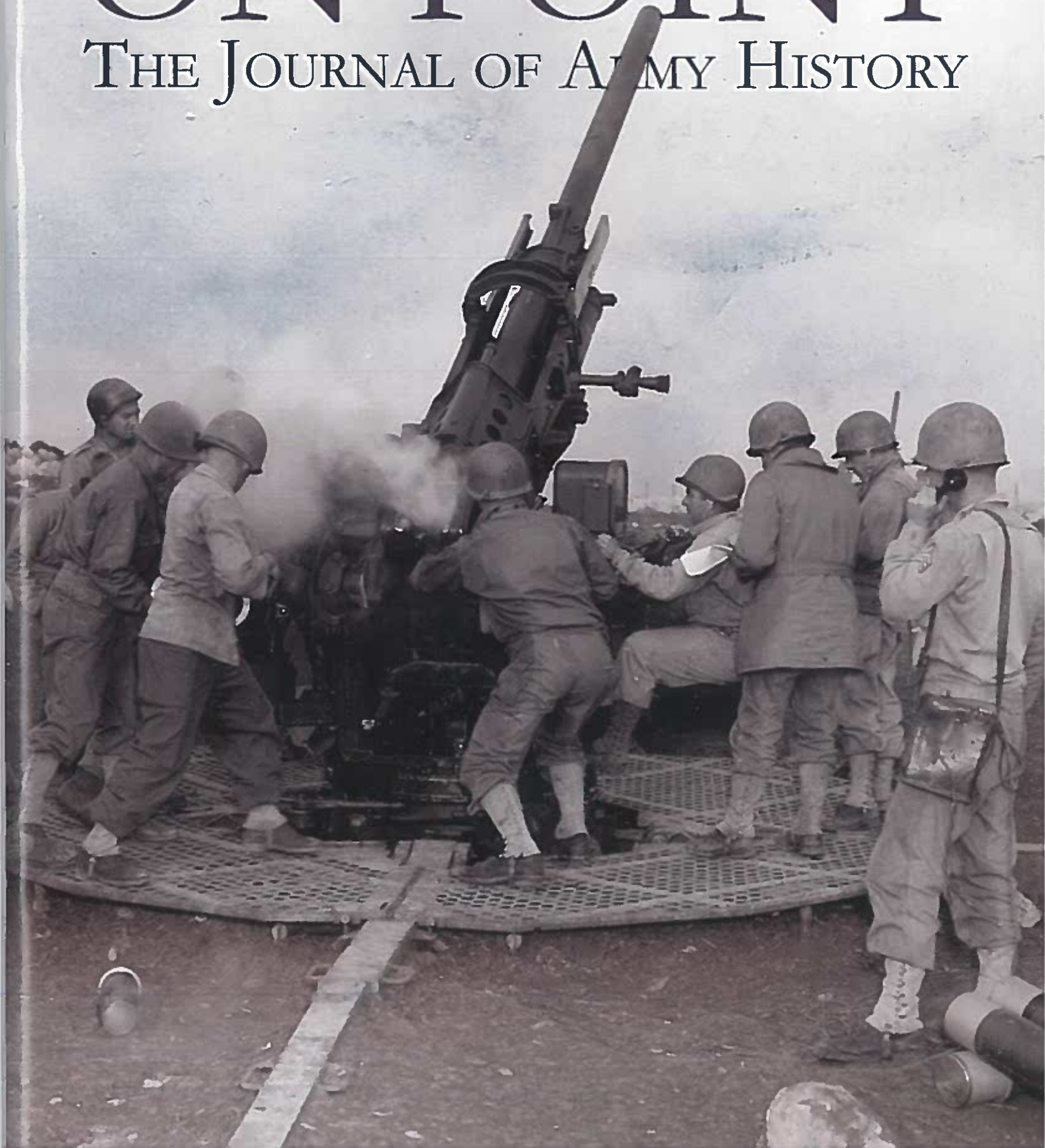


SUMMER 2018 VOL. 24 No. 1

# ON POINT

THE JOURNAL OF ARMY HISTORY



# LEARNING TO FIGHT FROM THE GROUND UP

## AMERICAN ANTI-AIRCRAFT ARTILLERY IN WORLD WAR II

By Bryon Greenwald

In combat, no one really cares who gets credit for the changes a unit makes to survive and win. The paternity of victory is irrelevant; learning while fighting is key, getting better is good, and living beats dying.

