TRADOC Branch History Series

KING OF BATTLE

A BRANCH HISTORY OF THE U.S. ARMY'S FIELD ARTILLERY

(Excerpts relating to WWII)

by
Boyd L. Dastrup

Office of the Command Historian
United States Army Training and Doctrine Command
Fort Monroe, Virginia
1992

Chapter VII

THE INTERWAR YEARS: 1919-1939

Following the Great War, various boards made recommendations for implementing the lessons of 1914-18 and improving the field artillery. Over the next two decades, pacifism, a surplus of materiel from the war, conservatism, limited budgets, and problems associated with new technology influenced rearming the field artillery and developing new tactics and techniques.

Unfulfilled Hopes

The War Department moved into the 1920s with great expectations for modernizing its field artillery, but opposition stalled serious progress. As far as many Americans were concerned, the November 1918 armistice had ushered in an era of endless peace.[1] The desire for peace continued into the 1930s, and the growing pacifism and the Great Depression influenced Americans to seek isolation and eventually led to the passage of neutrality acts in 1935 and 1937. The drive for neutrality and the avoidance of war in the 1920s and 1930s meant that the War Department did not feel pressure from the American people to modernize its weapons because disarming was more important than rearming.[2]

Despite the general mood of pacifism in the country, the War Department searched for a viable policy to prepare for a war. In 1919 the Chief of Staff, General Peyton C. March (1918-1921), devised a plan to build a large standing army. Basing his calculation on an invasion of the country, he advocated a large Regular Army of 500,000 men organized as an expansible force that could serve as a half-strength skeleton field army of five corps. To fillout the Regular Army, March and the General Staff proposed drawing on reserves formed by a system of universal military training and relegated the National Guard to third place behind the Regular Army and its conscripted reserves.[3]

The plan shocked Congress because of its desire to withdraw from foreign responsibilities and opposition to military commitments and a large army. Republican Senator James W.

1. Boyd L. Dastrup, *A Centennial History: The US Army Command and General Staff College* (Manhattan, Ks: Sunflower University Press, 1982), p. 61; Russell F. Weigley, *History of the United States Army* (New York: Macmillan Publishing Company, Inc., 1967), pp. 395-96.
2. Dastrup, A *Centennial History*, p. 61.
3. *Ibid.*, p. 62.

Wadsworth of New York, Chairman of the Senate Military Affairs Committee and an advocate of military preparedness, found it to be amusing and ironic that the War Department would push and even foster a plan closely resembling the German military system that it had just fought to eliminate. After months of inconclusive debate in 1919-20, the committee heard testimony from Colonel John McAuley Palmer, who enjoyed the support of General John Pershing. Palmer rejected the General Staff's and March's proposal. According to Palmer, the effective work of American citizen soldiers in France refuted the necessity of a large standing army. He suggested instead creating a small Regular Army to serve in an emergency and to train the citizen army.[4]

In response to the War Department's and Palmer's recommendations, Congress passed the National Defense Act of 1920. It authorized a force of 288,000, made provisions for a National Guard and Organized Reserves, and established a tactical as well as administrative peacetime organization that divided the country into nine corps areas, each under a Regular Army major general. At the same time, the act retained the coast artillery with its antiaircraft mission and the field artillery as separate branches. Some Army officers, however, argued that the use of heavy coast artillery as field pieces during the war, the practice of employing coast artillerymen to serve those guns, and the relative mobility of even the heaviest pieces had erased the traditional differences between the two branches.[5]

In the meantime, the Army examined its performance during the war. The General Headquarters, American Expeditionary Forces (AEF), convened the Board to Study the Experience Gained by the Artillery in the AEF. Chaired by Brigadier General Andrew Hero, the board, better known as the Hero Board, met from December 1918 through March 1919. After travelling through Europe and interviewing commanders of field artillery brigades, regiments, ammunition trains, and schools in the .AEF about training, organization, motorization, weapons, tactics, and equipment, the Hero Board submitted its report. Although the board's most detailed comments addressed training, it also examined the proper kind of field guns. Because the AEF had depended upon France and Great Britain for field artillery during the war, the Hero Board pointed out the need for a system of mutually dependent light, medium, and heavy pieces. The Army required medium and heavy artillery to bombard fortifications and break holes in the enemy's defenses and light division artillery to follow the infantry and exploit the gaps in the enemy's lines.[6] To ensure that mobility would not be compromised, the board recommended assigning regiments of 75-mm. guns or 3-inch guns, a regiment of 120-mm. howitzers, and a battalion of 3-inch mountain guns to the division and placing a regiment of 155-mm. howitzers in the corps.[7] Concurrently, the board proposed attaching heavy tractor, railway, trench, and antiaircraft artillery to the general headquarters reserves where mobility was not a requirement.[8]

4. Weigley, *History of the United States Army,* pp. 397-400.

5. Dastrup, *A Centennial History,* p. 62; Weigley, *History of the United States Army,* p. 400; Larry H. Addington, "The US Coast Artillery and the Problem of Artillery Organization, 1907-1954," *Military Affairs,* Feb 1976, pp. 2-3.

6. US Army, AEF, Report of the Board to Study the Experience Gained by the Artillery of the AEF, 1918, pp. 1, 3, 10-13, hereafter cited as Hero Board Report, in Morris Swett Library, Fort Sill, Ok.

7. *Ibid.*

8. *Ibid.,* pp. 11-12.

Besides addressing the need for a field artillery system, the Hero Board criticized aerial observation. Outside of a few isolated cases, aerial observation had been unsatisfactory during the war. Poor liaison between the field artillery and the Aviation Section of the Signal Corps (the Air Service after May 1918). the lack of field artillery training for observers, the tendency of commanders to relegate reconnaissance missions to secondary importance behind combat missions, and the Signal Corps' control of observation assets prevented effective aerial observation.[9] Notwithstanding these problems, most field artillery officers found aerial observation to be essential for observed indirect fire and to hold great promise. Brigadier General Albert J. Bowley, 6th Corps Artillery, wrote, "Aerial observation in my experience has been conspicuous by its absence .. . .Aerial observation is very essential and should be developed."[10] Expressing his displeasure with aerial observation under the Signal Corps, Brigadier General Adrian S. Flemming, 158th Field Artillery Brigade, noted, "The only solution I see is to assign certain aeroplanes and balloons to the artillery for the purpose of observing and permit them to do no other work."[11] In a short statement Brigadier General T.N. Horn, 7th Field Artillery Brigade, explained, "So far as has been observed a field artilleryman can become an aerial observer but an aerial observer can do very little for the field artillery unless he be a field artilleryman."[12]

After assimilating the various views on ways of improving aerial observation, the Hero Board issued its position. To realize the benefits of aerial observation, the board recommended placing it under the control of the field artillery and employing field artillery officers as observers. This would ensure aerial observation when needed and provide observers with the appropriate skills.[13]

To enhance the field artillery's mobility as a part of an overall upgrading of the branch, the Hero Board addressed motor traction. The board encouraged adopting tractors to pull the 155-mm. howitzer and small motor vehicles for light artillery as soon as adequate ones could be developed.[14] In a memorandum to the Hero Board's report, Major General Ernest Hinds, Chief of Artillery, AEF, endorsed motorizing the field artillery. Nevertheless, he cautioned against totally discarding horse-drawn light artillery for the division because motor vehicles still had weaknesses that needed to be eliminated before they would be dependable. Conservatives in the Army, such as Hinds, knew that motorization was the wave of the future, but their ties with the horse, their worries about the availability of spare parts, gasoline, trained drivers, and the slow speeds and unreliability of early motor vehicles prevented unconditional support.[15]

For the most part the Hero Board outlined a modest agenda for the field artillery. Besides recommending improved training, the board saw the need to create organic air observation and to

9. *Ibid.,* p. 25.
10. *Ibid.,* p. 663.
11. *Ibid.,* p. 664.
12. *Ibid.,* p. 665.
13. *Ibid.,* pp. 25-26, 665-71, 823-40.
14. Larry H. Roberts, "American Field Artillery," unpublished master's thesis, Oklahoma State University, 1977, p. 13; Hero Board Report, p. 13.
15. Memo, Office of the Chief of Artillery, AEF, 9 Dec 1918, in Hero Board Report, pp. 41, 43; Memo for Gen Kuhn, subj: Motor Traction, FA, 13 Jun 1917, in File No. 257812, RG 94, National Archives.

employ field artillerymen as observers to enhance observed fire. The distaste for trench warfare of the recent war caused the board to preach arming the division with light pieces and attaching the heavier ones to the corps or higher to ensure mobility. With the exception of advising the development of the 120-mm. howitzer, the board only pushed arming the field artillery with the existing weapons. Procuring new ones was not included since other boards were considering the proper armament.[16]

While the Hero Board discussed the appropriate calibers, aerial observation, motorization, and other related matters, Headquarters, Third Army, AEF, assembled a board of officers to investigate motorizing division artillery. Chaired by Major General William Lassiter, Chief of Artillery, Third Army, AEF, the board tested tractor-drawn field artillery in June 1919. At the conclusion of the trial, First Lieutenant Guy Taylor of the 76th Field Artillery Regiment wrote about the superiority of motorized field artillery. Motor vehicles gave the field artillery speed, power, and the ability to take longer marches.[17] Later, Brigadier General William M. Cruikshank, Commanding General, 3rd Field Artillery Brigade, supported motorizing the field artillery because of the success of the test.[18] Backed by these favorable endorsements and its own observations, the Lassiter Board concluded that tractors could be relied upon, that the division's 155-mm. howitzer regiment and one of the two 75-mm. gun regiments should be motorized, and that the division's other 75-mm. gun regiment should be converted to motor transport as soon as the equipment was available.[19]

As the Lassiter and Hero Boards studied the field artillery, the War Department formed an even more important board. At the promptings of Major General William J. Snow, Chief of Field Artillery (1920-1927), who had expressed grave concerns about the changes in tactics and technology and the AEF's dependence upon foreign artillery, the War Department convened a board of officers at Chaumout, France, to study the ammunition and field artillery used by the belligerents. Headed by Major General William I. Westervelt, the board, better known as the Westervelt or Caliber Board, interviewed French, Italian, British, and American field artillery officers and visited various artillery factories.[20] Upon returning to Washington in April 1919, the board digested its findings, consulted with the Chiefs of Ordnance, Coast Artillery, Field Artillery, and Chemical Warfare, and completed a lengthy report. The board concluded that every gun, howitzer, carriage, vehicle, and projectile needed to be replaced. The war, after all, had revealed the inadequacy of the field artillery.[21]

16. Hero Board Report, p. 12; William J. Snow, *Signposts ofExperience: World War Experience* (Washington: US Field Artillery Association, 1941), pp. 196-97.

17. Ltr, Taylor to Lassiter Board, subj: Observations of Recent Test of Motorized Artillery, 25 Jim 1919, in Report of a Board of Officers Convened in Accordance with the Following Order: SO No. 162, HQ Third Army, AEF, 11 Jun 1919, hereafter cited as Lassiter Board Report, in Morris Swett Library.

18. Ltr, Cdr, 3rd Field Artillery Brigade, to President, Lassiter Board, subj: Test of Motorized Artillery, 26 Jun 1919, in Lassiter Board Report.

19. Lassiter Board Report, pp. 11-15.

20. Annual Report, Chief of Field Artillery, 1920, p. 6; War Department, Report of Board of Officers Convened Pursuant to the Following Order: SO No. 289, 11 Dec 1918, hereafter cited as Westervelt Board Report, in Morris Swett Library.

21. Westervelt Board Report, pp. 4, 24-25; Constance M. Green, Harry C. Thomson, and Peter C. Roots, *The Ordnance Department: Planning Munitions for War* (Washington: Office of the Chief of Military History, US Army, 1955), p. 171. Snow served as Chief of Field Artillery during World War I and retained that position after Congress made the Chief of Field Artillery permanent in 1920 as part of the National Defense Act of 1920.

After examining the various calibers of guns and howitzers used during the war, the Westervelt Board observed that each echelon from division to general headquarters reserves should have guns and howitzers of such mobility, power, variety, and number to ensure the success of the mission and enable it to be gained with a minimum of casualties. A gun-howitzer mix was imperative since the gun's flat trajectory made hitting the reverse slope of a hill impossible and finding a suitable firing position hard, while the howitzer could hit the reverse slope and fire from almost any position.[22]

Seeking the proper gun-howitzer combination for each echelon, the board outlined ideal and practical alternatives.The board's ideal or long-term solution for division or light artillery involved adopting a 75-mm. to 3-inch gun with an elevation of eighty degrees and a range of 15,000 yards and a 105-mm. howitzer with an elevation of sixty-five degrees and a range of 12,000 yards. Corps or medium artillery required a 4.7-inch to 5-inch gun with an elevation of eighty degrees and a range of 18,000 yards and a 155-mm. howitzer with an elevation of sixtyfive degrees and a range of 16,000 yards. Army or heavy artillery needed a 155-mm. gun with an elevation of sixty-five degrees and a range of 25,000 yards and an 8-inch howitzer with an elevation of sixty-five degrees and a range of 18,600 yards. Intent on totally rearming the field artillery with new pieces, the board's ideal solution meant developing weapons of all sizes with longer ranges, 360-degree traverses to provide better support for the large fronts, more mobility, and more power than those in use.[23] In contrast, the board's practical or short-term (also less expensive) answer involved upgrading the French M1897, the American M1916, and the British M1917 75-mm. guns and the French M1918 155-mm. Schneider howitzer for division artillery, the American M1906 4.7-inch gun, the British 5-inch gun, and Ml918 155-mm. Schneider howitzer for corps artillery, the French 155mm. GPF gun and British 8-inch howitzer for army and general headquarters artillery, and other existing guns and howitzers of super heavy weight and caliber, such as the M1918 240-mm. howitzer, until the ideal ones could be fielded.[24]

The Westervelt Board's recommendations signalled a significant departure for the field artillery. Influenced by the war and the War Department's inability to supply its own field pieces, the board urged the acquisition of a balanced field artillery system of light, medium, and heavy pieces. As the Hero Board had advised, the Westervelt Board also pointed out the need for medium and heavy guns with greater destructive power and longer ranges to allow the Army to attack fortifications and interdict communication lines behind the front lines, while light field pieces would be assigned to the division to furnish close support to the infantry. Although it emphasized mobility, the board's conclusions suggested that interdicting fire was becoming more important than it had been so that the Army could restrict the flow of reserves and supplies to the front. Yet, this evoked a controversy since air power enthusiasts advocated employing aircraft to interdict communication lines.[25]

22. Westervelt Board Report, pp. 4, 24-25; Green, Thomson, and Roots, *The Ordnance Department,* p. 171.

23. Westervelt Board Report, pp. 24-25.

24. Westervelt Board Report, pp. 23-29; The Field Artillery School, *Field Artillery Material* (Fort Sill, Ok: The Field Artillery School, 1934), pp. 16-22.

25. Chief of Field Artillery, *Information Bulletin,* No. 45, 1922, p. 9; Westervelt Board Report, p. 10.

As the Hero, Lassiter, and Westervelt Boards' reports revealed, many field artillery officers understood the requirement for making significant changes in the field artillery. The officers wanted to introduce new technology to improve the field artillery's lethality and mobility. Rather than depending upon other countries, the War Department had to produce guns, howitzers, and motor transportation. European domination had to end.

After each combat arm or branch of the service had investigated its performance during the war and outlined ways to modernize, the War Department took steps to incorporate the findings into organization and tactics. Unhappy with the cumbersome four regiment (square) division with its field artillery brigade of a regiment of 155-mm. howitzers (twenty-four) and two regiments of 75-mm. guns (forty-eight), General Pershing wanted a more maneuverable division. He contemplated a division with an infantry brigade of three regiments, an artillery regiment of 75-mm. guns (thirty-six guns), a cavalry squadron, and combat support and service support units. Pershing's plan reduced division artillery's firepower and transferred the general support mission from the division to the corps. Exhibiting an open mind and following the suggestions of his staff, Pershing convened a review panel, the Superior Board, to examine the recent war and to find lessons that might create organizational and tactical changes. After studying the records of the war, the board recommended retaining the World War I division with minor increases in manpower. The board thought that the wartime division of 29,000 men would have sufficient power and mobility to fight a war of movement and have adequate resources. In comparison, officers at the Infantry School desired a smaller, mobile division of four infantry regiments, favored cutting the size of all divisional units except infantry, and urged abandoning the 155-mm. howitzer because the piece was too heavy. In the meantime, the War Plans Division in the War Department supported adopting a 24,000-man division and wanted to eliminate the 155-mm. howitzer and keep one field artillery brigade of two 75-mm. gun regiments (forty-eight guns).[26]

To resolve differences of opinion over the proper organization of the division, Secretary of War Newton D. Baker (1916-1921) appointed a special committee in 1920. Trying to solve the division's organizational problems, the committee identified several options in July. The War Department could retain the square division of 28,000 men, develop a triangular division of three infantry regiments, or reduce the size of the wartime square division to fewer than 20,000 men. After concluding that the square division was too large and unwieldy, the committee examined the triangular division and a small square division. Rather than dramatically overhauling the division, the committee decided that the square division could be reduced to less than twenty thousand men to improve mobility without sacrificing firepower. The committee decreased each infantry regiment by seven hundred men, revamped service units, introduced organic air reconnaissance assets, and dropped the 155-mm. howitzer regiment for a 105-mm. howitzer regiment as recommended by the Westervelt Board. Impressed with the committee's proposals, General March approved the committee's division for adoption in August 1920. As a result, the War Department started reorganizing its divisions in the fall of 1920 and planned to arm each division

26. Janice McKenney, "More Bang for the Buck in the Interwar Army: The 105-mm. Howitzer," *Military Affairs,* Apr 1978, pp. 81-82; John B. Wilson, "Mobility Versus Firepower: The PostWorld War I Infantry Division," *Parameters,* Sep 1983, pp. 47-52; Report, Virgil Ney, subj: Evolution of the US Army Division: 1939-1968, Combat Operations Research Group, 1969, pp. 29-31, hereafter cited as Ney Report.

with a field artillery brigade of two regiments of 75-mm. guns (forty-eight guns) and to reinstate a howitzer regiment of twenty-four howitzers as part of the brigade as soon as a satisfactory 105-mm. howitzer could be developed.[27]

The decision to arm the division with 75-mm. guns and 105-mm. howitzers generated a controversy over the proper field artillery weapons for the division. Upon hearing that the 105-mm. howitzer would replace the 155-mm. howitzer, many field artillery officers openly expressed opposition. They argued that the 105-mm. howitzer should supplant the 75-mm. gun because the gun was too light and had a flat trajectory. The gun's opponents also pointed out that the United States and France had been the only belligerents during the war to be equipped with the 75-mm. gun because other countries had discarded it for a light, mobile field howitzer with a high rate of fire.[28] Despite these arguments, Chiefs of Field Artillery and the War Department enthusiastically endorsed the 75-mm. gun and 105-mm. howitzer for the division early in the 1920s. In 1926 they received additional support when the Ten Year Ordnance Program for Rearmament and Extended Service Test standardized the 75-mm. gun and 105-mm. howitzer for division artillery.[29]

During the controversy over the proper combination of guns and howitzers for the division, the War Department launched ambitious rearmament programs to introduce modern 75-mm. guns and 105-mm. howitzers. Using the experience gained developing the M1916 75-mm. gun during the war, the Ordnance Department constructed several different 75-mm. guns between 1920 and 1925. As new tubes were being produced, the War Department built different models of split-trail and box-trail carriages. After the Field Artillery Board had thoroughly tested the various gun and carriage combinations, the War Department standardized the M1923E split-trail 75-mm. gun in 1926. This gun had better stability and greater elevation and traverse than any of the 75-mm. box-trail guns had or even the M1920 75-mm. split-trail gun had and had a range of 14,880 yards. With the adoption of M1923E 75-mm. gun, later designated the Ml 75-mm. gun, the War Department had four 75-mm. guns—the French M1897, the American M1916, the British M1917, and the Ml. Nevertheless, the Ten Year Ordnance Program for Rearmament and Extended Service Test of 1926 supported using only the Ml since it most closely met the Westervelt Board's standards of the ideal field gun.[30]

27. McKenney, "More Bang for the Buck in the Interwar Army," pp. 81-82; Wilson, "Mobility Versus Firepower," pp. 47-52; Ney Report, pp. 29-31.

