty years later, that "interim" weapon is found throughout the world's militaries.

The second lesson reminds us of the old saying that "you can get something good, fast, or cheap, but you can't have all three." Certainly, acquisitions officers are well familiar with this continual struggle between rapid provision of new equipment to the battlefield while ensuring quality and affordability. In directing the TCC to make "only such modifications as are absolutely necessary," McNamara assumed that rapid production would be the result.[38] Unfortunately, he failed to understand the inability of the Army, Air Force, and Marine Corps to cooperate on the M-16's standardization. McNamara certainly had matters of great world importance on his mind, and as the TCC struggled to gain consensus on the M-16's finer points, he no doubt felt frustration that the Department of Defense could not seem to get a rifle right.[39] McNamara had noted during 1961 that "it is a relatively simple job to build a rifle compared to building a satellite … or a missile system."[40] Perhaps this statement reflects the defense secretary's dismissive opinion of a rifle acquisition's complexity, further illustrated by his insistence on expediting the M-16 program.

Beyond the lesson of joint cooperation, McNamara failed to appreciate the cause-and-effect nature of weapons development, the importance of post-modification testing, and the time required to conduct such evaluations. As Stoner would note in his testimony before a congressional subcommittee, "you can't change the ammunition without causing a change in the performance of the weapon."[41] Nevertheless, the TCC changed the ammunition but failed to account for the changed performance. This shortcoming was largely due to pressure applied by McNamara's office. Therefore, while urgency is often required in the acquisitions process, it can result in battlefield deaths if not applied by those with sufficient knowledge and experience.

Lesson three is perhaps the most challenging. While tradition can inform future doctrine and equipment development, tradition must not dictate either. The military is an organization steeped in tradition, which is an important aspect of camaraderie and esprit de corps. Unfortunately, it can easily be carried too far. In this case, the M-16 was a sharp break with the Army's tradition of marksmanship. The M-16 did not look like a rifleman's weapon but was instead made of plastic and, as Marine company commander Dick Culver recalled, "drew lots of snickers and comments from the old timers."[42] Its effective range was less than half of its predecessors, and it fired a tiny bullet about two-thirds as big as the M-14's 7.62 round. It was invented and produced by an external firm, not the Springfield Armory. Moreover, it gave every rifleman the opportunity to waste ammunition while "spraying" the battlefield in automatic firing mode.

"McNamara had noted during 1961 that 'it is a relatively simple job to build a rifle compared to building a satellite … or a missile system.'"

And yet, this break with tradition was fully supported by research. Numerous studies conducted during and after World War II clearly showed that marksmanship doctrine was due for an update. Famed Army historian S. L. A. Marshall wrote that "we are on infirm ground when we hold to the belief that the routine of marksmanship training and of giving the soldier an easy familiarity with his weapon will automatically prompt the desire to use the weapon when he comes under fire."[43] He also concluded that soldiers armed with automatic weapons such as the Browning Automatic Rifle (BAR) were much more likely to fire their rifles than those armed with single-shot firearms such as the M-1 Garand, observing "many cases where men who had flunked it badly with a rifle responded heroically when given a flame thrower or BAR."[44]

For those modern historians who squirm at the mention of S. L. A. Marshall, substantial laboratory research also supported the idea of a small caliber, lightweight automatic weapon such as the M-16. Both the Ballistics Research Laboratory and the Operations Research Office conducted studies that contradicted the Army's longstanding wisdom. First, they noted that the optimum range for an infantry rifle was much

less than previously assumed, about 120 yards with maximum range of 500 yards.[45] Second, these reports countered the Army's assumption that bigger bullets equated to deadlier bullets, concluding that a .22 projectile could be more lethal than a .30 projectile due to the smaller caliber's higher velocity and tendency to tumble upon impact. Third, the probability of a hit increased with the number of projectiles fired.[46] Whether through so-called "Duplex" or "Triplex" ammunition containing two or three bullets in a single cartridge, or through full-automatic firing capability, the message was clear: The Army's commitment to well-aimed, individual, long-range marksmanship was obsolete on the modern battlefield.

Despite the research, many traditionalist Army leaders clung to marksmanship doctrine. For example, Army Chief of Staff Gen. J. Lawton Collins wrote in 1952 that "the primary job of the rifleman is not to gain fire superiority over the enemy but to kill with accurately aimed rifle fire."[47] The refusal to accept new doctrine and new equipment would manifest in strong bias against the M-16 and prevent objective evaluation until political leaders became involved.

In today's military, it is temptingly easy to maintain doctrine and equipment in keeping with tradition. Rarely does research provide a clear-cut recommendation to turn away from traditions, and even studies as definitive as those described above are often not fully understood until studied in hindsight. However, when such opportunities arise to embrace future concepts in lieu of traditions, today's military leaders must be ready and willing to do so.

Although some military leaders are still dubious of the M-16's killing power, the system has proven itself on battlefields throughout the world. Yet, although the M-16 and its descendants are ubiquitously found in both civilian and military sectors, unfortunately, most shooters today are only vaguely aware of the rifle's troubled origins and the controversies that plagued its development. By examining this case study, today's military professionals can glean valuable lessons. These are applicable to the acquisitions process but are equally important to all military leaders. We all must understand the long-term nature of our equipment, the cause-and-effect that one modification can have on performance, and most importantly, the impact, value, and limitations of our traditions on doctrine and equipment. ■

Notes

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11. Ibid., C1.

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14. Edward C. Ezell, *The Great Rifle Controversy* (Harrisburg, PA: Stackpole Books, 1984), 142–43.

15. For more on the Armory's role, see William H. Hallahan, *Misfire: The History of How America's Small Arms Have Failed Our Military* (New York: Scribner's, 1994). Since its founding in 1777, Springfield Armory played a crucial role in both design and manufacturing of American military firearms. Although numerous commercial firms supplemented Springfield's manufacturing capacity during wartime, the Armory retained a primary role in weapons development until the AR-15's invention.

16. Durham, "The M-16," 40; Office of the Chief of Staff, "History of the M16 Weapon System," C4.

17. For more information, see Durham, "The M-16," 37–38.

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Army University Press

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34. Testimony of Col. Harold Yount (M-16 project manager) to Ichord Subcommittee, *Hearings Before the Special Subcommittee on the M-16 Rifle Program*, 4694.
35. Dick Culver, "The Saga of the M16 in Vietnam (Part 1)," Jouster2, accessed 27 July 2021, http://www.jouster2.com/Sagaof16Part1.html.
36. Durham, "The M-16," 111.
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