Not so when one studies military innovation and combat adaptation, where some scholars look for specific causality, while others take a broader, non-linear approach. Those who focus on causality fixate on whether the change was led from the top down, pushed from the bottom up, or created from the middle out; the degree of inter- or intra-service rivalry; and if single- or double-loop learning occurred. Most military historians, by instinct and training, however, maintain that military innovation and adapta-

tion have multiple, overlapping causes. Indeed, military historians freely accept the non-linear nature of change and expect every innovative or adaptive effort to include several “schools” favored by those looking for distinct causality.

This article briefly examines how the U.S. Army of World War II learned to stop shooting at its own airplanes and start downing Axis aircraft. It traces the evolving anti-aircraft artillery (AAA) force from its first battles at Pearl Harbor, Clark Field, and Kasserine Pass, through the process of wartime learning and adaptation to its ultimate success in air and ground battles across the Mediterranean and Northwest Europe. Much like the larger Army it supported, the AAA force made several mistakes in the rapid transition

**Doughboys fire a machine gun at a German observation plane near Plateau Chemin des Dames, France, 5 March 1918. The U.S. Army entered World War I with no dedicated anti-aircraft artillery (AAA) units but it hastily formed the Antiaircraft Service to train some 12,000 soldiers to shoot down enemy aircraft. (National Archives)**



Coast artillerymen train on an M1918 3-inch mobile antiaircraft gun in September 1926. After World War I, the Coast Artillery Corps assumed the responsibility for AAA units. (National Archives)



from peace to war. Frequently under-trained and ill-equipped, antiaircraft units initially lost out to more numerous Axis pilots who flew higher and faster than expected. As antiaircraft units transitioned from defending static assets to protecting mobile forces, learning and positive change occurred at all levels. Stateside training became more realistic. In-theater coordination between air and antiaircraft units reflected a growing appreciation for the importance of a synchronized air defense scheme. Finally, work with combined arms forces in training paid off in combat as antiaircraft units not only enforced local air superiority over their divisions and corps, but also provided them with deadly accurate direct and indirect ground fire, in many cases saving ground units from complete destruction.

Along the way, this force destroyed or severely damaged 5,518

IN THE END, THIS BRIEF  
EXAMINATION OF WORLD  
WAR II AMERICAN AAA  
SUGGESTS THAT NO  
SINGLE THEORY—TOP  
DOWN, BOTTOM UP,  
MIDDLE OUT, INTER  
OR INTRA-SERVICE  
RIVALRY, OR SINGLE  
OR DOUBLE LOOP  
LEARNING—IS SUFFICIENT  
TO UNDERSTAND HOW  
INNOVATION AND  
ADAPTATION OCCURS IN  
COMBAT.

Italian, German, and Japanese aircraft, a figure that in isolation is of no significance. Added to the 15,880 aerial victory victories granted to the U.S. Army Air Forces during the war, the total accounts for over twenty-five percent of all Axis aircraft downed by air or land forces. These same forces also destroyed more than 2,637 V-1 pilotless aircraft, either in England or on the continent. In the end, this brief examination of World War II American AAA suggests that no single theory—top down, bottom up, middle out, inter or intra-service rivalry, or single or double loop learning—is sufficient to understand how innovation and adaptation occurs in combat. In this case, change, like combat, often occurs on multiple fronts and in several dimensions.

The U.S. Army entered World War I with absolutely no antiaircraft units, doctrine, or equipment, but through modification of French

**Gunners of the 71st Coast Artillery Regiment (Antiaircraft) train on M3 3-inch antiaircraft guns at Fort Story, Virginia. The M3 became the Army's standard AAA piece in 1928. (National Archives)**



doctrine and use of French equipment, the Antiaircraft Service trained 12,000 artillery gunners (firing the French 75mm gun) and machine gunners, fielded four battalions (two gun and two machine gun), and shot down fifty-eight aircraft in a very short time at the front. After the war, most of the manpower and equipment disappeared and the fledgling AAA branch of the Coast Artillery Corps began a two decade bureaucratic battle to develop modern equipment and field a modest force amid national retrenchment, the Great Depression, and limited budgets.