28. McKenney, "More Bang for the Buck in the Interwar Army," p. 82; Annual Report, Chief of Field Artillery, 1924-25, in *Field Artillery Journal,* Mar-Apr 1926, pp. 198-99.

29. Annual Report, Chief of Field Artillery, 1923-24, in *Field Artillery Journal,* Mar-Apr 1925, pp. 135-37; Annual Report, Chief of Field Artillery, 1924-25, p. 200; Annual Report, Chief of Field Artillery, 1925-26, in *Field Artillery Journal,* Jan-Feb 1927, pp. 4, 11; Annual Report, Chief of Field Artillery, 1929, in *Field Artillery Journal,* Jan-Feb 1930, p. 14; Annual Report, Chief of Field Artillery, 1930, in *Field Artillery Journal,* Jan-Feb 1931, p. 13; Annual Report, Chief of Field Artillery, 1931, in *Field Artillery Journal,* Nov-Dec 1931, p.589.

30. Maj William E. Burr, "Some Aspects of American Field Artillery," *Field Artillery Journal,* May-Jun 1922, p. 182; MG Snow, "The Development of Field Artillery," *Military Engineer,* Jan-Feb 1923, p. 47; Annual Report, Chief of Field Artillery, 1923, in *Field Artillery Journal,* Mar-Apr 1924, pp. 118-22; Annual Report, Chief of Field Artillery, 1926-27, in *Field Artillery Journal,* Jan-Feb 1928, p. 4; Annual Report, Chief of Field Artillery, 1931, in *Field Artillery Journal,* Nov-Dec 1931, pp. 588-89; Maj Ralph McT. Pennell, "A Field Artillery Viewpoint of Ordnance Development," *Field Artillery Journal,* Mar-Apr 1926, pp. 227-28; Green, Thomson, and Roots, *The Ordnance Department,* pp. 186-87.

Although the War Department retained the other 75-mm. guns, it announced a plan to arm its field batteries with the Ml after sufficient numbers had been manufactured. Yet, only a few Ml 75-mm. guns were purchased. A surplus of 75-mm. guns from the war and devotion to economy in government prevented Congress from authorizing procuring the Ml. Consequently, the War Department continued using the M1916, the M1917, and the M1897 into the thirties. However, the introduction of light field howitzers with greater power, longer ranges, and equal mobility made these 75-mm. guns obsolete.[31]

The high cost of manufacturing the Ml 75-mm. gun to meet mobilization requirements along the lines of the Great War eventually stimulated finding a less expensive way of equipping the division with a modern 75-mm. gun. Because of the large stock of M1897 75-mm. guns on hand, the War Department decided early in the 1930s to improve the field gun's range and mount the weapon on a modern carriage. In 1930-31 the Ordnance Department developed a high-explosive shell that used trinitrotoluene, commonly called TNT, amatol, and explosive D as propelling and bursting charges for the M1897 to give the piece a range of 13,600 yards. Subsequently, the Field Artillery Board tested the gun in 1932-34 and found it to be acceptable. In view of this, the War Department designated the gun the M2 75-mm. and put it into limited production in 1936. Meanwhile, the War Department started work on a carriage for towing at high speeds behind a motor vehicle.[32]

By the 1930s a well-developed arsenal system for field artillery existed. Watervliet, New York, produced finished guns. Watertown, Massachusetts, made gun castings, carriages, and recoil mechanisms for seacoast and antiaircraft guns. Frankfort, Kentucky, supplied fire control instruments, and Rock Island, Illinois, made carriages and recoil mechanisms. These arsenals constituted a ready source for field artillery, but they could furnish only a small fraction of the Army's demands during time of war. This meant that the War Department would have to rely on private industry that had neither expertise nor experience constructing artillery.[33]

While the War Department searched for a suitable 75-mm. gun for the division, it developed a 105-mm. howitzer.[34] Using captured German 105-mm. howitzers as models, field artillery and ordnance officers built four 105-mm. howitzers in 1920. Since the howitzers and carriages were too heavy and clumsy to be easily maneuvered by hand with a normal gun crew, structurally weak, and generally unsuitable for standardization, the Ordnance Department tested various box-trail and split-trail carriages with improved American 105-mm. howitzers mounted on them. At

31. W.J. Savoy, "The Evolution of the American Modern Light Field Gun," unpublished master's thesis, US Army Command and General Staff College, 1978, p. 65.

32. The Field Artillery School, Field Artillery Materiel (Fort Sill, Ok: The Field Artillery School, 1932), pp. 153-54; Maj Gen Upton Birnie, Jr., Lecture, US Army Command and General Staff College, 13 May 1937, pp. 13-14, in Morris Swett Library; Annual Report, Chief of Field Artillery, 1930, in *Field Artillery Journal*, Jan-Feb 1930, pp. 15-16; Annual Report, Chief of Field Artillery, 1932, in *Field Artillery Journal*, Nov-Dec 1932, pp. 585-86; Maj Gen Robert M. Danford, Lecture, Army War College, 23 Sep 1938, pp. 4-5, in Morris Swett Library; Annual Report, Chief of Field Artillery, 1923, in *Field Artillery Journal*, Nov-Dec 1924, p. 122; Savoy, "The Evolution of the American Modern Light Field Gun," pp. 65, 72-74.

33. Harry C. Thomson and Lida Mayo, *The Ordnance Department: Procurement and Supply* (Washington: Office of the Chief of Military History, US Army, 1960), pp. 72-73.

34. McKenney, "More Bang for the Buck in the Interwar Army," p. 82.

the same time the Field Artillery Board mounted captured German 105-mm. howitzers that had been rechambered for American ammunition on split-trail carriages and rigorously tested them. Pressured by field artillery officers, who endorsed the German pieces, the Field Artillery Board favored adopting them until a satisfactory American howitzer could be manufactured. The shortage of ammunition, the cost of putting the German howitzers into serviceable condition, and the lack of uniformity of those available from which to prepare drawings for production caused the Chief of Ordnance to protest. This led the War Department to abandon the superior German howitzers and place them in storage in 1925 and allowed the department to concentrate its limited funds on building an American howitzer and carriage. Pressed by the requirement for a companion piece for the 75-mm. gun and by General Snow, who insisted that developing a satisfactory 105-mm. howitzer was the most pressing ordnance problem, the Ordnance Department constructed a new American 105-mm. howitzer and mounted it on a split-trail carriage for testing. Supported by trials that demonstrated the howitzer and carriage were satisfactory, the War Department standardized them in 1928 as the horse-drawn Ml 105-mm. howitzer.[35]

The inability to produce enough Ml 105-mm howitzers because of limited funds forced the War Department to revamp division artillery. In 1929 the War Department reinstated the M1918 155-mm. howitzer in the division. This gave the division a field artillery brigade of one regiment of tractor-drawn 155-mm. howitzers and two regiments of horse-drawn 75-mm. guns commanded by a brigadier general. Each 75-mm. gun regiment had two battalions, six batteries, and twenty-four pieces, and the 155-mm. howitzer regiment had three battalions, six batteries, and twenty-four howitzers. Yet, integrating the 155-mm. howitzer back into the division was a temporary expedient because the War Department still planned to use a 105-mm. howitzer for general support when sufficient numbers of the weapon were available.[36]

Even before the Ml 105-mm. howitzer went into production, the War Department modified the field piece to load shrapnel as fixed ammunition to complement high-explosive shell and chemical shell of smoke or gas. In 1930 Chief of Field Artillery, Major General Harry G. Bishop (1930-1934), reported that ten altered Ml howitzers, redesignated the M2 105-mm. howitzer, were being manufactured. The following year, the War Department sent four M2 howitzers to Battery F, 1st Field Artillery Regiment, The Field Artillery School, Fort Sill, for testing. At the conclusion of the trials, the school reported in 1931 that the M2 howitzer tube was satisfactory but that the carriage could not be towed at a high-speed by a motor vehicle and required a recoil pit for high-angle fire missions. Even though the school found the M2 howitzer to be inadequate, it still

35. Maj Maxwell Murray, "The Place of Light Field Artillery Howitzer in Division Artillery," *Field Artillery Journal,* Nov-Dec 1925, p. 540; Ltr, Chief of Field Artillery to President, FA Board, subj: Test of Divisional Artillery, 20 Dec 1922, File No. 472.22, RG 177, National Archives; Green, Thomson, and Roots, *The Ordnance Department,* pp. 186-87; Annual Report, Chief of Field Artillery, 1925-26, p. 5; Annual Report, Chief of Field Artillery, 1928, in *Field Artillery Journal,* Nov-Dec 1928, p. 585; Annual Report, Chief of Field Artillery, 1926, in *Field Artillery Journal,* Mar-Apr 1926, pp. 198-99; Annual Report, Chief of Field Artillery, 1929, p. 14; Annual Report, Chief of Field Artillery, 1930, in *Field Artillery Journal,* Nov-Dec 1931, p. 590; Brig Gen John P. Lucas, "The 105-mm. *Howitzer," Field Artillery Journal,* Feb 1941, p. 68; The Field Artillery School, *Associated Arms* (Fort Sill, Ok: The Field Artillery School, 1934), p. 6.

36. Harry G. Bishop, *Field Artillery: King of Battle* (Boston:Houghton Mifflin Company, 1935), p. 24; The Field Artillery School, *Organization of the Field Artillery* (Fort Sill, Ok: The Field Artillery School, 1935), pp. 6-10; War Department, *Field Artillery Drill Manual,* 1931, p. 6 and Table I.

expressed faith in motor-drawn field artillery.[37] Limited funds, however, forced the War Department to stop the manufacture of the M2 howitzer in 1934 and the development of a carriage, left the division without a light howitzer for general support, and compelled keeping the M1918 155-mm. howitzer in the division.[38]

As the War Department fought an uphill struggle to adopt new field pieces, it searched for a motor vehicle to tow light artillery. Despite endorsements by many field artillery officers and the modest success of motor-drawn (towed) artillery during the war, an officer in the War College Division in June 1917 found the caterpillar tractor to be too slow for light artillery. Other field artillery officers preferred the horse because it did not require spare parts, did not run out of gas, and did not need repairs as motor vehicles did.[39] These evaluations highlighted the basic arguments surrounding motorizing light artillery in the twenties and early thirties and hampered adopting motor-drawn guns. Rather than advocating a wholesale and quick conversion and eagerly accepting the new technology, conservative Army officers opposed a rapid transition from horse-drawn to motordrawn field artillery, especially for the division. Moving slowly permitted leisurely testing and experimenting and forestalled dislocation and confusion. Supporting this rationale, Major William E. Burr wrote a prize-winning article for the *Field Artillery Journal* essay contest in mid-1922. He pointed out that the tractor had revolutionized the field artillery's ideas regarding the means of pulling guns and howitzers on the battlefield. Tractors had great possibilities. However, they had to be improved before they would be satisfactory traction for field guns because they were unreliable and slow.[40] The following year, General Snow urged retaining horse-drawn light artillery. Writing in his annual report in 1923, he explained that motor vehicles were slow and were better than horses but only under "certain circumstances." As a result, division artillery should remain horse-drawn. Although he had reservations about motordrawn light artillery at the time, he still envisioned it as the trend of the future.[41]

Such thinking by Snow, Burr, and other field artillery officers strongly influenced the War Department. Following the war, it conducted various test and development programs to determine the suitability of motor vehicles for towing artillery. Based upon existing evidence, the War Department had to motorize medium and heavy artillery because horses simply could not pull such pieces. In contrast, the War Department displayed less enthusiasm for motorizing light division artillery. Even though the War Department realized that motor-drawn and even self-propelled artillery would eventually supplant horse-drawn guns, it did not intend to

37. Annual Report, Chief of Field Artillery, 1931, p. 581; Green, Thomson, and Roots, *The Ordnance Department,* pp. 186-87; Riley Sunderland, *History of the Field Artillery School,* Vol. I (Ft. Sill, 1942), p. 130.

38. McKenney, "More Bang for the Buck in the Interwar Army," p. 82; Annual Report, Chief of Field Artillery, 1930, p. 590; Annual Report, Chief of Field Artillery, 1933, in *Field Artillery Journal,* Jan-Feb 1934, p. 23; Lucas, "The 105-mm Howitzer," p. 68-69; Green, Thomson, and Roots, *The Ordnance Department,* pp. 186-87; Sunderland, *History of the Field Artillery School,* p. 130.

39. Memo for Gen Kuhn, subj: Motor Traction, Field Artillery, 13 Jun 1917, File No. 257812, RG 94; Green, Thomson, and Roots, *The Ordnance Department,* p. 203.

40. Burr, "Some Aspects of American Field Artillery," p. 183.

41. Annual Report, Chief of Field Artillery, 1923, p. 117.

motorize light artillery until motor traction had proven itself to be mobile and dependable.[42]

Despite the War Department's and field artillery's desire to test motor vehicles further, congressional action stalled serious progress. Budget cuts in 1922 compelled the War Department to direct the elimination of all experimental motorized division artillery except for one battalion of the 83rd Field Artillery Regiment at Fort Benning, Georgia, and part of the 1st Field Artillery Regiment at Fort Sill, Oklahoma, both of which were school units, and to abandon ambitious research programs with motorized light artillery. Despite this setback, testing tractors and trucks over the next several years continued but on a much smaller scale than before 1922.[43] Without sufficient funding for adequate evaluation and with support from the Field Artillery Board, which opposed motorizing light artillery, the War Department announced in November 1928 its decision to retain horse-drawn artillery for the division for the foreseeable future.[44]

Tests conducted through 1928 might have indicated that motor vehicles had a promising future, but the War Department still doubted their quality and reliability for division artillery and insisted that the horse provided the maximum mobility under all conditions for light artillery. Mobility was critical for light division artillery more so than for medium and heavy artillery for the corps and army since it had to provide close, continuous support to the infantry in a war of movement. As a result, the War Department held fast to the principle that division artillery was horse-drawn and was not willing to expand the number of motorized division artillery units beyond the experimental light regiments in the Hawaiian Division, one battalion at The Field Artillery School, and one battalion of the 6th Field Artillery Regiment. Division artillery would remain horse-drawn even though medium and heavy artillery was being motorized during the 1920s. Because of the lack of funds, fears about motor traction's dependability and mobility, the belief in the horse's superiority over motor vehicles, and conservatism, the War Department refused to motorize light division artillery and make a complete break with the horse in the 1920s.[45]

Introducing self-propelled artillery, another goal outlined by the Westervelt Board, encountered similar difficulties. During the 1920s, the ordnance board developed several selfpropelled gun mounts, also called motor carriages. After testing the Holt Mark VI and Christie self-propelled

42. Col Harry G. Bishop, "What of the Future," *Field Artillery Journal,* Sep-Oct 1922, p. 368; Annual Report, Chief of Field Artillery, FY 1922, in *Field Artillery Journal,* Nov-Dec 1922, pp. 458, 459, 472; Annual Report, Chief of Field Artillery, 1923, p. 117.

43. Annual Report, Chief of Field Artillery, FY 1922, pp. 458, 459, 472; Annual Report, Chief of Field Artillery, 1923, p. 117; Annual Report, Chief of Field Artillery, 1923-24, p. 137; Annual Report, Chief of Field Artillery, 1924-25, in *Field Artillery Journal,* Mat-Apr 1926, pp. 201, 206; Annual Report, Chief of Field Artillery, 1925-26, p. 6; Annual Report, Chief of Field Artillery, 1926-27, pp. 6-7; Annual Report, Chief of Field Artillery, 1928, in *Field Artillery Journal,* Nov-Dec 1928, pp. 584-85.

44. Ltr, Bishop to Adjutant General, subj: Motorization of Light Field Artillery, 1 Sep 1931, in Morris Swett Library; Annual Report, Chief of Field Artillery, 1923-24, p. 137; Annual Report, Chief of Field Artillery, 1923, *m Field Artillery Journal,* Mar-Apr 1924, p. 117; Cpt W.D. Dunwoody, "Problems of Mobility in Motorized Artillery," *Field Artillery Journal,* Jul-Aug 1925, p. 330; "Division Light Artillery to Remain Horse-Drawn," *Field Artillery Journal,* Jan-Feb 1929, p. 84; Annual Report, Chief of Field Artillery, 1925-26, p. 11; Annual Report, Chief of Field Artillery, 1929, pp. 22-23; Annual Report, Chief of Field Artillery, 1930, in *Field Artillery Journal,* Jan-Feb 1931, p. 12; Annual Report, Chief of Field Artillery, 1932, p. 589; Green, Thomson, and Roots, *The Ordnance Department,* p. 203.

45. Ltr, Bishop to Adjutant General, subj: Motorization of Light Field Artillery, 1 Sep 1931; Annual Report, Chief of Field Artillery, 1929, pp. 21-22; Bishop, *Field Artillery,* pp. 66-67; Annual Report, Chief of Field Artillery, 1930, p. 126.

chassis, the field artillery arrived at the conclusion in 1923 that they were useless for light guns and howitzers and noted that introducing self-propelled artillery in its present state of development would be sheer madness. Moreover, the field artillery did not want to adopt self-propelled pieces because they presented a big silhouette that was easy to hit with counterbattery fire, because they were too heavy, and because they were unreliable. Influenced by these liabilities and the Field Artillery Board's recommendation to cease testing self-propelled artillery for service in the division, the Ordnance Department turned its attention to self-propelled 155-mm. guns and 8-inch howitzers. Limited funds and apathy on the part of the field artillery for the same reasons that produced resistance to introducing self-propelled division artillery, however, halted serious work by the middle of the 1920s.[46] Chief of Field Artillery, Major General Fred T. Austin (1927-1930), explained the dilemma of adopting motor-drawn light artillery in the twenties. In his annual report for 1929, he wrote that he would have encouraged the War Department to motorize light artillery faster than it was doing but that inadequate funding retarded testing to find the right vehicle.[47]

Because of the inability to tow 75-mm. guns behind a motor vehicle, General Bishop took aggressive action to find a solution shortly after taking office in 1930. Bishop openly criticized the War Department's reluctance to adopt motorized guns and howitzers for the division. In September 1931 Bishop pointed out that those units that had violated the directive of 1922 to eliminate motor-drawn light artillery were having success with it. At the end of a letter to the Adjutant General on 1 September 1931, Bishop wrote, "Long continuous study, experimentation and tests have convinced this office [Office of the Chief of Field Artillery] that the prime mover problems can be solved by the use of Ford vehicles (or their equivalent)."[48] Even though rapid improvements in motor transportation and the lack of funds prevented his office from reaching definitive conclusions about the best motor vehicle for division artillery, Bishop still found motor-drawn light field pieces to be practical.[49]

Bishop correctly evaluated the advancements in motor vehicles. During the twenties and early thirties, General Motors, International Harvester Company, Marmon-Herrington Company, Ford Motor Company, and other companies were building four- and six wheel trucks with cross-country capabilities, while the Cleveland Tractor Company, Allis Chalmers Company, the Caterpillar Tractor Company, and Holt Tractor Company were producing dependable and sturdy track tractors with cross-country abilities. Because of these trucks and tractors, Bishop simply could not understand why the War Department cautiously approached motorizing division artillery. As far as the General was concerned in 1931, only the scarcity of money stood in the way of motorizing all of the division's artillery.[50]

46. Annual Report, Chief of Field Artillery, FY 1922, p. 471; Annual Report, Chief of Field Artillery, 1928, p. 584; Green, Thomson, and Roots, *The Ordnance Department*, pp. 203, 314.

47. Annual Report, Chief of Field Artillery, 1929, p. 22.

48. Ltr, Bishop to Adjutant General, subj: Motorization of Light Field Artillery, 1 Sep 1931.

49. *Ibid.*

50. Daniel R. Beaver, "Politics and Policy: The War Department Motorization and Standardization Program for Wheeled Transport Vehicles, 1920-1940," *Military Affairs*, Oct 1983, p. 104; Memorandum for Commandant, Army War College, subj: Motorization of Divisional Artillery, 6 May 1929, pp. 3-11; The Field Artillery School, *Field Artillery Military Motor Transport*, 1935, pp. 29-40; Maj J.H. Wallace, Lecture, Motor Transportation School, 18 Jan 1934, pp. 108, in Morris Swett Library; Annual Report, Chief of Field Artillery, 1929, p. 22.

At Bishop's urging the War Department directed the Field Artillery Board in 1931 to test four Ml897 75-mm. guns mounted on carriages suitable for towing behind trucks. Upon receiving four Ml897 guns with carriages adapted for high-speed movement, the Field Artillery Board conducted tests between May 1932 and March 1933. After evaluating the findings of the trials, the board recommended testing a battalion of towed 75-mm. guns. Although the lack of funds prevented the battalion trial, General Bishop accepted the results of the battery test as evidence that light trucks were suitable for towing light artillery.[51]

However, more work had to be done before selecting a particular truck. Because of insufficient money and rapid, continuous improvements in motor transportation, the field artillery could not decide which motor vehicle was best. Even though all of the results of the Field Artillery Board's tests were not available yet and the type of motor vehicle was still unsettled, Bishop pointed out late in 1932 the practicality of motor transportation for light division artillery. Based upon this supposition, the War Department could not stall the conversion to towed artillery any longer because the technology existed.[52]

Unlike motorizing light field artillery, acquiring medium field pieces did not create excitement. In fact, it was an uneventful process. In 1926 the Field Artillery Board tested a pilot model of an American-built 4.7-inch gun with the intention of using it in the corps. Although the board found the gun to be satisfactory, the War Department suspended development in 1928 because its experimental 155-mm. gun met the requirement for a medium gun, and eliminating the 4.7-inch gun meant a reduction in the number of calibers and monetary savings. The successful construction of a new 155-mm. howitzer further obviated the need for a 4.7-inch gun. The War Department planned to develop the 155-mm. howitzer, but financial constraints prevented producing it until the mid-1930s and left the French 155-mm. GPF gun from the Great War as the sole corps field artillery piece.[53]

Procuring heavy artillery for the army and general headquarters reserve also did not fare well in the 1920s. Insufficient funds slowed down modifications of the 8-inch howitzer and development of the 9.2-inch howitzer and 8-inch gun and forced keeping the M1918 240-mm. howitzer operational even though it was obsolete, difficult to maneuver, and an inadequate substitute for the 8-inch howitzer. Without heavy field pieces the field artillery's harassment and interdiction missions would suffer. According to air power enthusiasts, the role of harassing and interdicting the enemy's rear areas would pass to the air force anyway, and the War Department accepted their assertions. Because of this and the War Department's belief that heavy field artillery was

51. Maj Gen Paul B. Malone, "The Significance of the Truck Drawn Battery of 75-mm. Guns," *Field Artillery Journal,* May-Jun 1933, pp. 205-08; "Truck-Drawn 75-mm. Gun Battery and Battalion," *Field Artillery Journal,* Jul-Aug 1933, p. 293; Maj J.H. Wallace, "Test of the Truck-Drawn 75-mm. Battery," *Field Artillery Journal,* Jul-Aug 1933, p. 301; Capt M.R. Cox, "Truck-Drawn Artillery," *Field Artillery Journal,* May-Jun 1931, pp. 224, 230.

52. Annual Report, Chief of Field Artillery, 1932, pp. 589-90.

53. Birnie, Lecture, US Army Command and General Staff College, 13 May 1937, p. 4; Bishop, Field Artillery, pp. 26, 273; Green, Thomson, and Roots, *The Ordnance Department,* pp. 178-79; Danford, Lecture, Army War College, 23 Sep 1938, p. 6; Annual Report, Chief of Field Artillery, 1931, p. 590; The Field Artillery School, Field Artillery Material (Fort Sill, Ok: The Field Artillery School, 1937), p. 165; Annual Report, Chief of Field Artillery, 1930, in *Field Artillery Journal,* Jan-Feb 1931, pp. 13-14.

outmoded, the pressure to develop heavy pieces did not exist.[54]

Thus, a modern field artillery system desired by the War Department at the beginning of the 1920s had not materialized. Research and development projects that had started energetically in 1920 and 1921 stalled because of the reduction of funds later in the twenties, conservatism, and war surplus that could be modified less expensively or used until it was worn out. As a result by the mid-1930s, field pieces and materiel from the Great War still dominated the inventory.

A Change of Direction

Pushed by General Bishop, the Army War College, and the existence of obsolescent guns, howitzers, organization, and technique, the War Department stepped up the pace of modernizing its field artillery in the 1930s. Because of the decline in the horse population in the United States and a modernization program initiated in 1933 by Chief of Staff, General Douglas MacArthur (1930-1935), the War Department decided to motorize fifty percent of its light field artillery. As an expedient, it adapted old M1897 75-mm. gun carriages for towing behind a truck until a new carriage could be developed. Supported by funds provided by the Public Works Administration, by 1936 the War Department developed carriages with pneumatic tires, antifriction bearings, and springs to give the 75-mm. gun two types of carriages—a modified Ml897 carriage and a totally new one. Although resistance from conservative field artillery officers hindered adopting towed light artillery, the War Department motorized fifty-six of its eighty-one 75-mm. gun batteries by 1940 and had even developed an experimental motor-drawn M2 105-mm. howitzer.[55] Motorizing seventy-five percent of division artillery (75-mm. guns and 155-mm. howitzers) in approximately seven years represented a giant leap forward and a shift in attitudes toward motor vehicles by the War Department and field artillery and compared favorably with developments in Europe and Japan.[56]

Although the field artillery and War Department finally accepted towed division artillery in principle, they still resisted developing self-propelled artillery. From 1933 onward, field artillery officers consistently contended that motor-drawn artillery was more maneuverable, less conspicuous, and less likely to be deadlined for repairs than self-propelled artillery and, therefore, opposed

54. Annual Report, Chief of Field Artillery, 1933, in *Field Artillery Journal,* Jan-Feb 1934, p. 24; Maj Jay M. MacKelvie, Lecture, Quartermaster School, 12 Jan 1941, pp. 4-6, in Morris Swett Library; Thompson and Mayo, *The Ordnance Department,* p. 68.

55. McKenney, "More Bang for the Buck in the Interwar Army," p. 82; Lucas, "The 105-mm Howitzer," p. 69; Thomson and Mayo, *The Ordnance Department,* p. 72; Maj Max Beasley, Lecture, Quartermaster School, 6 Mar 1939, p. 10, in Morris Swett Library; Birnie, Lecture, US Army Command and General Staff College, p. 22; Memorandum for Cmdt, Army War College, subj: Motorization of Division Artillery, 26 Apr 1929, in Morris Swett Library; "Tests of Mechanical Prime Movers," *Field Artillery Journal,* Jan-Feb 1931, p. 110; The Field Artillery School, *Field Artillery Materiel* (Fort Sill, Ok: The Field Artillery School, 1932), pp. 18-19; Green, Thomson, and Roots, *The Ordnance Department,* p. 187; Allan R. Millet and Peter Maslowski, *For the Common Defense: A Military History of the United States of America* (New York: The Free Press, 1984), p. 380.

56. Frank E. Comparato, Age of Great Guns: *Cannon Kings and Cannoneers Who Forged the Firepower of Artillery* (Harrisburg, Pa: The Stackpole Company, 1965), p. 352; Lucas, "The 105-mm Howitzer," p. 69; Thomson and Mayo, *The Ordnance Department,* p. 72; Report, Chief of Army Field Forces, subj: Artillery Conference, 23-25 Jun 1954, p. 64, in Morris Swett Library; Beasley, Lecture, Quartermaster School, 6 Mar 1939, p. 10; Birnie, Lecture, US Army Command and General Staff College, 13 May 1937, p. 22; Memorandum for the Commandant, Army War College, subj: Motorization of Division Artillery, 26 Apr 1929; Danford, Lecture, Army War College, 28 Sep 1938, pp. 12-16.

the latter. In fact, Chief of Field Artillery, Major General Robert M. Danford (1938-1942), adamantly refused to introduce self-propelled artillery because towed artillery was better as far as he was concerned.[57]

Early in the fall of 1939, General Danford expressed his and other field artillery officers' feelings about towed and self-propelled artillery. In September 1939 he told Army War College students that the motor surpassed the horse in some situations, while the horse was better in others. He explained further, "For light division artillery, the horse still remains superior as the prime mover off roads, through the mud, the darkness and the rain. . . .To discard him during peace in favor of the motor, 100 per cent, is simply putting all our eggs in one basket, and is, in my judgement, an unsound policy."[58] Danford cautiously supported motorization, but like others he fought to preserve some horse-drawn light artillery. Because of this, field artillerymen had to be prepared to serve in towed and horse-drawn artillery units. In view of this, courses at the Field Artillery School at Fort Sill continued teaching animal management, equitation, and other related courses to officers and enlisted personnel as late as 1941.[59]

Caught in the middle of a technological revolution, many field artillery officers had problems accepting the changes around them. Even though their fears about the reliability of motor vehicles discouraged motorization, most officers knew that horse-drawn artillery had to be abandoned because it was becoming obsolete. Yet, influenced by their apprehensions and not technically oriented and faced with the possibility of restructuring tactics, doctrine, and organization, many field artillery officers kept their horses and had a mixture of horse- and motordrawn light artillery in 1941.[60]

As such, the field artillery reached an important milestone in 1933. Ironically at the height of the Great Depression, the War Department received funds to motorize. As a result, the field artillery no longer could use the scarcity of money as a reason for moving so methodically. After 1933 conservative field artillery officers challenged the reliability and mobility of motor vehicles to slow down converting from horse-drawn light artillery even though General Bishop found motor vehicles to be suitable.

Prompted by improvements in motor transportation and the appearance of a mobile 155-mm. howitzer carriage, pressure from eager reformers, and the desire to stay abreast of developments in foreign armies, in June 1938 Danford directed the Field Artillery School to determine the best combination of weapons for division artillery. Specifically, he wanted to know whether the 105-mm. howitzer should be used with the 75-mm. gun in the division or whether it should be the sole weapon. The school categorically rejected replacing the 155-mm. howitzer with the 105-mm. howitzer as a companion piece for the 75-mm. gun because it only offered mobility. In a lengthy

57. Annual Report, Chief of Field Artillery, 1930, p. 14; "Forecast of Field Artillery Progress During Next Five Years," *Field Artillery Journal,* Nov-Dec 1933, p. 510; Green, Thomson, and Roots, *The Ordnance Department,* pp. 203, 314; Danford, Lecture, Army War College, 23 Sep 1939, p. 17.

58. Danford, Lecture, Army War College, 23 Sep 1939, p. 19.

59. Danford, Lecture, Army War College, 23 Sep 1939; Sunderland, *History of the Field Artillery School,* pp. 198, 199, 214.

60. "Forecast of Field Artillery Progress During the Next Five Years," p. 510; Comparato, *Age of Great Guns,* p. 226; Beaver, "Politics and Policy," pp. 105-06.

report the school explained that experience with the 155-mm. howitzer had demonstrated the piece's mobility and suitability as a general support weapon for the division.[61] The school also pointed out, "To replace it [the 155-mm. howitzer] piece for piece, by the 105-mm. howitzer would be at the sacrifice of much artillery fire-power, which we can ill afford to lose, and at a gain which is, in the main illusory."[62] Understanding that the War of 1914-18 and the Spanish Civil War had reaffirmed the importance of firepower, the school opposed any reduction in firepower in 1938. At the same time, employing the 105-mm. howitzer as the sole weapon had merit. Such an arrangement would simplify supply, maintenance, training, in some instances organization, and increase firepower, but it would reduce mobility unless a larger truck was used to pull the piece. Assaulting the orthodox position of a 75-mm. gun and 105-mm. howitzer combination for the division and realizing that motorization had improved mobility, the Field Artillery School wanted 105-mm. and 155-mm. howitzers as division artillery. Yet, the school understood that the surplus of 75-mm. guns and ammunition would probably delay scrapping the 75-mm. gun for the 105-mm. howitzer.[63]

Other field artillery officers also challenged the War Department's decision to strip the division of the 155-mm. howitzer for the 105-mm. howitzer. They argued that tractors and trucks had dramatically increased the 155-mm. howitzer's mobility. As a result, they wanted 105-mm. and 155-mm. howitzers as companion pieces for the same reasons that their predecessors of the 1920s had outlined.[64]

In the meantime, the War Department tested the 75-mm. gun and 105-mm. howitzer combination as part of its effort to develop a more mobile division. Prodded by officers, who found the 22,000-man square division created after the Great War to be cumbersome, the War Department directed the 2nd Division at Fort Sam Houston, Texas, in 1936 to test a triangular division of three infantry regiments, a motorized field artillery regiment of three direct support battalions of 75-mm. guns (twenty-four) and one general support battalion of 105-mm. howitzers (eight), and support units. Trials in 1937 substantiated the division's mobility and the suitability of the four-battalion field artillery organization but simultaneously demonstrated field artillery's lack of firepower. In response to this revelation, test participants, especially Brigadier General Lesley J. McNair, Commander, 2nd Field Artillery Brigade, 2nd Division, urged arming the division with heavier field pieces. Consequently, the War Department restructured the triangular division's artillery late in 1938 into three battalions of 75-mm. guns (thirty-six), one battalion of 105-mm. howitzers (eight), and one battalion of 155-mm. howitzers (eight) for testing. Trials in 1938-39 by the 2nd Division reaffirmed the soundness of four artillery battalions for division artillery and the 155-mm. howitzer's superiority over the 105-mm. howitzer because it had more firepower. Yet, the War Department ignored the test results. Upon approving the triangular division for adoption, the War Department supplied it with 75-mm. guns and 105-mm. howitzers even though the

61. The Field Artillery School, A Study of the 105-mm. Howitzer with particular regard to the practical aspects of certain features of design, Sep 1938, pp. 1-2, in Morris Swett Library, hereafter cited as Study of the 105-mm. Howitzer.

62. *Ibid.*

63. *Ibid.*, pp. 2, 19, 42.