Toward the end of the interwar period, however, interest in antiaircraft capability grew as airplanes became more numerous and capable. Furthermore, reports from Spain and China highlighted the capabilities of airpower and the value in having AAA to defend against it. Accordingly, the purchase of antiaircraft artillery pieces became the top priority for the War Department from 1937 to 1939. Unfortunately, it took more than money to overcome the extreme deficit in modern equipment and trained manpower needed initially to defend the Western Hemisphere and America's possessions, particularly in Hawaii and the Philippines, and eventually begin global operations against Axis forces.

Thus, it was in December 1941 that the antiaircraft forces at Pearl Harbor and Clark Field were both woefully under-equipped

and poorly prepared to face determined attacks by better trained and equipped Japanese pilots. At Pearl Harbor, the four antiaircraft regiments had eighty-six of their authorized ninety-eight 3-inch guns. As for their automatic weapons, which were more valuable against low-flying attackers, the regiments possessed just twenty of 120 (sixteen percent) of their 37mm guns and 113 of 246 (forty-one percent) of their .50 cal machine guns. More importantly, while the joint Army-Navy force trained regularly together and had demonstrated a month earlier that it could detect and intercept an attacking air force, on 7 December this force had only three of the six SCR-270 radar sets operating, one of which picked up the Japanese formation 132 miles out just as it shut down for the day around 0700. Unfortunately, when this crew reported their radar contact, the only people in the air information center were a radio operator and an untrained duty officer. The officer subsequently waved off the track as a flight of inbound B-17s and told the radar operator to "forget it." The warning, however, would have made little difference for the Army antiaircraft force, as most the AAA ammunition was still in the ammunition supply point because the Chief of Ordnance in Hawaii refused to release it for fear it would get dirty and become corroded. Of the thirty-one separate antiaircraft batteries assigned to Hawaii, only four retrieved their am-



Gun crew members of the 200th Coast Artillery Regiment (Antiaircraft), a New Mexico National Guard unit, celebrate the downing of a Japanese airplane over Luzon, Philippine Islands, in December 1941 in Don Stivers's painting, *First to Fire*. (Don Stivers Publishing)

munition and reached their positions before the attack ended. Of all these forces, just one fixed 3-inch gun battery, prepositioned on Sands Island, proved it was both trained and ready as the crew broke into its crate of ready ammunition and opened fire, downing two Japanese aircraft. In contrast, the Navy, which was manning just one quarter of its 780 onboard anti-aircraft weapons continuously, had all of its weapons firing within ten minutes. Thus, at Pearl Harbor, well known strategic and operational failures enabled the Japanese to get close to Oahu, but tactical failures engendered by a penurious administrative policy and tired leadership lost the day.

On 8 December in the Philippines, a similar fate struck U.S. forces on Luzon, only this time General Douglas MacArthur's Far East Air Forces (FEAF) were well aware of the impending Japanese attack. At 0400, intercept controllers dispatched a squadron of P-40s from Iba Field eighty miles north of Clark Field to search for Japanese bombers heading toward Corregidor. At 0930, the 30th Pursuit Squadron at Clark Field sent more P-40s toward Rosales to intercept the Japanese while simultaneously ordering the FEAF's B-17s airborne. None of the patrols found the Japanese, some of whom were clearly conducting a feint to draw protection away from the airfields. At 1130, the B-17s returned to Clark Field

just as the interceptor command there received a teletype report (between 1130 and 1145) of inbound bombers. Compared to Pearl Harbor, at least the air warning system seemed to work. No one, however, thought to alert the 200th Coast Artillery (Antiaircraft) Regiment, located on the same compound at Fort Stotsenberg, to the threat. The "Old Two Hon'erd," a New Mexico National Guard regiment, was in the chow hall eating pork chops and chocolate cake when the Japanese attacked and did not learn about it until the air raid siren sounded at 1215.

Not that it would have mattered. This collection of Mexicans, Anglos, and Indians had served as the 111th Cavalry Regiment until late 1940, when it joined over 100 other formations the War Department hurriedly and clumsily converted to AAA units. Amazingly, less than a year later on 17 August 1941, the Army declared the "200th... the best anti-aircraft Regiment (regular or otherwise), now available... for use in an area of critical military importance."

Unfortunately, "best" was far from good enough. The regiment received a large portion of its actual anti-aircraft equipment, particularly automatic weapons, as it boarded the USS *President Pierce* and the USS *President Coolidge* in San Francisco. During training at Fort Bliss, Texas, the 37mm batteries had a single 37mm gun, but no ammunition. Men "simulated guns from boxes and

broomsticks...fired rocks for ammunition and shouted bang." The regiment trained primarily with 3-inch guns and M1903 Springfield bolt action rifles. After shipping out, several of the regiment's 3-inch guns went overboard during a typhoon encountered west of Hawaii, leaving the gun battalion with twelve of twenty-four guns, one of which was later sent to Corregidor for repair. Beyond that, the regiment had one battery of .50 caliber machine guns, twenty-two of thirty-two 37mm guns (seven of which were defective and sent to Manila for repair), and a few SCR-268 radar sets, which were unusable as they were missing the connecting cables and the M4 directors. Ironically, while the Philippine Department received a higher priority for reinforcements than Hawaii or the Panama Canal, the same Ordnance Corps rules apparently applied. One soldier noted his platoon "was definitely told, 'DO NOT BREAK THE SEAL on the ammunition box.' So prior to the day of the war, we had never seen a live round."

As a result, the first time any soldier fired a 37mm gun was in combat. In one case, a poorly trained soldier fed a 37mm gun and jammed it. So overwhelmed, the battery was "blowing holes through trucks and tents." The crews on the 3-inch guns fared no better. Most of the ammunition was manufactured in 1932. An abnormally high percentage of the rounds were duds and "most of the fuses were badly corroded." About one in every six shells actually fired. According to First Lieutenant Russell Hutchinson, "the shell casings were green with corrosion. Every time we fired a shot, [the rounds] had to be cleaned to go into the breechblock, and we had to break the frozen fuses with a wrench. We had World War I weapons, and our modified ammunition had too much muzzle pressure for the guns to withstand." Several gun tubes blew up, injuring a number of soldiers and killing one. Adding insult to injury, most of the shells that did fire exploded 2,000 to 4,000 feet short of their targets. The men of a .50 caliber machine-gun battery found themselves equally confounded. Sergeant Earl Harris angrily commented that "Our machine-gun ammunition was made in 1918, re-inspected in 1929, and issued to us in 1941. We had to polish the corrosion off with steel wool before we could get it into the belt. The guns were 1918. The mounts were jury-rigged during

World War I, and they didn't work."

After more than an hour, the attack ended. By achieving complete tactical surprise, the Japanese had destroyed eighteen of the original thirty-five B-17s and fifty-three P-40s. The attack damaged many other planes along with Clark and Iba Fields, killed eighty personnel, and wounded 150 others. Japanese losses amounted to seven aircraft. Despite obsolete weapons, bad ammunition, and limited training, the "Old Two Hon'erd" scored five

confirmed kills during the attack. Unfortunately, they also shot down at least one P-40 during the confusion, probably not the first incident of fratricide of the war and certainly not the last. The 200th Regiment, as well as the 60th Coast Artillery, a Regular Army antiaircraft regiment on Corregidor, would go on to fight with valor until forced to surrender, after which those not killed in action spent the rest of the war in captivity.

With the United States now at war, and recognizing the need for more antiaircraft units (as well as forces of all types), the Army moved quickly to establish them. This situation, however, exacerbated the training and equipping problems faced by units like the 200th Coast Artillery. As units formed, they placed an ever-increasing demand on limited amounts of antiaircraft equipment. Moreover, the rush to deploy forces, particularly antiaircraft formations, cut unit training time, spread the number of trained officer and noncommissioned officer cadre too thin, and ensured that the



On 9 March 1942, the Army formed the Antiaircraft Command (AAC) separate from the Coast Artillery Corps and named Major General Joseph Green as AAC's commanding general. Green had commanded the Coast Artillery Corps from April 1940 until his appointment as AAC commander. (Library of Congress)

quality of the training was minimal.

In a significant "top-down" move, the War Department created the Army Ground Forces in March 1942 under Lieutenant General Lesley J. McNair to produce trained and equipped units. As it did so, the War Department also established the Antiaircraft Command (AAC), cleaving it from the Coast Artillery Corps and establishing its headquarters in Richmond, Virginia. In a smooth transition, Major General Joseph Green, previously the Chief of Coast Artillery, took over the AAC and continued expanding the antiaircraft training bases across the United States. The AAC created training regimens and standards for deployment, published training inspection checklists in the *Coast Artillery Journal* to spread the word vertically and horizontally across the rapidly expanding force, and

attempted to flood early deploying units with enough equipment and ammunition to develop expertise.