64. Birnie, Lecture, US Army Command and General Staff College, 13 May 1937, A Study of the 105-mm. Howitzer, p. 1; McKenney, "More Bang for the Buck in the Interwar Army," pp. 8485.

combination lacked the desired firepower.[65]

The triangular division consisted of combat infantry and supporting arms and services. The division had three infantry regiments, a reconnaissance troop, engineer battalion, medical battalion, quartermaster company, ordnance company, signal company, military police platoon, a band, and division artillery. Commanded by a brigadier general, division artillery had 144 officers and 2,439 enlisted personnel and was composed of three 75-mm. gun battalions (thirty-six guns) for direct support and one 155-mm. howitzer battalion (twelve howitzers) for general support because sufficient quantities of 105-mm. howitzers were unavailable. Each field artillery battalion was commanded by a lieutenant colonel and had three firing batteries of four pieces each. The battery was commanded by a captain and had 4 officers and 104 enlisted men. The gun crew consisted of a section chief, who ensured that all duties were properly performed, that all commands were executed, and that all safety precautions were observed, a gunner, who laid the piece, and five cannoneers for the 75-mm. gun and twelve for the 155-mm. howitzer, who loaded and fired their weapon.[66]

As the new division artillery organization indicated, the War Department still refused to abandon the 75-mm. gun and 105-mm. howitzer mix. The War Department saw the 75-mm. gun as an all purpose weapon and noted in 1939-40 that the M2 105-mm. howitzer's range was shorter than the M2 75-mm. gun's, that it took longer for the howitzer to go into action, that the howitzer had still not been proven in battle, that there was a surplus of 75-mm. guns and ammunition, and that replacing the 75-mm. gun with the 105-mm. howitzer would be expensive. In fact, Chief of Staff, General George C. Marshall (1939-1945), opposed abandoning the 75-mm. gun and ammunition. Like many of his predecessors, Marshall was reluctant to spend money on new weapons in peacetime when a surplus from the Great War existed.[67]

Events in 1940 finally forced the War Department to recast its division artillery. Reports prepared by field artillery officers during maneuvers in April and May reaffirmed the necessity of supplanting the 75-mm. gun with the 105-mm. howitzer. Moreover, the Germans' success with pieces heavier than the 75-mm. gun in its division artillery convinced the War Department to reevaluate keeping the 75-mm. gun. In June 1940 after Germany had signed an armistice with France, the Organization and Training Division (G-3) of the General Staff sent General Danford a memorandum announcing its decision to arm division artillery with 105-mm. and 155-mm. howitzers. Nevertheless, many divisions continued equipping their field artillery with 75-mm. guns until 1943 when 105-mm. howitzers became available in large numbers.[68]

Adopting other new field pieces in the 1930s fared as poorly as the conversion to the M2

65. McKenney, "More Bang for the Buck in the Interwar Army," 82-84; Key Report, pp. 36-37; Weigley, *History of the United States Army,* pp. 461-63; Jonathan M. House, "Designing the Light Division: 1935-44," *Military Review,* May 1984, pp. 41-47.

66. Jonathan M. House, *Towards Combined Arms Warfare: A Survey of Tactics, Doctrine, and Organization in the 20th Century* (Fort Leavenworth, Ks: Combat Studies Institute, US Army Command and General Staff College, 1984), p. 74; The Field Artillery School, Instruction Memorandum, 1942, pp. 1-19; Field Manual 685, 1939, pp. 33-34. 17; Field Manual, 6-55, 1939, pp. 22-23.

67. McKenney, "More Bang for the Buck in the Interwar Army," pp. 84-85; MacKelvie, Lecture, Quartermaster School, 12 Jan 1941, p. 5.

68. McKenney, "More Bang for the Buck in the Interwar Army," p. 85.

105-mm. howitzer. In 1937 the Field Artillery School commented, "It cannot be expected that this reserve [M1897, M1916, and M1917 75-mm. guns, M1918 155-mm. howitzers, M1918 155-mm. guns, and M1918 240-mm. howitzers] will be replaced, in peace, with more modern materiel, because of the great cost involved."[69] After acknowledging that new designs were being developed, the school added, "However, so long a time is required for production, issue, and training with new types that it is safe to assume that any war fought by the United States during this generation will be begun and continued during a considerable period with modified World War materiel."[70] In light of the war surplus, Congress' reluctance to fund developing new weapons during peace, and the time required to introduce new weapons, the school viewed the field artillery's future pessimistically in 1937.[71]

Besides encouraging the War Department to employ the 155-mm. howitzer and 105-mm. howitzer combination in the division, motorization also persuaded a serious reexamination of fire direction techniques. Since the inception of indirect fire at the beginning of the twentieth century, the battery had been the firing unit with fire direction data being calculated there. Higher headquarters from battalion to brigade determined how, where, and when the fire would be placed. This method of fire direction revolved around the concept that the battery was the fire unit and that the battalion was the tactical unit.[72]

With the battery serving as the firing unit, the field artillery had two methods of massing observed fire of several batteries. When a map was available, the observer would designate one or two points on a map as targets. The observer would then send grid coordinates to the batteries for plotting and computing firing data. Although this was satisfactory for static warfare, it was too slow for mobile warfare. When a map was unavailable and when all of the observers could see the target, the batteries, and the aiming point, field artillerymen adjusted one battery on the target and employed it as a base for the rest to determine their fire. This way was also slow. However, it worked as long as the batteries adjusted successively. When they adjusted simultaneously, this method produced confusion because forward observers could not tell which battery was hitting the target. As a result, close support was intermittent and often entirely lacking during World War I, and flexibility did not exist.[73]

69. Field Artillery School, *Field Artillery Materiel*, 1937, p. 11.

70. *Ibid.*

71. Field Artillery School, *Field Artillery Materiel*, 1937, p. 11; Mark S. Watson, *Chief of Staff: Prewar Plans and Preparations* (Washington: Historical Division, US Army, 1950), pp. 31-40.

72. Chief of Field Artillery, *Digest of Field Artillery Developments* (Fort Sill, Ok: The Field Artillery School, 1935), pp. 1-2; US Forces, European Theater, General Board, Report on Study of Field Artillery Gunnery, No. 64, undated, pp. 21-22, in Morris Swett Library.

73. US Forces, European Theater, Report on Study of Field Artillery Gunnery, No. 64, undated, pp. 21-22; Ltr, Maj Gen Carlos Brewer to Cmdt, The Field Artillery School, 5 Feb 44, in Development of Fire Direction File (FDC) File, Morris Swett Library; Ltr, Brig Gen R.C. Barkalow to Cmdt, The Field Artillery School, subj: Development of the Field Artillery FDC, 4 Feb 1944, in Correspondence of Development of FDC Filed; Ltr, Maj Gen H.L.C. Jones to Cmdt, The Field Artillery School, 23 Feb 44, in Development of FDC File; Lt Col Frank G. Ratliff, "The Field Artillery Battalion Fire-Direction Center—Its Past, Present, and Future," *Field Artillery Journal*, May-Jun 1950, p. 117; Russell Gugeler, "Fort Sill and the Golden Age of Field Artillery," unpublished manuscript in Morris Swett Library, pp. 6-7.

Critiquing fire direction procedures as they existed, progressive field artillery officers in the 1920s knew that they would be inadequate for a motorized army. Targets would be moving faster, causing more confusion, while forward observers would be dispersed more than before and frequently be unable to see other batteries' targets. Motorization was revolutionizing the battlefield and making the ways of 1917-18 of massing fire dangerously obsolete.[74]

Without a method of massing fire quickly and effectively on the mobile battlefield, field artillery officers searched for one. Inspired by Lieutenant Colonel Neil Fraser-Tytler's *Field Guns in France* (1929), in which he described his ability to shift fire around the battlefield in World War I, Major (later Major General) Carlos Brewer, director of the Gunnery Department at the Field Artillery School, and his instructors dramatically overhauled fire direction procedures. In 1931 Major Brewer concluded that using terrain features or giving "guessed at" coordinates of the target to the batteries to plot was part of the problem of inadequate close support in 1917-18. Brewer and his instructors revised observation methods, created a firing chart on which the base point (the target) was plotted, and located battery positions through survey. In the spring of 1931, they used these innovations to mass battalion fire accurately after registering one battery on a target without all forward observers being able to see the target and without maps. Yet, Brewer did not centralize computing firing data at the battalion even though some officers at the school thought that it was the proper firing unit. He kept this function in the battery because he could not find a rapid method of centralizing computing firing data at the battalion to make it a firing unit.[75]

Major (later Major General) Orlando Ward, Brewer's successor, and his instructors continued the work to find a satisfactory method of massing fire quickly and accurately. In 1932-34 they established the fire direction center to centralize computing firing data in the battalion. The battalion commander would dispatch forward observers from the batteries and battalion, who would report their observations back to the center using radios rather than telephones. The center would then prepare firing data rather than the forward observer party, apply the necessary corrections, conduct the adjustments, and synchronize fire on the most dangerous target. The center allowed the battalion to shift fire rapidly to mass on a single target and deliver a hammer blow when only one observer could see the target. With accurate maps a battalion could mass fire within ten minutes after receiving a call for fire from a forward observer, while a battery could provide fire within five minutes. Without maps the battalion generally took longer. Although the system

74 Comparato, *Age of Great Guns*, pp. 240-41; Ltr, MG Carlos Brewer to Cmdt, The Field Artillery School, 5 Feb 1944; Memo, Col Francis M. Boucher, undated, in Correspondence on Development of FDC File; Riley Sunderland, "Massing Fire and the FDC," Army, May 1958, p. 58; Gugeler, "Fort Sill and the Golden Age of Field Artillery," p. 6.

75. Ltr, Brewer to Cmdt, The Field Artillery School, 5 Feb 1944; Ltr, Col Sidney F. Dunn, former instructor in Gunnery Department, to Cmdt, Field Artillery School, subj: Development of the Field Artillery Fire Direction Center, 21 Feb 44, in Development of the FA FDC, US 401st FA Group File, Morris Swett Library; Ltr, Field Artillery School to Col Sidney F. Dunn, 10 Mar 44, The FDC File, Morris Swett Library; Ltr, Brig Gen R.G. Barkalow to Cmdt, The Field Artillery School, subj: Development of the FA FDC, 4 Feb 1944; Ltr, Dunn to Cmdt, The Field Artillery School, subj: Development of the Field Artillery Fire Direction Center, 21 Feb 44; Ratliff, "The Field Artillery Battalion Fire Direction Center," pp. 117-18; Gugeler, "Fort Sill and the Golden Age of Field Artillery," pp. 8-10; Sunderland, *History of Field Artillery School*, pp. 129-30; Sunderland, "Massing Fire and the FDC, p.58.

could only handle observed fire, the fire direction center surpassed anything in Europe.[76]

Besides allowing gunners to mass fire rapidly, the fire direction center altered the battalion's role. Prior to the development of the center, the battery commander directed fire, while the battalion commander assigned duties and tasks to each battery commander, supervised the expenditure of ammunition, and kept his battery commanders informed about the situation. He rarely interfered with actual firing. With the introduction of the fire direction center, the battalion commander also assumed responsibility for fire direction. The battalion directed the fire, and the battery commander conducted the fire. In effect, the battalion replaced the battery as the field artillery's firing unit.[77]

Drawing upon their days as battery commanders, many senior field artillery officers opposed placing the battalion commander in charge of directing fire. In emotional arguments and articles they insisted that the battery commander was "king in his own right, and that no one but the battery commander could give orders" to fire.[78] In fact, the Chief of Field Artillery, Major General Upton Birnie, Jr. (1934-1938), was the greatest obstacle. He opposed taking any prerogatives away from the battery commander and stubbornly fought against introducing the fire direction center. In the meantime, many veteran field artillery officers wanted the forward observer to talk directly to the battery doing the firing, while others claimed attempts to mass fire from a battalion on one single target by adjusting one battery was not practical and dismissed the development of the fire direction center. Supported by fiery opposition and its own conservatism, the War Department refused to accept the fire direction center.[79]

As tension in Europe increased, Lieutenant Colonel (later Major General) H.L.C. Jones, who became the director of the Gunnery Department at the Field Artillery School in 1939, and his staff refined the fire direction center to make it acceptable. Based upon Jones' experience as a commander of the 2nd Battalion, 77th Field Artillery, the Gunnery Department made the battery commander responsible for observed fire and the battalion commander for unobserved fire, centralized computation for observed and unobserved fire at the fire direction center, and increased the number of people in the center. The department also stressed that the entire battalion should fire on critical targets and that simultaneous opening of fire by all batteries on critical targets was normal unless the need for early fire was pressing. After demonstrating the improved fire direction methods to the Commandant of the Field Artillery School, Brigadier General George R. Allin

76. Ltr, Col Sidney F. Dunn to Cmdt, The Field Artillery School, subj: Development of FA FDC, 21 Feb 1944, in Correspondence on Development of FDC; Memo, Boucher, undated, pp. 5, 10; Ltr, Ward to Cmdt, The Field Artillery School, 15 Jun 1944, in Correspondence on Development of FDC; Comparato, *Age of Great Guns*, p. 242; "Field Artillery Notes," *Field Artillery Journal*, Jan-Feb 1932, p. Ill; "Field Artillery Notes," *Field Artillery Journal*, Nov-Dec 1932, p. 631; Sunderland, "Massing Fire and the FDC," pp. 58-59.

77. Ratliff, "The Field Artillery Battalion Fire-Direction Center," p. 116; Chief of Field Artillery, *Digest of Field Artillery Developments*, 1935, pp. 1-2.

78. Ltr, Dunn to Cmdt, The Field Artillery School, 25 Feb 1944, p.4.

79. Ratliff, "The Field Artillery Battalion Fire-Direction Center," p. 118; Ltr, Ward to Cmdt, The Field Artillery School, 15 Jun 44, Development of FDC File; Gugeler, "Fort Sill and the Golden Age of Field Artillery," pp. 17-18; Ltr, Dunn to Cmdt, The Field Artillery School, subj: Development of the Field Artillery FDC, 21 Feb 44; Sunderland, "Massing Fire and the FDC," p. 59.

(1941-1942), Jones finally convinced him to accept the fire direction center early in 1941.[80]

Aware of the success of the fire direction center and the growing possibility of war, the War Department subsequently adopted it for the division. In 1941 General Marshall witnessed massed fire from a division with a fire direction center. Using a system similar to the battalion's, the division fire direction center employed one gun from each battalion to adjust fire. Later in the year, General Danford observed another demonstration and approved employing the fire direction center in the division. By utilizing the center field artillerymen could mass fire from a battalion or division within minutes and put a maximum number of rounds on the right place at the right time with or without maps. As a result, the field artillery acquired the capability of delivering massed fires rapidly and shifting fire around the battlefield at will.[81]

In the meantime, improved field artillery fuses appeared. Based upon the Westervelt Board's recommendation for bore-safe fuses to prevent detonation of the main charge before the shell had left the gun's muzzle, the Ordnance Department developed a system of fuses during the 1930s that combined the firing mechanism, the detonator, and booster into one unit and would not explode the bursting charge prematurely. As a result, the fuses could be shipped assembled in the shell. The first to be introduced was a 30-second mechanical M34 time fuse. The second, adopted by the War Department in 1938, was a combination super quick-delay action M48 fuse. This point detonating fuse was safe, reliable, easily set, and accurate. After 1938 the Ordnance Department produced additional superquick-delay action fuses. These fuses detonated high-explosive steel shell, forged steel shrapnel, and white phosphorous smoke shell. With the introduction of these fuses, field artillerymen no longer had to carry superquick, quick, or delay fuses in the field as they had done during World War I to burst rounds above the ground or to permit rounds to penetrate the target before exploding.[82]

Unlike motorization, the fire direction center, and better fuses that improved the field artillery's capacity to perform its traditional role of supporting the infantry and cavalry, the possibility of using field pieces to fight tanks had the potential of forging a new and controversial mission. Based on the German experience in 1914-18, the Americans decided to place 75-mm. field guns forward of the main defensive lines in camouflaged positions to command the most likely approaches to allow batteries to hit the flanks of the tanks with direct fire.[83] Although they had faith in their ability to stop the lumbering tanks of the era, many American field artillery officers of the twenties favored employing a tank armed with 75-mm. cannon as an antitank weapon because it was more mobile than a field piece.[84]

Over the next several years, field artillery officers refined their antitank tactics. In the 1930s

80. Ltr, H.L.C. Jones to Cmdt, The Field Artillery School, 23 Feb 1944, pp. 1-4; Ratliff, "The Field Artillery Battalion Fire-Direction Center," pp. 118-19; Sunderland, *History of the Field Artillery School,* pp. 210-11.

81. Comparato, *Age of Great Guns,* pp. 243-45; Ltr, Asst Cmdt, The Field Artillery School, to Cmdt, The Field Artillery School, 25 Jan 44, Development of FDC File; Sunderland, "Massing Fire and the FDC," p. 59.

82. Green, Thomson, and Roots, *The Ordnance Department,* pp. 174-75; Field Artillery School, *Field Artillery Materiel,* 1937, pp. 145-54.