Unfortunately, the War Department could not accelerate everything. The Army activated many units with only fifty percent of their authorized personnel, with recruits joining units throughout the training cycle. The battalion training cycle was a mere twelve weeks long, with four weeks of individual soldier training and eight weeks of unit training, and did not include any training with infantry or armored units. Beset by the enormous increase in demand for equipment, American industry could not provide the AAC with sufficient numbers to outfit units completely in training, nor could it provide enough training ammunition, or the Army Air Forces enough towed targets, to allow those units to become proficient on their weapons until mid-1943. Despite these problems, the AAC "produced" 154 battalions by the end of 1942.

A few of these anti-aircraft battalions joined Allied forces as they surprised the Germans and landed in North Africa on 8 November 1942 as part of Operation TORCH. During the ensuing campaign, American forces, including anti-aircraft units, made several major mistakes, and learned a great deal. In their first legitimate contact with Field Marshal Erwin Rommel's *Afrika Korps* in and around Kasserine Pass in Tunisia from 13 to 23 February 1943, the few anti-aircraft forces positioned forward with II Corps fought well, but suffered from a lack of firepower, mobility, training with maneuver units, and, like the rest of the Army, combat experience.

One of the first lessons learned by theater commanders and conveyed back to the AAC was the need to position more anti-aircraft forces forward with the maneuvering combat elements. At the time of Kasserine Pass, there were a total of four anti-aircraft regiments (eight battalions total), eight automatic weapons battalions, and four separate machine gun batteries (one battalion equivalent) in the rear area, but only one anti-aircraft regiment (two battalions) and the equivalent of a reinforced automatic weapons battalion forward supporting the II Corps—approximately a 17 to 3 ratio of battalions between the rear and forward areas. This arrangement and the distribution of anti-aircraft forces across the theater led to both an inter-service issue between ground and air force commanders over whether air commanders should command

anti-aircraft units, particularly in the rear area, as well as an intra-service issue between theater commanders and Lieutenant General McNair at Army Ground Forces over whether anti-aircraft units should be assigned to divisions and corps.

While they met little initial resistance from the *Luftwaffe*, as Allied forces moved inland, enemy air activity increased. In the ever-increasing target rich environment, American AAA units shot down a number of enemy aircraft, but they also downed several friendly planes. After all, training at home had been rushed and the opportunities for joint training with the Army Air Forces in

the United States were minimal. Many soldiers had never seen an American aircraft, let alone mastered identifying enemy airplanes. Despite Major General Green's best efforts, the need to deploy anti-aircraft units overtook the ability to ensure they were trained properly.

In North Africa, as the territory captured by Allied forces expanded, so did the need for more anti-aircraft artillery. Attacks on air bases and convoys occurred more frequently, forcing Lieutenant General Dwight D. Eisenhower and his anti-aircraft commander to choose between defending ports and the ever-increasing number



The water-cooled M2 .50 caliber (shown here) and M4 37mm gun served as the Army's standard AAA weapons against low-flying aircraft during the early years of the U.S. involvement in World War II. (National Archives)

of airfields, or push units forward to protect maneuver forces. With too few units across the theater, this issue led to challenges concerning command over anti-aircraft units and their assignment to divisions. Concerned about fratricide, the Army Air Forces sought control of all anti-aircraft forces in theater early on, only to be rebuffed by the War Department. Eisenhower relented slightly and established a rear area defense coordinator, essentially giving the theater air force what it wanted in the rear area, but left it to the Army to command forces in the forward area. After the most significant fratricide of the war during the invasion of Sicily, a combined Army-Navy error that destroyed several transport planes and killed dozens of paratroopers, the Army Air Forces renewed their claim, only to be rebuffed again.

If that decision seemed to be an inter-service issue, the question of whether to assign anti-aircraft units to divisions and corps became a heated intra-service problem within the War Department. Eisenhower and several senior commanders had wanted to assign mobile anti-aircraft automatic weapons battalions, those armed with a combination of half-tracked quad .50 caliber machine guns and



AAA and searchlights seek out Axis aircraft over the port of Algiers in John Lavallo's 1943 watercolor on paper, *Algiers under Fire*. The North Africa campaign posed the first real test for AAC. (Army Art Collection)

37mm guns linked to dual .50 caliber machine guns, to divisions to protect forward troops and most importantly, their artillery, which in at least one division area received ninety-five percent of all air attacks. McNair, however, believed in pooling antiaircraft and other forces, such as tank destroyers, thinking that centralization would allow more efficient employment and not slow down attacking divisions. In the end, Eisenhower deferred to McNair, but in theater, American forces, in a middle-out adaptation, attached units to divisions with increasing regularity, bypassing McNair. By the Normandy invasion, this situation was fairly routine.