83. Lt Col C. Deems, "A Doctrine for the Use of Anti-Tank Guns," *Field Artillery Journal,* Jul-Aug 1923, pp. 287-89.

84. Maj Frank B. Jordan, "Artillery and Tanks," *Field Artillery Journal,* Sep-Oct 1924, p. 437.

they stressed employing indirect fire from medium and heavy pieces to bombard tank assembly areas and all routes leading from them.[85] Through massed indirect fire cannoneers planned to interdict tanks before they were ready to attack. In fact, field artillery doctrine emphasized that "fire on tanks in assembly areas is particularly effective and always sought."[86]

After 1934 field artillery officers, therefore, envisioned a two-phase antitank defense. Long-range indirect fire formed the first phase, in which batteries massed fire on tanks and their supporting elements as soon as they assembled. This barrage would knock out some tanks and reduce the offense's striking power. When those tanks that had escaped moved in closer, the second began. At that time gun crews aimed their 75-mm. and 37-mm. guns at individual tanks.[87]

Although field artillery officers saw the need for antitank tactics, they clung tightly to those missions that pre-dated tanks. For example, Colonel Allen J. Greer wrote in the *Field Artillery Journal* in 1937 that division artillery should be armed and organized to carry out its mission to fire on personnel and their accompanying weapons, mainly machine guns, that corps and general headquarters reserve artillery should furnish counterbattery fire, prepare for infantry attacks, and supply harassing and interdicting action, and that shelling tanks was not a primary mission for the artillery. It should be left to the infantry and special units equipped for antitank work.[88]

Speaking before students at the US Army War College in September 1938, General Danford echoed Greer's remarks. In a brief comment Danford said, "The artillery should not be diverted from its primary role solely for antitank defense except in real emergencies."[89] Supporting the infantry was more important than using field artillery against tanks. In his effort to define the field artillery's role against tanks, he emphasized developing mobile antitank weapons and attaching them to the division or corps. Guns and howitzers simply lacked sufficient mobility to fight tanks, which made them vulnerable to being overrun and captured. Steeped in the tradition of aggressive offensive warfare, Danford also opposed antitank warfare because it would give the field artillery a defensive role. Under Danford's direction the field artillery pushed the development of antitank guns and special units for employment against tanks so that it could concentrate on providing close support and counterbattery work.[90]

The field artillery also had a narrow view of the tank's role in offensive combat. Although Major Adna R. Chaffee's work at Camp Meade, Maryland, in the 1920s with mechanized regiments of tanks, motorized infantry, and motorized artillery demonstrated that the tank could be the core of a new arm, the field artillery still saw the tank as an aid to the infantry. As the literature at the Field Artillery School indicated, field artillery officers understood the tank's potential for dramatically restructuring tactics and organization. Like the War Department, the officers did

85. The Field Artillery School, *Tactical Employment of Field Artillery* (Fort Sill, Ok: The Field Artillery School, 1931), pp. 141-42.

86. The Field Artillery School, *Tactical Employment of Field Artillery* (Fort Sill, Ok: The Field Artillery School, 1934), p. 204.

87. *Ibid.*

88. Col Allen J. Greer, "Artillery Missions and Doctrines," *Field Artillery Journal,* May-Jun 1937, pp. 191-202 .

89. Danford, Lecture, US Army War College, 28 Sep 1938, p. 28.

90. *Ibid.*

not integrate tanks, infantry, and field artillery into formations as the Germans were developing with Blitzkrieg warfare or as B.H. Liddell Hart or J.F.C Fuller were promoting in Great Britain to avoid positional warfare along the lines of the Great War. As a result, the field artillery failed to develop tactics to support armored thrusts.[91] Creating an effective team of field artillery, infantry, armor, and air power did not come until the War Department and field artillery had digested the lessons of the Spanish Civil War of 1936-39.[92]

Consequently, with the exception of adoption of the M2 105-mm. howitzer and Ml 155-mm. gun in 1940, the development of improved fuses, and the creation of the fire direction center during the 1930s, the field artillery had not changed much since 1918. On the eve of World War II, antiquated weapons and thinking characterized the field artillery. Some progressive officers had tried to move the field artillery forward, but conservatism, limited funds, and pacifism overwhelmed them, limited serious reform and rearmament, and left the field artillery poorly prepared, technologically and tactically, to fight armies that were adopting the latest weapons and innovative tactics.

91. The Field Artillery School, *Tactical Employment of Field Artillery* (Fort Sill, Ok: The Field Artillery School, 1938), pp. 16, 289.

92. War Department, *Field Service Regulations,* 1939, pp. 7, 137; Russell F. Weigley, "Shaping the American Army of World War II: Mobility Versus Power," *Parameters,* Sep 1981, pp. 15-16; Danford, Lecture, US Army War College, 28 Sep 1938, p. 28; Russell F. Weigley, *The American Way of War: A History of United States Military Strategy and Policy* (New York: Macmillan Publishing Company, Inc., 1973), pp. 212-19; Weigley, *History of the United States Army,* 410, 411, 414; Col Conrad H. Lanza, "Lessons from Spain," *Field Artillery Journal,* May-Jun 1938, pp. 191, 196.

Table 5

SELECT AMERICAN FIELD ARTILLERY IN 1938

Weapon	Ammunition	Range in yards	Traverse in degrees	Elevation in degrees
M2 75-mm. Gun (modernized)	Mark I HE Shell Mark IV HE Shell	8,800 12,700	85	46
M1 897 75-mm. Gun	Mark II Chemical Shell M48 HE Shell Mark I Shrapnel	8,800 13,600 6,700	NA	NA
M2 105-mm. Howitzer (experimental)	M1 HE Shell	12,150	45	65
M1918A1 155-mm. Howitzer	Mark I Shell Mark II Chemical Shell Mark I Shrapnel	12,400 12,400 10,800	6	42
M1918 155-mm. Gun (GPF)	Mark III HE Shell Mark VII Chemical Shell Mark I Shrapnel	18,000 18,000 15,800	60	NA
M1918 240-mm. Howitzer	Mark III HE Shell	16,400	20	NA

Source: The Field Artillery School, *Field Artillery Fundamentals* (Fort Sill, Ok: Printing Plant, The Field Artillery School, 1942), p. 42; The Field Artillery School, *Tactical Employment of Field Artillery (Fort* Sill, Ok: Printing Plant, The Field Artillery School, 1938), p. 3.

Chapter VIII

FIELD ARTILLERY IN WORLD WAR TWO: 1939-1945

Motorized field pieces, the fire direction center, radio equipped forward observers, and technological and organizational developments increased the field artillery's ability to support the other combat arms as well as wreak destruction. Beginning in 1942 and continuing through 1945, field artillerymen massed fire to cut apart offensive thrusts, tear holes in defensive lines, or pin down the enemy to allow the offense to attack.

War in Europe

With the invasion of Poland in September 1939, Adolph Hitler smashed twenty years of uneasy peace in Europe. As the field artillery blasted holes in Polish lines, German tanks and infantry poured through with impunity. Simultaneously, German air forces bombed critical communication lines, prevented the Poles from bringing up reinforcements and supplies, and destroyed many aircraft on the ground before they could get airborne. By the last week of September, German and Soviet military forces had partitioned Poland.[1]

To ensure fire support the Germans had to modify field artillery tactics. Prior to the invasion they massed their field artillery to silence Polish batteries. Once the Germans had cut through the initial defense and as the first wave of tanks had disclosed enemy strongholds and other defenses, gun crews shifted their fire from the area of the breakthrough to screen the flanks of the first wave of advancing tanks. Shortly after, the second wave with close support from self-propelled and towed artillery hit antitank guns and field artillery positions that had not already been neutralized.[2] Subsequent tank waves struck any remaining points of resistance and cleared a path for infantry and horse-drawn artillery to follow.[3] Realizing that close cooperation between the field artillery and the other combat arms was paramount, the Germans assigned radio-equipped forward observers to the leading armor and infantry elements to direct fire, kept their guns so close

1. Richard A. Preston and Sydney F. Wise, *Men in Arms: A History of Warfare and Its Interrelationships with Western Society* (New York: Holt, Rinehart and Winston, 1979), pp. 295-96.

2. Military Intelligence Division, War Department, Tentative Lessons Bulletin, 23 Jun 1941, pp. 3-8, in Morris Swett Library, Fort Sill.

3. Military Intelligence Division, War Department, Tentative Lessons Bulletin, 23 Jun 1941, pp. 7-8; Office of the Chief of Field Artillery, Field Artillery Intelligence Digest, 7 Aug 1941, pp. 9-12.

to the front that gun crews frequently had to use direct fire, attached an artillery battalion to an armor or infantry regiment, and allowed their artillery battalions to operate independently of each other.[4] Because of these practices, the Germans generally massed their field guns only for breakthroughs or when resistance stiffened.[5]

Although German field artillery certainly did not lead the bold thrusts into Poland, it along with aggressive aerial attacks tore gaps in Polish defenses to allow tanks and mechanized infantry to roll through. Observing the German successes in Poland, Major General Robert M. Danford, Chief of US Field Artillery (1938-1942), commented that effective combined arms warfare had produced the quick victory over Poland.[6]

After eight months of preparation and after attacking Norway and Denmark, Hitler struck France in May 1940. The Germans used parachute troops to clear difficult obstacles, dive bombers to give close support to the ground forces, and tanks to probe, pierce, and fan out behind Allied lines.[7] When the Germans hit the Low Countries, France and Great Britain quickly shifted their defenses from their right along the incomplete Maginot Line to their left. This action absorbed their most mobile units and left their right flank unguarded and open to attack. In concert with the secondary thrust into the Low Countries, the German main force advanced through the woody and hilly country of the Ardennes, which many military experts thought was impassible for tanks and mechanized infantry, and surprised the Allies by breaking through at Sedan, France, in mid-May. Under the cover of aircraft rather than field artillery because their horse-drawn and even towed guns could not keep up with the other combat arms, the Germans crushed their opposition.[8] Trained in the ways of the Great War of 1914-18, French and British commanders simply could not react fast enough to stop the onslaught. After the British evacuated the continent at Dunkirk, the Battle for France ensued. Within nine days the Germans captured Paris and grabbed control of western Europe.[9]

At the outbreak of war in Europe in 1939, the US Army found itself poorly prepared for combat. The Army lacked airplanes, tanks, combat and scout cars, antiaircraft artillery, searchlights, fire control equipment, and other equipment. Based upon experience gained in France in 1918, the Army's offensive operations featured heavy artillery preparations, rolling barrages, the employment of tanks to assist the infantry to move through barbed wire entanglements and other obstacles, and massive infantry advances designed to engage the enemy in hand-to-hand combat. Although the Army boldly

4. Chief of Field Artillery, Field Artillery Intelligence Bulletin, 3 May 1941, p. 3; Military Intelligence Division, Tentative Lessons Learned Bulletin, 19 Jul 1940, p. 5.

5. Office of the Chief of Field Artillery, Field Artillery Intelligence Digest, 7 Aug 1941, p. 11; The Field Artillery School, Advanced (Special) Course Report, subj: German Operations in Poland, 1939, 16 Apr 1941, pp. 8, 10, 19; The Field Artillery School, Advanced (Special) Course Report, subj: German Operations in Poland, 1939, 6 Dec 1940, p. 5; Maj Gen Robert M. Danford, Lecture, Army War College, 23 Scp 1939; Charles von Luttichau, "Notes on German and US Artillery," Foreign Studies Branch, Office of the Chief of Military History, May 1957, p. 3.

6. Office of the Chief of Field Artillery, Field Artillery Intelligence Digest, 7 Aug 1941, p. 12.

7. Preston and Wise, *Men in Arms, p.* 299.

8. B.H. Liddell Hart, *History of the Second World War,* Vol I (New York: Capricorn Books, 1972), pp. 67-70. Even though the Germans had motorized field artillery, approximately fifty percent of their field artillery remained horse-drawn until the end of World War II.

9. Theodore Ropp, *War in the Modern World* (New York: Collier Books, 1959), pp. 318-19; War Department, Tentative Lessons Learned Bulletin, 11 Jul 1940, pp. 1-5.

proclaimed adherence to offensive and aggressive tactics and was converting to the triangular division to improve mobility, its doctrine relegated aircraft, tanks, machine guns, and field artillery to secondary roles to the infantry. The Army was simply more attuned to combat styles of 1918 than those of 1939-40 and resembled its French and British counterparts that the Germans had easily defeated.[10]

Yet, German successes in 1939 and 1940 dispelled any lingering doubts in the War Department about towed and self-propelled artillery.[11] Although the field artillery embraced towed artillery by abandoning horse-drawn artillery, many field artillery officers were reluctant to use self-propelled artillery because they persisted thinking that it was too unreliable and conspicuous. Despite high-level opposition from General Danford, resistance to change from many field artillery officers, and technological problems, necessity finally compelled the War Department to introduce self-propelled field artillery.[12]

At the recommendation of the Board of Officers on the Development of Equipment for Armored Divisions, Secretary of War Henry H. Woodring (1936-1940) directed the Ordnance Department in June 1940 to develop a motorized mount, also called a gun motor carriage, for the 75-mm. gun. The department advocated using commercially-built, high-speed tractors and the 3-inch gun, while the newly created Armored Force wanted self-propelled 105-mm. howitzers. Influenced by the movement towards heavier guns in Europe with the ability to follow the infantry, the Ordnance Department eventually substituted the 105-mm. howitzer for the 75-mm. gun. Even though this was comparatively easy, finding a high-speed, light-weight mount was difficult. Driven by expediency, the department experimented with wheeled carriages, half-tracks, and medium tank chassis rather than constructing a mount designed especially for the 105-mm. howitzer. In view of the need for mobility, the Ordnance Department picked a medium tank chassis. It reduced the chassis' armor, dispensed with the closed turret, deliberately rejected incorporating 360-degree traverse because it would increase the weight of the weapon, placed a M2 105-mm. howitzer on the vehicle, and named the weapon the M7 105-mm. self-propelled howitzer. Because of the M7's pulpit-like machine gun turret, the weapon was better known as the Priest. The Ordnance Department then rushed the M7 to the British in Africa early in 1942. Concurrently, the department installed 105-mm. howitzers on half-tracks built by the International Harvester Company and issued them to tank destroyer units in 1942.^

10. Martin Blumenson, "Kasserine Pass: 30 January-22 February 1943," in Charles E. Heller and William A. Stofft, eds., *America's First Battles: 1776-1965* (Lawrence, Ks: University Press of Kansas, 1986), pp. 226-28.

11. Charles M. Baily, *Faint Praise: American Tanks and Tank Destroyers During World War II* (Hamden, Ct: Archon Books, 1983), p.6.

12. Constance M. Green, Harry C. Thomson, and Peter C. Roots, *The Ordnance Department: Planning Munitions for War* (Washington: Office of the Chief of Military History, US Army, 1955), pp, 203, 276.

13. Green, Thomson, and Roots, *The Ordnance Department,* pp. 314-15; Ltr, Subcommittee on Automotive Equipment, Ordnance Department, to the Ordnance Technical Committee, Ordnance Department, subj: Carriage, Motor, 240-mm. Howitzer, T92; Carriage, Motor, 8-inch gun, Y93—Development and Procurement of Pilots Recommended, 4 Jan 1945, in Morris Swett Library, Fort Sill; Harry C. Thomson and Lida Mayo, *The Ordnance Department: Procurement and Supply (Washington:* Office of the Chief of Military History, US Army, 1960), pp. 100-01; Report, Office of Chief of Army Field Forces, subj: Artillery Conference, Fort Monroe, 2325 Jun 1954, pp 63-4; Ian V. Hogg, *The Guns: 1939-45* (New York: Ballantine Books, 1970), p. 38; Ltr with annexes, Col Thomas B. Hedekin, Observer, Army Ground Forces, to Cmdt, Field Artillery School, subj: Report of Observer to North African Theater, 5 Jul 1943, Appendix C, p. 26, in Morris Swett Library.

The introduction of self-propelled artillery represented improvisation at its best. After expressing little interest with this form of field artillery for two decades and even opposing it, the War Department and field artillery officers abruptly changed their position after war in Europe had broken out. To stay abreast of the German juggernaut, they decided to obtain self-propelled artillery as soon as possible. Without the benefit of a solid research and development program, the Ordnance Department did nothing more than weld a M2 105-mm. howitzer to a medium tank chassis and send the weapon to the field.

Converting to self-propelled and towed artillery opened a new era. With support from the field artillery, the War Department started arming the division with the towed (also horse-drawn) M1897 75-mm. gun, the towed M1916A1 75-mm. gun, the towed M1917A1 75-mm. gun, the towed M2 75-mm. gun, the towed M2 105-mm. howitzer, the self-propelled M7 105-mm. howitzer, and the towed M1918 155-mm. howitzer during 1942. Simultaneously, the War Department took steps to equip the corps with the towed Ml 155-mm. gun, the towed Ml 8-inch howitzer, and the towed M1918A 240-mm. howitzer. With the introduction of totally new field pieces to replace World War I guns and howitzers, the field artillery acquired the speed and mobility required to keep up with mobile armored and mechanized units being formed in the Army. By late 1942 a new family of field artillery weapons existed. M2 105-mm. howitzers, self-propelled M7 105-mm howitzers, Ml 4.5-inch guns, Ml 155-mm. guns, self-propelled M12 155-mm. guns, Ml 8-inch howitzers, and towed M2 8-inch guns began to dominate the field artillery. These weapons had greater ranges than World War I artillery and even modernized World War I pieces. They fired high-explosive shell, chemical shell, steel shrapnel, and shot to pierce armor. To eliminate the necessity of carrying several kinds of fuses, field artillerymen detonated their ammunition with combination superquick-delay action fuses that could be set at the time of firing.[14]

Concurrently, the War Department restructured air observation. The introduction of more powerful field guns, the growing use of camouflage, and deeply defiladed battery positions made ground observation more formidable. In some cases only air observation could detect targets. In light of this, the field artillery set out to make aerial observation more responsive to its needs. As early as 1935, former Chief of Field Artillery, Major General Harry G. Bishop (1930-1934), openly opposed using Air Corps personnel as observers because they did not know the field artillery's requirements. Like many other field artillery officers, he wanted observers to be artillerymen because only they could best understand the needs of the field artillery.[15]

Several years later in May 1941, a committee at the Field Artillery School under Colonel P.M. Hanson called for organic air observation for the field artillery as the best answer to meeting the arm's needs. To the committee the increased mobility of combat forces in the 1930s and early 1940s multiplied the difficulties of ground observation and threatened the field artillery's ability to provide close support on the mobile battlefield. Besides being under the control of the field

14. Frank E. Comparato, *Age of Great Guns: Cannon Kings and Cannoneers Who Forged the Firepower of Artillery* (Harrisburg, Pa: The Stackpole Company, 1965), pp. 123-25; War Department, Field Manual 6-130, Field Artillery Field Manual, Reference Data (Washington: Government Printing Office, 1940), pp. 8-11; The Field Artillery School, Characteristics of Weapons Chart, 1 Mar 1940, in Morris Swett Library; The Field Artillery School, *Field Artillery Fundamentals* (Fort Sill, Ok: The Field Artillery School, 1942), pp. 177-78.