To ensure communication and coordination with theater commanders, Green recommended that the AAC send officers into combat theaters to supervise training and disseminate information. McNair, however, vetoed this plan. To achieve his objective despite McNair's disapproval, Green arranged for an exchange of general officers between the AAC and the combat theaters. Beyond this middle-out adjustment, Green also championed the distribution of Antiaircraft Intelligence Circulars and Information Bulletins from the AAC to the theaters, just one of several examples of double-loop institutional learning. Eventually, in November 1943, the War Department approved Green's recommendation that each theater staff include an antiaircraft officer.

In the field, troops adopted several bottom-up techniques to improve early warning and avoid fratricide. None of them, however, were foolproof. The SCR-268 radar proved very effective, but mostly in the rear areas. To avoid shooting friendly aircraft during raids on Allied air bases, antiaircraft artillery commanders urged pilots to clear the perimeter area and allow antiaircraft units to fire. Often overzealous pilots would not comply and antiaircraft gunners frequently had to "withhold fire on [enemy] planes ... because of the presence of our own fighters." Eventually, inner aircraft zones were created that restricted aircraft during certain periods and became free-fire zones for antiaircraft units. These worked with middling success and were a continual concern for the Allied air forces, particularly after the invasion of Normandy. In the forward areas where antiaircraft units were on the move, radar was seldom used or suffered degraded range due to the mountainous terrain. To get some sort of early warning, one battalion created its own antiaircraft artillery information system using four vehicles with radios and positioning them with three-man crews twenty to twenty-five miles in front of the defended position along the most probable air avenues of approach. The system worked extremely well, reduced fratricide, and kept both the antiaircraft battalion and the unit it supported alert to enemy air attacks.





AAC employed a number of techniques and innovations to prevent fratricide and improve early warning of enemy air attacks, including the use of the SCR-268 radar set, such as this one used by the 184th AAA Battalion in England in October 1943. (National Archives)

The M45 Multiple Caliber .50 Machine-Gun Mount entered service in 1942 and equipped the Army's antiaircraft artillery-automatic weapons (AAA-AW) battalions. Its four M2 .50 caliber machine guns made it an effective weapon against low-flying enemy aircraft. It was also devastating against ground targets and earned the nicknames "meat chopper" and "kraut mower." This example served with the 435th AAA-AW Battalion. (National Archives)



IN THE EVER-INCREASING TARGET RICH ENVIRONMENT, AMERICAN AAA UNITS SHOT DOWN A NUMBER OF ENEMY AIRCRAFT, BUT THEY ALSO DOWNED SEVERAL FRIENDLY PLANES. AFTER ALL, TRAINING AT HOME HAD BEEN RUSHED AND THE OPPORTUNITIES FOR JOINT TRAINING WITH THE ARMY AIR FORCES IN THE UNITED STATES WERE MINIMAL.

Many units invented localized solutions to guard against fratricide, including having friendly aircraft rock their wings upon returning to Allied lines, painting aircraft noses different colors, and dropping smoke. By the time of the Normandy campaign, aircraft would sport five alternating black and white invasion stripes. Some commands even adopted aircraft flashcards to train troops in aircraft recognition. While these measures reduced, but did not eliminate, fratricide, they remained local examples of single-loop learning and were never standardized across the antiaircraft force. The only anti-fratricide standard institutionalized by the Army at this point in the war was the one imposed by Brigadier General Paul Robinette, commander of Combat Command B, 1st Armored Division, when he directed antiaircraft units to fire at aircraft only after being attacked. The Army captured this guidance in its October 1943 *Lessons from the Tunisian Campaign* when it stated that “positive identification of aircraft is essential before fire is opened. The best identification under such circumstances is *attack by the aircraft.*”