15. Harry G. Bishop, *Field Artillery: King of Battle* (Boston: Houghton Mifflin Company, 1936), pp. 130-35.

artillery, organic air observation offered the prospect of tracking a mobile enemy more easily over greater distances and detecting more targets than ground observation permitted. From the school's perspective, organic aerial observation was essential for exploiting the battalion fire direction center's ability to mass fire.[16]

At the same time field artillery officers outside of the school led by General Danford had their own reasons for wanting organic aerial observation. Influenced by this dissatisfaction, Aeronca, Piper, and Taylorcraft aircraft manufacturers offered their light aircraft complete with pilots to senior commanders participating in the Army maneuvers in 1941 for testing in artillery observation and liaison roles. Chief of the Air Corps, General Henry "Hap" Arnold, approved using the light aircraft and assigned them to squadrons of 0-49 observation aircraft for employment in the maneuvers. These light aircraft, named "Grasshoppers" by Major General Innis P. Swift, Commanding General, 1st Cavalry Division, Fort Bliss, Texas, flew over 400,000 miles during the maneuvers, completed more than 3,000 missions without losing one plane, and demonstrated their utility for air observation, courier, and reconnaissance missions.[17]

Notwithstanding the success of the light aircraft in observation missions, field artillery officers, participating in the Louisiana maneuvers, expressed their desire to have control of air observation. Criticizing aerial observation being furnished by the Air Corps, the officers explained that they never knew when air observation would be available, that the diversion of aircraft to other missions disrupted observation, that coordination between the field artillery and the Air Corps was difficult, and that there was never enough aircraft for artillery missions. Given these conditions, the field artillery lacked the ability to detect targets beyond the line-of-sight of ground observers. The field artillery required organic air observation and field artillery observers.[18]

Despite resistance from the Air Corps, which did not want to lose the observation mission, the War Department ordered a test of organic air observation for the field artillery. Using various models of light aircraft, experiments at Camp Blanding, Florida, and Fort Sam Houston, Texas, in February and March 1942 demonstrated the timeliness of organic air observation. In view of the

16. Field Artillery School, Committee Study, subj:The Observation Aviation Required for Artillery Missions, 14 May 1941, in Morris Swett Library.

17. Laurence B. Epstein, "Army Organic Light Aviation," *US Army Aviation Digest,* Jun 1977, pp. 11-17; William W. Ford, "Grasshoppers," *US Army Aviation Digest,* Jun 1982, pp. 3-4. This article, written by one of the founding fathers of organic air observation, is part of a five-part series entitled "Forty Years of Army Aviation," *US Army Aviation Digest,* 1982.

18. Ltr, Danford to Chief of Staff, Army, subj: Air Observation, 8 Oct 1941, Tab D, in Memorandum to the Chief of Staff, War Department, Washington DC, subj: Air Observation, 8 Oct 1941, in Morris Swett Library; Maj H.W. Blakely, "We Must See With Our Own *Eyes" Field Artillery Journal,* May-Jun 1939, pp. 215-18; "Aerial Observation for Field Artillery," *Field Artillery Journal,* Mar-Apr 1928, pp. 138-40; Memorandum to the Chief of Staff, War Department, Washington DC, subj: Air Observation, 8 Oct 1941; Ltr, Col Fred C. Wallace, Office, Chief of Field Artillery, to Adjutant General, subj: Air Observation for Field Artillery, 15 Jul 1940, in Tab B, Memorandum to the Chief of Staff, War Department, subj: Air Observation, 8 Oct 1941; Ltr, Dept of Tactics and Communications, Field Artillery School, to Cmdt, Field Artillery School, subj: Air Observation for Field Artillery, 4 Aug 1941, in Tab F, Memorandum to the Chief of Staff, subj: Air Observation, 8 Oct 1941; Ford, "Grasshoppers," pp. 3-4; Ltr, Wallace to AG, 15 Jul 1940; Ltr, Dept of Tactics and Communications to Cmdt, Field Artillery School, subj:Air Observation for Field Artillery, 4 Aug 1941; Maj William A. Ford, "Wings for Saint Barbara," *Field Artillery Journal,* Apr 1941, pp. 232-34.

success of the trials, the board of officers, conducting the tests, found organic air observation to be essential for the effective operations of the field artillery especially when terrestrial observation was not possible and recommended implementing this form of observation without delay. Based upon the board's report, the War Department approved establishing organic air observation for the field artillery. A War Department directive of 6 June 1942 allotted two planes, two pilots, and one mechanic to each field artillery battalion and the same to each group, division, and corps artillery headquarters.[19]

Although combat in Europe encouraged the field artillery to accept self-propelled and organic air observation, many field artillery officers still opposed adopting antitank and antiaircraft missions. In 1942 the field artillery continued to view supporting the infantry and furnishing counterbattery fire as its primary missions. Despite pressure to accept prominent roles in antitank and antiaircraft work, the field artillery successfully resisted adding these missions because the War Department organized tank destroyer units of towed and self-propelled guns and because the coast artillery retained responsibility for antiaircraft artillery.[20]

In the meantime, the field artillery rapidly expanded. In 1937 the Army had one hundred firing batteries. Five years later, it had 568 batteries (142 battalions of four batteries each). To accommodate this growth the War Department dramatically increased training programs. Between 1935 and 1940 the Field Artillery School's officer courses (Regular, Refresher, Advanced Communications, Advanced Motors, and Advanced Horsemanship) produced 1,006 officer graduates, while the school's enlisted courses trained 1,167 personnel. During the first nine months of 1941, six officer courses (Battery Officers, Advanced, Field Officers, Communications, Motors, Horsemanship, and Officers Candidate) turned out 4,396 graduates, while enlisted courses (Communications, Motors, Battery Mechanics, Saddlers, Horseshoers, and Horsemanship) trained 4,196 people.[21] Through the efforts of the Field Artillery School and field artillery training centers at Fort Bragg, North Carolina, Camp Roberts, California, and Fort Sill, field artillery units received skilled enlisted soldiers and officers for collective training.[22]

As the rapid growth in training reflected, the war years of 1939-42 generated profound changes in the field artillery.The acceptance of motorized artillery as the norm even though vestiges of horse-drawn artillery were still hanging on, determined efforts to introduce new weapons, and the adoption of organic air observation and the fire direction center revolutionized the field artillery. Even so, field artillery officers could only speculate about how effectively they could mass fire and provide close, continuous support under combat conditions.

19. Maj Delbert L. Bristol, "Air OP Is Here to Stay," *Field Artillery Journal,* Oct 1946, p. 586; Lt Col Lowell M. Riley, "Organic Air Observation for Field Artillery," *Field Artillery Journal,* Jul 1942, p. 498; Capt Angus Rutledge, "Organic Air Observation for Field Artillery," *Field Artillery Journal,* Jul 1942, p. 498; Ford, "Grasshoppers," pp. 8-10; Report of Board of Officers Appointed to Test Organic Short-Range Air Observation for Field Artillery, 18 Apr 1942, in Morris Swett Library.

20. Bailey, *Faint Praise,* p. 10; Larry H. Addington, "The U.S. Coast Artillery and the Problem of Artillery Organization, 1907-1954," *Military Affairs,* Feb 1976, p. 5.

21. Riley Sunderland, *History of the Field Artillery School,* Vol. I (Fort Sill, Ok: The Field Artillery School, 1942), pp. 190, 232-33.

22. Robert R. Palmer, Bell I. Wiley, and William R. Keast, *The Procurement and Training of Ground Combat Troops* (Washington: Office of the Chief of Military History, Department of the Army, 1948), pp. 373-73.

While the field artillery was mobilizing and the War Department was gleaning the lessons of 1939-41, the United States declared war on Japan and Germany in December 1941. Although public opinion pressed President Franklin D. Roosevelt to avenge the Japanese attack on Pearl Harbor, he thought that Germany presented a graver danger to American security. It had the manpower, industrial strength, and military capacity to ensure an Axis victory whereas Japan did not. Prompted by this reasoning and British Prime Minister Winston Churchill's influence, Roosevelt directed American energies towards defeating Germany first and then Japan.

Early in 1943, combat in North Africa provided the field artillery with one of its first opportunities to fight on a mobile battlefield. To defeat the Germans, who had established a defensive line in Tunisia running from Cape Serrat in the north to El Guettar in the south, General Dwight D. Eisenhower, commander of the Allied forces in North Africa, moved Major General Lloyd R. Fredendall's inadequately trained American II Corps into southern Tunisia to support poorly equipped French troops holding Fondouk, Faid, and Maizila Passes and Gafsa, an important road center. Just before dawn on 30 January 1943, German Field Marshall Irwin Rommel's main attack struck Faid Pass as secondary assaults hit to the north. To bolster collapsing Allied defenses Fredendall hastily rushed portions of his scattered command forward. Even though batteries had been parcelled out to infantry and armor battalions to give them more firepower and were committed piecemeal into battle, American field artillery fire slowed down the Germans. Despite the resistance, the Germans seized the pass. Coupled with other attacks, this action gave the Germans control of the passes leading to Kasserine Pass and demonstrated Fredendall's limited knowledge about the proper employment of field artillery because he reduced its ability to mass fire by decentralizing command.[23]

After staging local counteroffenses during the first part of February 1943, the Allies prepared to defend against an expected German thrust. With the objective of taking Sidi Bou Zid, the Germans' main effort poured through Faid on the fourteenth during a sandstorm as a secondary thrust moved through Maizila Pass. Badly outnumbered and still scattered, the Americans bravely resisted even though some gun crews abandoned their pieces and fled. Although the Germans had grabbed the initiative, they chose to regroup to oppose an American counterattack. On the fifteenth the Americans struck with inadequate field artillery support because it was still dispersed. Soon, German tanks emerged from hiding and encircled the Americans. After fierce fighting the Americans retreated. By the time that the fighting was over around Sidi Bou Zid, the Americans had lost 2,500 men, 100 tanks, 280 vehicles, and 30 field guns. Along with a successful push that drove the Americans westward from Gafsa, the German triumph at Sidi Bou Zid put the Axis in position to move into Kasserine Pass.[24]

As Fredendall's corps was struggling to hold the passes, Eisenhower dispatched reinforcements

23. Blumenson, "Kasserine Pass, 30 January-22 February 1943," pp. 245-46; David W. Hazen, "Role of the Field Artillery in the Battle of Kasserine Pass," unpublished masters thesis, US Army Command and General Staff College, 1973, pp. 1-11; George F. Howe, *Northwest Africa: Seizing the Initiative in the West* (Washington: Office of the Chief of Military History, Department of the Army, 1967), pp. 451-55; See Blumenson's Kasserine Pass (New York: PBJ Books, 1983) for an indepth study of the battle.

24. Blumenson, "Kasserine Pass, 30 January-22 February 1943," pp. 250-55; Hazen, "Role of the Field Artillery in the Battle of Kasserine Pass," pp. 51-58.

from Algeria to Tunisia. After several days of forced marches through snow and mud, Brigadier General S. LeRoy Irwin's division artillery of three battalions and two cannon companies from the 9th Infantry Division reached Thala to bolster British defenses. On 21 February Irwin's twenty-four 105-mm. and twelve 155-mm. howitzers, twelve 75-mm. guns, and antitank guns moved into position. With thirty-six other pieces of various calibers manned by British stragglers under his direction, Irwin massed fire on the Germans on 22 February. Unable to continue under such destructive fire, the Germans retreated to Kasserine Pass. Meanwhile, Brigadier General Clift Andrus, Commander, 1st Infantry Division Artillery, took control of the field artillery on the road to Tebessa, massed fire on the Germans and Italians as they were driving out of Kasserine Pass towards Tebessa, and forced them retire back towards the pass.[25]

Although the field artillery played a dominant role in stopping the German offensive, American participants expressed mixed observations. Joseph B. Mittelman, a soldier in the 9th Division, recalled that turning back the Germans meant the virtual elimination of an infantry battalion and two supporting companies. "However, the gallant stand of Divarty [division artillery] and its cannon company support overshadowed any losses which the Division might have had," Mittelman wrote.[26] Despite Mittelman's complimentary remarks about the field artillery, commanders still had to master the fire direction center and centralize command to mass fire on the mobile battlefield. After all, effective field artillery support during the battles around Kasserine Pass came only when command was centralized.[27]

After pushing Rommel back, the British and Americans then drove the Axis out of North Africa. Taking advantage of the fire direction center, radio-equipped observers attached to infantry or armor units or sent aloft in organic spotter aircraft, and centralized command, field artillerymen repeatedly massed fire on German positions and targets of opportunity. As division artillery furnished rolling barrages to allow the infantry to catch the enemy while it was still recovering or still seeking cover, corps artillery fired interdicting and harassing missions on assembly areas and installations. During the Battle of El Guettar early in the spring of 1943, for example, II Corps artillery shelled German tanks as they prepared to attack on 23 March. Together with tank destroyers, American field artillery knocked out nearly thirty German tanks before they could overrun friendly infantry. Later in the day, the 1st Infantry Division's artillery shattered another German attack led by thirty-eight tanks. Following the Battle of El Guettar, an enthusiastic report recorded that American artillery had crucified the Germans with high-explosive shells.[28] Based upon El Guettar and other battles in North Africa where division and corps

25. Blumenson, "Kasserine Pass, 30 January-22 February 1943," pp. 255-62; Howe, *Northwest Africa, p.* 466; Hazen, "The Role of Field Artillery in the Battle of Kasserine Pass," pp. 97-111.

26. Joseph B. Mittelman, *Eight Stars to Victory: A History of the Veteran Ninth U.S. Infantry Division* (Columbus, Oh: The F.J. Heer Printing Company, 1948), p. 92.

27. Blumenson, "Kasserine Pass, 30 January-22 February 1943," p. 262.

28. Lt Col Paul W. Thompson, "Close Support in Tunisia," *Field Artillery Journal,* Jul 1943, p. 836; Col C.C. Benson, "Some Tunisian Details," *Field Artillery Journal,* Jan 1944, pp. 482-84; Rpt, HQ II Corps, subj: Employment of Field Artillery of the II Corps in Northern Tunisian Campaign, undated, pp. 1-10, in Morris Swett Library; Rpt, HQ II Corps, subj: Employment of the Artillery of the II Corps during Gafsa-El Guettar-Maknassy Campaign, 1 May 1943, p. 8, in Morris Swett Library; Howe, *Northwest Africa,* pp. 560-62.

commanders often massed up to twelve battalions (144 guns) to attack enemy positions, field artillerymen found artillery to be one of the dominating factors on the battlefield when it was employed in mass.[29]

For the most part, commanders favorably commented about the field artillery's performance during the drive to push the Axis out of North Africa. Reflecting on the effectiveness of his field artillery, Major General Manton Eddy, Commander, 9th Division, recorded, "One Nazi who had served on almost every German front said that the American artillery fire was the most deadly that he had experienced." After driving the Axis out of North Africa, Lieutenant General Omar Bradley, Commanding General, II Corps, commented, ". . .the American field artillery technique of massed fires was a major contributing factor toward the early and successful conclusion of the operation" at Gafsa and El Guettar.[30]

Given the opportunity, the Army's field artillery demonstrated the impact of the fire direction center, ground and organic air observation, and motorized light artillery.[31] In most cases observed fire proved to be more effective than unobserved fire because the hills and ridges in Tunisia provided excellent positions for observation and because each field artillery battalion had at least ten observers to adjust fire through the fire direction center.[32] Addressing the center, General Eddy said that it united observers and battalions into an effective network. In one instance a forward observer on the northern flank of Eddy's division sector conducted fire for a battalion of 155-mm. howitzers on the southern flank.[33]

As Eddy suggested, the fire direction center allowed artillery commanders to crush the enemy and supply flexibility to hit targets of opportunity. The commander of the 1st Armored Division's artillery reported that any one of his observers could adjust fire for any battery in the division because of the center. In an interview the commander wrote, "On any important target I usually mass all the artillery of the division [forty-eight howitzers]."[34] At the conclusion of the campaign in North Africa, General Bradley readily admitted that any observer in his corps could adjust fire for any battery and bring the fire of all of the corps' artillery (324 howitzers and guns) onto a single target if required because of the fire direction center.[35] Equally important, the fire direction center and radio-equipped observers tied the field artillery, armor, and infantry into an

29. Col Douglas J. Page," El Guettar: March 25-Apr 8, 1943," *Field Artillery Journal,* Sep 1943, pp. 646-47; Lt Col Paul W. Thompson, "Close Support in Tunisia," p. 836; Col C.C. Benson, "Some Tunisian Details," pp. 482-84; Rpt, HQ II Corps, subj: Employment of Field Artillery of the II Corps in Northern Tunisian Campaign, undated, pp. 1-10; Rpt, HQ II Corps, subj: Employment of the Artillery of the II Corps during Gafsa-El Guettar-Maknassy Campaign, 1 May 1943, p. 8; Howe, *Northwest Africa,* pp. 560-62; Field Artillery School, Review of Confidential Information, 10 Aug 1943, pp. 5, 50, in Morris Swett Library.

30. "Official Commendation," *Field Artillery Journal,* Sep 1943, p. 652.

31. Ltr with Annexes, Hedekin to Cmdt, The Field Artillery School, 5 Jul 1943, Appendix C.

32. War Department, *Lessons of the Tunisian Campaign* (Washington: Government Printing Office, 1943), pp. 22-25, in Morris Swett Library.

33. Ltr, Eddy to CG, Allied Forces Headquarters, 21 Jun 1943, in Report on Operations Conducted by 9th Infantry Division, in Morris Swett Library.