Back in the United States, top-down intervention via the Chief of Staff, General George C. Marshall, and McNair hastened changes in the training cycle operated by the AAC. As equipment became more plentiful, units trained more comprehensively and fired more rounds in practice. Training became tougher and more realistic and antiaircraft units expanded their exercising with infantry and armor divisions. Major General Green, upon receiving word that 40mm and 90mm crews were performing “far below the standard,” dressed down Antiaircraft Training Center commanders and challenged each officer to take personal responsibility for training new officers and NCOs. He gained permission from McNair to lengthen the unit training regimen and dramatically expanded it between March 1942 and April 1944 in response to feedback from the battlefield. Specifically, he doubled the individual soldier skills

portion from four to eight weeks and instituted a battle-conditioning program to expose antiaircraft crews, as much as possible, to the atmosphere of battle before actually entering a combat environment. This program included more rigorous and extensive field training exercises, obstacle courses, forced marches of twenty-five miles or longer with full field equipment, and the use of live ammunition and explosives to acclimate soldiers to the sounds and sensations of battle. Green also expanded the collective or unit portion of the training period from eight to fourteen weeks, added a four-week period of combined training with ground forces, and, in early 1944, added a two-week block specifically for 90mm gunnery at ground targets.

These changes in training, along with continued improvements in equipment—like the Variable Time (VT) or proximity fuse for 90mm guns—ultimately produced a highly effective antiaircraft force capable of clearing the skies and assisting ground units in sweeping away the enemy before them. In North Africa, despite their initial travails, antiaircraft units destroyed 526 German aircraft. In Sicily and Italy, Corsica/Sardinia, and southern France, they added another 866. In the Pacific, antiaircraft crews downed another 975 aircraft and in Northwest Europe, from D-Day through V-E Day (6 June 1944 to 8 May 1945) they destroyed (Category I) or probably destroyed (Category II) another 3,151 enemy aircraft—for a total of 5,518. Along the way, at places like Anzio, Salerno, Omaha Beach, Okinawa, and the Ardennes, antiaircraft quad .50 caliber “Meatchoppers” and 90mm guns used as both direct fire snipers and high velocity indirect fires protected U.S. and Allied forces.

In the end, a non-linear series of innovations, adjustments, and adaptations occurred in the United States and in combat theaters across the globe to produce eventually an American antiaircraft force that was extremely well-supplied, well-equipped, and well-


**Soldiers of the 450th AAA-AW Battalion (Colored) man an M1 40mm Bofors gun near Presenzano, Italy, 14 January 1944. Like the M45, the Bofors was effective against low-flying aircraft. (National Archives)**





Gunners of the 62d Coast Artillery Regiment (Antiaircraft) fire their M1 90mm gun in Palermo, Sicily, 15 December 1943. The more effective 90mm gun began replacing the M3 3-inch AAA piece early in World War II. (National Archives)

trained. This force, by virtue of top-down, middle-out, and bottom-up change, continued to learn from its mistakes and improve. As this brief summary from Pearl Harbor through the North African campaign suggests, the anti-aircraft forces had to overcome a myriad of errors, self-inflicted and otherwise, to provide effective air defense of fixed sites, like ports and airfields, and maneuvering units. While this article focused on a brief period and location in the war, these units did so across every possible geographic location and under every climatic condition. From North Africa to Western Europe, from the Southwest Pacific to Okinawa to China and Alaska, anti-aircraft forces adapted to every environment and provided increasingly better protection from air attack, while often adding devastating ground and artillery fires to the mix.

As service members discovered in World War II, the enemy can come from any direction. As the anti-aircraft artillerymen of World War II learned, and as this article demonstrates, innovation and change, like enemy aircraft, can arrive from several directions and on several levels simultaneously. 

## About the Author

Colonel Bryon Greenwald, USA-Ret., is a professor of military history and theory at the Joint Advanced Warfighting School (JAWS), one of the National Defense University's constellation of war colleges, located in Norfolk, Virginia. During a twenty-seven-year Army career, he served in Europe and the United States, where he commanded 2d Battalion, 43d Air Defense Artillery (Patriot) and, as a garrison commander from 2003-2005, where he led the effort to transform Fort Bliss, Texas, into the largest maneuver post in the Army. He graduated from the Command and General Staff College, School of Advanced Military Studies, and the National War College, and holds an M.A. and Ph.D. from The Ohio State University. He is the author of *SCUD ALERT!: The History, Development, and Military Significance of Ballistic Missiles on Tactical Operations* (AUSA, 1995) and *The Anatomy of Change: Why Armies Succeed or Fail at Transformation* (AUSA, 2000). At JAWS, he teaches military history and theory as well as an elective on military innovation and change. He is currently writing the history of U.S. Army anti-aircraft artillery development from 1917 to 1945.