34. Ltr with Annexes, Hedekin, to Cmdt, The Field Artillery School, 5 Jul 1943, Appendix C, p. 21.

35. *Ibid.,* Appendix C, p. 19.

effective combined arms team.[36]

As General Bradley suggested, organic air observation played a critical role in North Africa. In a brief article in *Field Artillery Journal* in 1944, Major Edward A. Raymond, a field artillery officer, explained that air observation had "come into its own."[37] In fact, the Battles of El Guettar, Mateur, and Bizerte silenced detractors. Although the enemy was a master of camouflage, air observers repeatedly identified gun flashes from almost perfectly concealed positions for corps artillery to engage. Hostile antiaircraft fire might have prevented air observers from flying behind enemy lines on occasion, but observers still picked out enemy batteries for neutralizing or adjusted fire on targets over ten thousand yards away. As a result, flying behind lines was not critical for effective fire support. During the action near Hill 609 by Sidi Nsir late in April and early in May 1943, for example, organic air observers located so many targets that the 34th Infantry Division's artillery "could hardly haul in ammo fast enough" to respond to calls for fire. Organic aerial observation also had a side benefit. During the Battles of El Guettar, Mateur, and Bizerte, observation planes flying over enemy lines frequently caused hostile batteries to cease firing to prevent disclosing their positions, which allowed the Americans to mass fire with impunity. As a whole, organic air observation was timely and solved the artillery's need for observation to hit targets beyond the view of ground observers.[38]

At the same time, self-propelled and towed artillery vindicated themselves. Although self-propelled artillery was not any faster than towed artillery on the road, it had the ability to move into position more rapidly to deliver fire, then to displace quickly to avoid counterbattery fire, and to follow armor over terrain impassable for towed artillery. As a result, the self-propelled M7 could be used aggressively on the offense. An article in *Field Artillery Journal* in March 1944 reported that the M7 105-mm. howitzer was not only mobile but also offered the crew protection from small arms fire and shell fragments so that the weapon could be sited forward and closely support any action. Based upon combat in North Africa, towed and self-propelled field artillery silenced critics by becoming acknowledged assets by mid 1943.[39]

Although the field artillery group for corps artillery had been recently introduced early in 1943, it proved its utility in North Africa. Seeking flexible combat organizations, the Army Ground Forces restructured corps artillery in 1942-43. It abolished the brigade system with its three organic field artillery regiments (two regiments of 155-mm. howitzers and one regiment of 155-mm. guns) for a flexible corps organization of a group with only a headquarters battery as an organic element and a variable number of self-sufficient attached field artillery battalions. This arrangement allowed the battalions to be moved from corps to corps more easily than the brigade allowed. The first field artillery group, the 5th Armored Field Artillery Group with three battalions of M7 105-mm. howitzers (thirty

36. *Ibid.*, Appendix C, pp. 19-21.

37. Maj Edward A. Raymond, "Air Operations," *Field Artillery Journal,* May 1944, p. 274.

38. Lt Col Paul W. Thompson, Lecture, Field Artillery School, 26 Jun 1943, p. 22, in Morris Swett Library; Capt Woodrow M. Smith, "A Summary of Tunisia,' *Field Artillery Journal,* Nov 1943, p. 836; Howe, *Northwest Africa,* pp. 631-39; Field Artillery School, Review of Confidential Information, 10 Aug 1943, p. 8, in Morris Swett Library.

39. Col Lowell M. Riley, "Armored Artillery Action," *Field Artillery Journal,* Mar 1944, p. 179; Lt Col Douglas G. Dwyre, "The Field Artillery Puts on Armor," *Field Artillery Journal,* Dec 1943, pp. 917-18; War Department, *Lessons of the Tunisan Campaign,* pp. 17-18; The Field Artillery School, "Artillery in Combat," Aug 1944, p. 14; Field Artillery School, Review of Confidential Information, 10 Aug 1943, p. 8.

six), arrived in North Africa in January 1943 but did not see any combat until March 1943 when it reached Tebessa, Tunisia, where it was attached to II Corps. Because of the presence of a corps field artillery brigade, II Corps employed the 5th Armored Field Artillery Group with its attached battalions almost exclusively as a pool to reinforce division artillery. Consequently, II Corps operated with a mixture of old and new corps artillery organizations to support division artillery of three battalions of 105-mm. howitzers (thirty-six) and one battalion of 155-mm. howitzers (twelve).[40]

Notwithstanding the general consensus on the effectiveness of field artillery support in North Africa, some Army officers saw the need for changes. General Irwin's desire for even more firepower in the division influenced him to support expanding the light battery from four to six pieces. Colonel George B. Barth, Chief of Staff, 9th Division, also favored a six-gun battery because it would increase firepower by fifty percent without causing the artillery commander to lose control.[41]

Irwin's and Barth's conclusions paralleled those of the Field Artillery School. In a confidential review of information in August 1943, the school pointed out that II Corps' 324 field pieces fired over 23,000 rounds a day in North Africa. Although this number of guns and ammunition expenditure rate seemed imposing, it was not. Because of the failure of the Germans to mass their artillery effectively and their lack of artillery and ammunition, II Corps had enough field artillery. With this in mind, the school then warned against drawing any false conclusions from the North African campaign concerning the amount of field artillery required to support a campaign. According to the Field Artillery School, the division's organic artillery was the bare minimum, while the corps required more field artillery than II Corps had in North Africa when the US Army invaded Europe because of the vast concentration of enemy artillery on the continent.[42]

After defeating the Axis in North Africa and Sicily, the Allies invaded Italy in September 1943. By pushing up the coasts they planned to outflank Rome and force the Germans to retreat. Nevertheless, the Germans constructed strong defensive lines in the rugged Apennine Mountains to compel the Allies to fight hard for every inch of ground.

Fighting in the mountains presented new challenges for the field artillery. Positioned on high ground that provided excellent observation of Allied movements, the Germans shelled Allied batteries effortlessly. Under the pressure of heavy enemy artillery barrages, the Americans had to pick out battery positions and fire direction center sites during the day, had to move into them under the cover of darkness, and had to stress camouflaging, sandbagging, and digging in to conceal their guns.[43]

40. Russell A. Weathersby, "The Field Artillery Group in Support of the Corps and Field Army, 1942-1953," unpublished masters thesis, US Army Command and General Staff College, 1965, pp. 1-8, 14-18. II Corps had a field artillery group and field artillery brigade because the War Department decided to delay restructuring units already in combat to minimize confusion and to phase in the artillery group.

41. Ltr, Hedekin to Cmdt, The Field Artillery School, 5 Jul 1943, Appendix C, pp. 30-31; Dwyre, "The Field Artillery Puts on Armor," p. 918.

42. Field Artillery School, Review of Confidential Information, Nov 1943, p. 4; Field Artillery School, Review of Confidential Information, 10 May 1943, p. 22, in Morris Swett Library.

43. The Field Artillery School, "Artillery in Combat," Aug 1944, pp. 26, 28, 33; Report, Col N.P. Morrow, Army Ground Forces Board, subj: Field Artillery Technique and Procedure, 7 Jan 1944, pp. 4, 6, in Morris Swett Library, hereafter cited as Morrow Report; Report, Col L.S. Griffing, Army Ground Forces Board, 29 May 1944, p. 7, in Report, US Army Ground Forces Board, subj: Artillery in the Initial Breakthrough, Garigliano Offensive, in Morris Swett Library, hereafter cited as Griffing Report.

The mountains also restricted the availability of good firing positions and forced commanders to position their guns close together, which made them easier targets for counterbattery fire. Reflecting on the difficult terrain, Lieutenant Colonel R.D. Funk, Commander, 158th Field Artillery Battalion, recounted in an after action report, "We have had some pretty tight areas assigned to us. We have had batteries firing over each other and practically interlaced."[44] Long periods of fire at slow rates and time-on-target (TOT) fire in which gun crews adjusted their field pieces on one target and timed their firing so that the rounds would hit at the same time regardless of the different ranges of their field pieces destroyed the prepared defenses and helped the infantry batter its way up the rugged peninsula. Addressing the artillery's contribution through early 1944, Brigadier General David G. Barr, Chief of Staff, Headquarters, North African Theater of Operations, US Army, reported that it played a vital role in making the advance up the peninsula possible because of the liberal expenditure of ammunition.[45]

Prodded by the need for more firepower to break through well-prepared German defenses in Italy, American commanders used tank destroyers as field artillery. Based on the precedent set in North Africa, commanders attached one tank destroyer battalion (thirty-six guns) to the division. This increased the division's firepower by the equivalent of three light artillery battalions and broadened the destroyer's role. From mid-1943 onwards tank destroyers served more increasingly as field artillery as the demand for firepower grew and as the need for antitank weapons diminished even though Lieutenant General Lesley J. McNair, Commander, Army Ground Forces, and others still perceived that the destroyer's primary role was antitank warfare.[46]

After hitting the Gustav Line for almost five months and not being able to break it, the Allies abandoned their frontal assaults. They decided that the British would hit the line along the seacoast, that the Americans would drive across the Rapido River and through Cassino, and that a British-American force would land at Anzio. On 17 January 1944 the British crossed the lower Garigliano River and gained a foothold. Simultaneously, a British-American force landed at Anzio, while the American II Corps attacked Cassino, which was the most heavily fortified town yet encountered in Italy.[47]

After constant artillery and tank destroyer bombardments failed to weaken German resolve at Cassino, the Allies intensified their efforts. On the morning of 15 March 1944, Allied aircraft dropped almost one thousand tons of bombs on German defenses in the Cassino area, while field

44. Memo, HQ North African Theater of Operations, subj: Lessons from the Italian Campaign, 10 Mar 1944, pp. 91-95, in Morris Swett Library.

45. Morrow Report, pp. 7-8, 12; Griffing Report, p. 4; Liddell Hart, *History of the Second World War,* pp. 456-74; The Field Artillery School, Report of Confidential Information, No. 5, Feb 1944, p. 14, in Morris Swett Library; Rpt, HQ II Corps, subj: Employment of Field Artillery with II Corps, Italian Campaign, 18 Nov 1943-26 Feb 1944, undated, p, 6; Report, HQ North African Theater of Operations, US Army, subj: Lessons form the Italian Campaign, 10 Mar 1944, pp. 72, 75.

46. Report, HQ North African Theater of Operations, US Army, subj: Lessons from the Italian Campaign, 10 Mar 1944, pp. 83-85, 117-18; Griffing Report, p. 10; Christopher R. Gabel, *Seek, Strike, and Destroy: U.S. Army Tank Destroyer Doctrine in World War II* (Fort Leavenworth, Ks: Combat Studies Institute, US Army Command and General Staff College, 1985), pp. 20, 21, 39, 40, 41, 45, 50.

47. Chester G. Starr, From Salerno to the Alps: *A History of the Fifth Army, 1943-45* (Washington: Infantry Journal Press, 1948), p. 80.

artillery and tank destroyers shelled the target between the waves of aircraft. This deadly combination reduced the town and monastery atop a nearby hill, which the Germans were using for observation, to rubble. Following this pounding, 746 guns and howitzers delivered 2,500 tons of high explosives in front of the assaulting infantry and an additional 1, 500 tons on pre-selected targets. In eight hours Allied field artillery fired almost 200,000 rounds. Yet, the Germans still did not surrender or retreat because they found protection in bunkers, caves, and tunnels and returned to their defensive positions when the cannonades had stopped as their predecessors had done during World War I and hit Allied infantry and armor. To break the stubborn German defense the Allies moved more divisions into position at Cassino, which raised the number from twenty to twenty-eight by the first of May. As this was taking place, the American II Corps and British artillery launched a smoke program to hamper German counterbattery work and to cover moving 155-mm. guns, 240-mm. howitzers, 8-inch howitzers, and other field pieces within 1,500 yards of the enemy. By the time that the Allies had finished, they had over two thousand guns, including tank destroyers, on a front of approximately twenty-five miles that ran from the mouth of the Garigliano River to the mountains just beyond Cassino. On 11 May 1944 a massive Allied artillery barrage totally surprised the Germans. Allied corps and division artillery hit all known and suspected enemy batteries for sixty minutes. Following this, corps artillery and tank destroyers shelled road junctions, command posts, lines of communication, bridges, and enemy installations and reinforced division artillery as required.[48] After a week of intensive Allied bombardments in which the Allies fired between twenty and thirty rounds for every one the enemy shot and aggressive infantry charges, the Germans finally retreated. Reflecting on field artillery fire, especially that of 11-12 May 1944, II Corps Artillery said that the operations "proved again the inestimable value in.. .massing artillery fire."[49]

In the meantime, the Allies landed a force at Anzio. Under perfect weather conditions they hit the beaches late in January 1944. As the Allies consolidated their gains, the Germans assembled a strong counterattack force, the equivalent of five divisions and forty-two batteries, by the first of February. Employing field artillery and aircraft flown in from southern France, the Germans halted advances off the beachhead.[50]

In mid-February the Germans counterattacked. They hit the western side of the beachhead where the American 45th Infantry Division was posted. After several diversionary attacks the Germans struck their main blow along the Albano-Anzio Road. Unable to drive the Allies off the beach because artillery and tank destroyers in the threatened sector went into action, the Germans renewed their offensive on the sixteenth. This pressure forced the 45th Infantry Division to move in additional field artillery, tanks, and antiaircraft guns to prevent the American line from collapsing.[51]

48. Starr, *From Salerno to the Alps,* p. 117; Report, HQ II Corps Artillery, subj: Minturno to Rome, 23 Jun 1944, pp. 1-6; Martin Blumenson, *Salerno to Cassino* (Washington: Office of the Chief of Military History, US Army, 1969), pp. 438-42.

49. Report, HQ II Corps Artillery, subj: Minturno to Rome, 23 Jun 1944, p. 5.

50. Report, Supreme Allied Commander, Mediterranean, to Combined Chiefs of Staff on the Italian Campaign, 8 Jan to 10 May 1944, pp. 17-22.

51. Griffing Report, p. 1.

Despite intense German artillery fire, Allied infantry, machine gunners, mortarmen, and tankers refused to budge, while American artillery massed fire. By the time that the fighting had ended along the Albano-Anzio Road, American field artillery, tank destroyers, and tanks had converted the landscape into a mass of craters and ruins. In his report to the Combined Chiefs of Staff, General Sir Henry Maitland Wilson, Supreme Allied Commander, Mediterranean Theater, credited field artillery and airpower with the successful defense along the Albano-Anzio Road. He wrote, "The enemy attack was halted because of. . .combined Artillery and Air action."[52] Brigadier General Raymond McLain, Commander, 45th Division Artillery, told Colonel L.S. Griffing of the Army Ground Forces Board in April 1944, "Our only salvation on the beachhead has been the use of mass fires and an effective counter-battery system."[53]

After the initial offensive had failed, the Germans attacked again on 20 February. This time they hit the opposite side of the beachhead. There, the American 3rd Infantry Division concentrated artillery fire on two critical areas to stop the Germans from massing on any particular point.[54] This permitted the Allies to launch an offensive to link their forces that had finally penetrated the Gustav Line near Cassino.

The field artillery received praise for its action in Italy. "The mass of available artillery of all calibers, skillfully controlled and accurately directed, so effectively neutralized the enemy countermetal [artillery] that the break-through of the line of the GARIGLIANO and the break-out from the Beachhead were assured," Headquarters, Mediterranean Theater of Operations, US Army, wrote in early 1945.[55] Resembling World War I combat all over again, counterbattery fire from corps artillery silenced enemy guns, destroyed lines of communication, and reinforced division artillery, while the latter knocked out all obstacles in the path of the advancing infantry. Seeking to destroy determined enemy resistance in prepared defensive positions, the Army massed fire in unprecedented proportions in Italy. For example, the US Fifth Army had twice the number of field pieces of all sizes during the push up Italy than employed in Tunisia and Sicily combined.[56]

Besides reaffirming the wisdom of concentrating fire, the Italian Campaign strengthened the importance of the fire direction center and air observation. The center allowed commanders to disperse batteries in the face of difficult terrain and destructive German counterbattery fire but still mass fire quickly and accurately. In a memorandum in March 1945, General Barr wrote that the fire direction center allowed "massing of fires up to seven battalions after the adjustment of observed fire by one battalion or by one forward observer" to become routine. The center permitted the field artillery to fire devastating TOT missions to surprise the enemy and prevent it from

52. Starr, From *Salerno to the Alps*, p. 144; Report, Supreme Commander to Combined Chiefs of Staff on the Italian Campaign, 8 Jan 1944 to 10 May 1944, p. 26.

53. Griffing Report, p. 10.

54. Starr, *From Salerno to the Alps*, p. 163.

55. Memo, HQ Mediterranean Theater of Operations, US Army, subj: Lessons from the Italian Campaign, 15 Mar 1945, p. 83, in Morris Swett Library.

56. Memo, HQ Mediterranean Theater of Operations, US Army, subj: Lessons from the Italian Campaign, 15 Mar 1945, p. 83; Blumenson, *Salerno to Cassino*, pp. 438-42; Comparato, *Age of Great Guns*, pp. 248-49; Report, HQ North African Theater of Operations, US Army, subj: Lessons from the Italian Campaign, 10 Mar 1944, p. 82.

escaping into bunkers or other forms of protection.[57]

In fact, massing artillery fire from an entire corps was not unusual in Italy. The American II Corps and VI Corps did it regularly. For example, VI Corps artillery concentrated fire on a force of 2,500 Germans on 17 February 1944 before it could attack. In the span of one hour, VI Corps gun crews shelled five separate targets, helped stop the enemy, and also reinforced division artillery.[58] Field artillerymen generally conceded that mastering the fire direction center permitted them to mass fire "to an extent never before equalled in any American campaign in the present war" and "exceeded all previous experience."[59] Discussing air observation in Italy, General Barr pointed out that it had been outstanding. Although the mountains limited the operations of light aircraft to some extent, organic air observation was frequently the only means of spotting enemy targets.[60]

In addition, the Italian campaign demonstrated the value of the artillery group for corps artillery. Initially, the field artillery brigade dominated corps artillery organization in Italy.When there was a need for combining two or more battalions of different calibers to perform a particular mission, brigade commanders formed a group of two to three battalions under the control of one of the three corps artillery regiments. To provide more flexibility and facilitate command functions, reconnaissance, and communications, artillery brigade commanders also divided their artillery at times into groups of two or three battalions under a group commander with the rest of the corps artillery under the brigade commander. With the arrival of more nondivisional (corps) separate artillery battalions in the fall of 1943, creating groups assumed greater importance since some brigades had as many as thirteen battalions and required an intermediate headquarters to reduce the number of battalions under the direct control of the brigade commander. As the build-up of nondivisional artillery continued with the appearance of separate battalions and group headquarters late in 1943 and early in 1944 and as the demand for flexibility mounted, the artillery group headquarters with its attached battalions supplanted the brigade for corps artillery by March 1944. Reviewing the contribution of the group to corps operations in June and July 1944, the VI Corps commander reported that the group made possible the rapid, flexible, and efficient organization of corps artillery into the size and composition required for a particular mission.[61]

Shortly after breaking out of the Anzio Beachhead and cutting through the Gustav Line, the Allies invaded northern France. Under the cover of naval guns and light self-propelled artillery that fired from landing craft, the Americans hit the beaches of Normandy on 6 June 1944. Examining the impact of self-propelled field pieces, the First US Army candidly admitted that attaching them to the assaulting parties greatly expedited establishment of a fire base during the

57. Report, HQ North African Theater of Operations, US Army, subj: Lessons from the Italian Campaign, 10 Mar 1944, p. 100; Memo, HQ Mediterranean Theater of Operations, US Army, subj: Lessons from the Italian Campaign, 15 Mar 1945, p. 84.

58. Memo, HQ North African Theater of Operations, US Army, subj: Lessons from the Italian Campaign, 10 Mar 1944, pp. 82-83.

59. The Field Artillery School, Report of Confidential Information, No. 5, Feb 1944, p. 99.

60. Report, HQ North African Theater of Operations, US Army, subj: Lessons from the Italian Campaign, 10 Mar 1944, p. 107.

61. Report, HQ North African Theater of Operations, US Army, subj: Lessons from the Italian Campaign, 10 Mar 1944, pp. 79-82.

initial stages of the landing. Self-propelled guns sustained only small losses during the landing, crossed the beaches rapidly, and were the only field pieces ashore during the early stages of the landing. By 10 June, however, the Americans had 624 towed and self-propelled pieces ashore, which gave them a density of approximately one gun per one hundred yards of front.[62]

Although the Germans reacted lightly at first to the invasion, they responded resolutely upon realizing that the Normandy landings were the main ones. In the face of Allied air superiority, the Germans pushed reinforcements forward to keep the Allies from breaking out and committed most of their armored forces around Caen, a critical road center, where the British were driving hard. To the west the Americans slugged their way through the hedgerows, which were earthen dikes about four feet in height and covered with tangled hedges, bushes, and even trees. Apart from the few main roads, only sunken lanes often screened by a canopy of tree branches offered passage and transformed hedgerow country into a labyrinth of covered ways that concealed the defender and confused the attacker. To advance from pasture to pasture, the Americans had to break a path through the hedgerows in the face of heavy enemy fire. As they climbed the hedgerows, tanks exposed their unprotected bellies to German antitank weapons, while infantrymen often got caught in the bushes.

American field artillerymen also experienced the difficulties of fighting in hedgerow country. On the one hand, the hedgerows provided natural cover, concealed muzzle blasts, and offered good observation posts at times. For example, as the 12th Infantry Regiment of the 4th Infantry Division attacked northwestward towards the high ground north of Neville-au-Plain, a strong German counterattack hit it. When American 81-mm. mortars could not stop the Germans, Captain Morrisett, B Battery, 42nd Field Artillery Battalion, climbed atop a hedgerow to his battery's front and directed artillery fire to smash the Germans and save the 12th Infantry.[63] On the other hand, the hedgerows hampered mobility and handicapped ground observation because they restricted visibility to one to two pastures at a time. Lieutenant Colonel Lewis R. Soffer wrote that his battalion could not use the mobility of its self-propelled M12 155-mm. guns, which had just been adopted, effectively in hedgerow country because the guns had to fight their way from field to field or move single file down the sunken lanes. Despite Morrisett's example, the field artillery generally depended on organic air observation to adjust fire, and in some instances it furnished the only observed fire.[64]

The Battle for St. Lo climaxed fighting in the hedgerows. By possessing the city the Americans would have a road center that rivaled Caen and put them in a position to breakout of the hedgerows into terrain favorable for maneuver warfare. Early on 7 July, nine XIX Corps field artillery battalions silenced enemy batteries and disrupted communication lines. Shortly after, division artillery laid down a rolling barrage that moved just ahead of the attacking infantry and

62. Report, The Supreme Commander to the Combined Chiefs of Staff on the Operations in Europe of the Allied Expeditionary Force, 6 Jun 1944 to 8 May 1945, p. 22, in Morris Swett Library; Report, First Army, 21 Jun 1944, p. 1, Morris Swett Library; Report, The General Board, USFET, subj: Study of Field Artillery Operations, undated, pp. 6-11.

63. Col Howard W. Blakely, "Artillery in Normandy," *Field Artillery Journal,* Mar-Apr 1949, p. 53.

64. Soffer, "An M12 Battalion in Combat," *Field Artillery Journal,* Jan 1945, p. 170; Blakely, "Artillery in Normandy," p. 54; Report, VII Corps Artillery, 25 Jul 1944, p. 1, in Morris Swett Library.

armor.[65] After being viciously hit and pushed back for two days, the Germans counterattacked, but American artillery, infantry, tank destroyers, and armor stopped them and permitted XIX Corps to continue its advance.[66] Two days later on 11 July, a strong German armor attack struck XIX Corps. Working under extreme difficulties because of the hedgerows and confronting stiffening resistance, XIX Corps artillery shelled the Germans to prevent them from bringing up their reserves. Division artillery, in the meantime, pounded the Germans so hard that their avenue of approach became a death trap.[67] Just as the Germans hit XIX Corps, V Corps to the left of XIX Corps bombarded Hill 192 that offered good observation of St. Lo with nine artillery battalions. After this shelling division artillery covered the attacking infantry and armor with a rolling barrage to help them seize the hill.[68]

After being slowed down by the stiff German defense, the Americans resumed their offensive. Operating to the right of XIX Corps, VII Corps seized the Periers-St. Lo road. In the meantime, XIX Corps captured Hill 122 and Martinville Ridge to give the Americans total control of the high ground to the east and north of the city as V Corps pressed down the road to St. Lo. While XIX and V Corps infantry and armor advanced from hedgerow to hedgerow, fire from field artillery and tank destroyers compelled the Germans to abandon their positions and seek cover. After several days of fierce small arms and artillery fire, the Germans retreated from St. Lo.[69]

On 25 July First Army launched Operation Cobra to break out of the hedgerows into country more suitable for maneuvering. Realizing that the Germans would offer obstinate resistance, First Army supported the infantry and armor with over 1,000 artillery pieces and 1, 800 aircraft. At the point of penetration, First Army positioned one artillery piece for every fourteen yards of front.[70] In mid-morning front line troops withdrew 1, 200 yards from the forward edge of the jump off line as Allied fighter-bombers dropped over 4, 700 tons of bombs on the St. Lo-Perier Road. As in the case of the aerial bombardment of Caen a week earlier, the air blow of the twenty-fifth did not cause a large number of casualties because the Germans had retreated to dug-in positions. Nevertheless, it produced confusion, stunned the enemy, cut communication lines, and allowed the infantry and armor to attack.[71] As the maneuver arms pushed through, observed and unobserved artillery fire blew up known enemy installations, masked friendly troop movements with smoke rounds, and silenced German batteries. By the time that the Americans had broken through, gun crews had fired over 130,000 rounds but not as many as they desired. Difficulties unloading at the beaches and moving the ammunition to the front restricted the quantity on hand

65. Historical Division, War Department, *St. Lo* (Washington: Historical Division, War Department, 1946, reprinted by Center of Military History, US Army, 1984), p. 9.

66. Report of Operations, First Army, 20 Oct 1943 to 1 Aug 1944, pp. 89-91, in Morris Swett Library.

67. St. Lo, p. 90; Mittelman, Eight Stars to Victory, pp. 191-92; Report of Operations, First Army, 20 Oct 1943 to 1 Aug 1944, p. 90.

68. Martin Blumenson, *Breakout and Pursuit* (Washington: Office of the Chief of Military History, US Army, 1961), pp. 15152; Report of Operations, First Army, 20 Oct 1943 to 1 Aug 1944, p. 91.

69. Report of Operations, First Army, 20 Oct 1943 to 1 Aug 1944, pp. 90-91.

70. Report, The General Board, USFET, subj: Study of Field Artillery Operations, undated, p. 19.

71. Report, The Supreme Commander to the Combined Chiefs of Staff on the Operations of the Allied Expeditionary Force, 6 Jun 1944-8 May 1945, p. 36, in Morris Swett Library; Report of Operations, First Army, 20 Oct 1943-1 Aug 1944, p. 97.

and led to rationing. Even though commanders had sufficient artillery ammunition to perform their mission, they complained about inadequate supplies because they wanted to fire more rounds than they were allotted.[72]

Uncertain intelligence data also plagued the field artillery during Cobra. Recalling his unit's difficulties, Colonel Carl I. Hutton, Commander, 67th Armored Artillery Regiment, noted that he lacked information about key enemy positions on which to base his planned fire. This caused him and others in similar circumstances to select points on a map that appeared to be critical and to mass fire on them. Even though this limited the effectiveness of the shelling since important positions were often missed, many field artillery officers repeatedly used it to conduct planned fire throughout Cobra.[73]

In an after action report First Army also indicated that organic air observation provided a vital service during Cobra. Air observers' presence in the air over enemy lines caused the Germans to curtail their artillery firing to avoid disclosing their batteries and helped American artillery hit targets that could not be engaged by any other means. Equipped with radios, air observers ranged behind enemy lines, directed fire on batteries that had been elusive despite sound-and-flash ranging, and sealed off the battlefield by adjusting fire on targets of opportunity as they appeared far behind the front.[74]

Once the Americans broke out of hedgerow country, they swept through France and Belgium with a heavily armed force. In 1944 the Americans equipped their army in Europe with twenty-three field pieces per thousand combat soldiers as compared to four per thousand in World War I. Unlike World War I where American artillery networks were segregated and operated by autonomous artillery headquarters that did little coordinating with other arms, the fire direction center and practice of attaching observers to the infantry, armor, and tank destroyers created a combined arms team that was new to the Army. This arrangement and the availability of towed and self-propelled artillery supplied fire at the right time and place with few exceptions, reduced enemy strongholds, and allowed the maneuver arms to move. Commenting upon the field artillery's ability to support the other combat arms, a General Board, US Forces, European Theater (USFET), report of 1946 noted that the artillery group had been the key to success because it permitted commanders to move artillery battalions from army to army, corps to corps, or division to division with ease and furnish additional artillery support where it was needed.[75]

Although the Americans rationed ammunition during the race across France, it did not create

72. Report, The General Board, USFET, subj: Study of Field Artillery Operations, undated, pp. 21-22; Report, The General Board, USFET, subj: Ammunition Supply for Field Artillery, undated, pp. 14-15, 46; Roland G. Ruppenthal, *Logistical Support of the Armies: September 1944-May 1945* (Washington: Office of the Chief of Military History, US Army, 1959), p. 247; Ruppenthal, *Logistical Support of the Armies: May 1941-September 1944* (Washington: Office of the Chief of Military History, Department of the Army, 1953), pp. 445-48.

73. Report, The General Board, USFET, subj: Study of Field Artillery Operations, undated, p. 22; Carl I. Hutton, "An Armored Artillery Commander in the European Theater," unpublished manuscript, pp. 104-08, 114, in Morris Swett Library.

74. Report of Operations, First Army, 8 Oct 1943-1 Aug 1944, pp. 123-24.

75. Report, The General Board, USFET, subj: Study of Field Artillery Operations, undated, pp. 30, 31, 33, 35, 36; Report, The General Board, USFET, subj: The Study of the Organization and Equipment of Field Artillery Units, undated, pp. 24-29, in Morris Swett Library.

problems. The rapid advance and lack of organized enemy resistance reduced the expenditure of rounds to well below established allowances. Consequently, field artilleryman had more than they required or even wanted despite the restrictions imposed by rationing.[76]

Slowed by long supply lines and stiffening German resistance, the Allied drive ended in September 1944 as it drew closer to the German frontiers. On the Allied right the American Third Army commanded by Lieutenant General George S. Patton encountered strong defenses around Metz and Nancy in the Lorraine.[77] Fortunately, the end of the rapid advance allowed Third Army to bring up heavy field pieces and corps artillery and to organize nondivisional artillery into groups of three to four battalions each and tie them into division artillery through one fire direction center. While this arrangement permitted the corps artillery commander to coordinate every piece within the corps, it caused problems. Since Third Army's corps fronts were so wide, one fire direction center could not control all of the artillery. As a result, corps artillery commanders often created a second fire direction center as the XX Corps artillery commander did in September.[78]

Early in September, Patton opened his offensive to capture Nancy and Metz. Under the cover of artillery, XII Corps attacked Nancy on 5 September. Unable to advance across the Moselle River during the initial thrust, Major General Manton Eddy, Commander, XII Corps, struck again on 11 September after regrouping his forces. With artillery support the 35th Infantry Division pushed towards Nancy from the south as the 4th Armored Division encircled the city from the south and north to cut off any lines of retreat. During the pincer movements, gun crews shelled German observation posts with smoke rounds, fired harassing and interdicting missions, but often had problems supporting the infantry and armor because of the fluid operations and shortages of ammunition.[79] After fierce fighting Combat Command B of the 4th Armored Division, pushing from a bridgehead south of Nancy, joined with Combat Command A of the 4th Armored Division, moving from the north, to cut off the city. Subsequently, the 35th Division captured Nancy on 15 September.[80]

In the meantime, XX Corps hit Metz. Supported by artillery barrages, the 5th Infantry Division opened the assault on 7 September. Strong German resistance threw the division back and forced Major General Walton Walker, the commander, to revise his strategy. Rather than continuing his futile frontal attack, he decided to encircle the city. The 5th Division crossed the Moselle River south of the city under the cover of thirteen artillery battalions.[81] Although American

76. Karl Thoholte, General of the Artillery, German Army, "A German Reflects Upon Artillery," *Field Artillery Journal*, Dec 1945, p. 714; Report, The General Board, USFET, subj: Study of Field Artillery Operations, undated, pp. 22, 195-97; Report, The General Board, USFET, subj: Ammunition Supply for Field Artillery, undated, pp. 33-34.

77. Report of the Supreme Commander to the Combined Chiefs of Staff on the Operations in Europe of the Allied Expeditionary Force, 6 Jun 1944-8 May 1945, p. 66; Report, HQ Third Army, Office of the Artillery Officer, 13 Sep 1944, p. 2, in Morris Swett Library; Report, The General Board, USFET, subj: Ammunition Supply for Field Artillery, undated, pp. 18-29.

78. History of XX Corps Artillery, 21 Oct 1943-9 May 1945, p. 21, in Morris Swett Library; Report, HQ Third Army, Office of the Artillery Officer, 9 Sep 1944, p. 2, in Morris Swett Library.

79. Reports, HQ Third Army, Office of the Artillery Officer, 12-13 Sep 1944, p. 2, in Morris Swett Library.

80. Hugh M. Cole, *The Lorraine Campaign* (Washington: Historical Division, US Army, 1950), pp. 69-96.

counterbattery fire forced German guns to move frequently during the offensive, **XX** Corps could not push the Germans out of Metz.[82] Using old forts as shelters and positioning artillery inside their steel and concrete walls, the Germans skillfully and stubbornly fought back. This coupled with diminishing ammunition supplies forced **XX** Corps to cut back its artillery missions in mid-September to build up sufficient stocks for a major drive.[83] Nevertheless, logistical shortages of all kinds halted Patton's offensive late in September and forestalled capturing the city.[84]

After building up reserves throughout October, **XX** Corps opened another offensive early in November. Because of a forty-five mile long corps front, the corps artillery commander divided his artillery into two groups with each possessing a fire direction center. One supported the 5th Division, while the other assisted the 90th Infantry Division and 10th Armored Division. In the darkness of the eighth of November after an intensive corps artillery preparation on enemy command posts, communication centers, and concentration areas, the 5th Division jumped off. As the division attacked, its artillery smoked observation posts and neutralized enemy strong points and forward defenses as corps artillery shelled all known enemy batteries. To preserve secrecy **XX** Corps did not provide any preparation fire to the north. At the jump off time division artillery blasted entrenchments, automatic weapons, and mortars, while corps artillery bombarded casemates, forts, pillboxes, known batteries, and long range targets as the 90th Division and 10th Armored Division moved out.[8^] With over seven hundred artillery pieces for support, the Americans slugged their way towards Metz. By 15 November the 5th Division had captured several of the forts to the south and west of the city, and the 95th Infantry Division, moving in from the west, had destroyed several forts to the north. Five days later, the 5th and 95th Divisions entered the city. Shortly thereafter, elements of the 5th and 90th Divisions linked together to the east of Metz. After a hard battle that lasted almost fourteen days, the Third Army finally crushed the Germans. Together, the seizure of Metz and Nancy left Patton's army poised to strike into Germany.[86]

Although rationing restricted the availability of ammunition and hampered operations, the field artillery still played a critical role in the Lorraine Campaign. By carefully planning operations and wisely expending existing supplies, field artillerymen supported river crossings, shelled the approaches to Metz, Nancy, and other crucial places, blasted the enemy, and opened the way for the infantry and armor to attack. During the two-week offensive against Metz, for example, the field artillery bombarded the Germans with over 130,000 rounds with almost 100,000 coming from 105-mm. howitzers and 25,000 coming from 155-mm. howitzers.[87] Unable to use air power because of adverse weather, Patton depended on field artillery to batter the Germans into submission.[88]

81. Report, HQ Third Army, Office of the Artillery Officer, 14 Sep 1944, p. 2.

82. *Ibid.*

83. Report, HQ Third Army, Office of the Artillery Officer, 20 Sep 1944, p. 2; Report, The General Board, USFET, subj: Ammunition Supply for Field Artillery, undated, pp. 24-27, 46.

84. Cole, *The Lorraine Campaign,* pp. 117-83.

85. Report, The General Board, USFET, subj: Study of Field Artillery Operations, undated, pp. 84-87.

86. Report, Third Army, subj: A Brief Summary of Operations, 10 Jun 1945, pp. 3-4; Report, The General Board, USFET, subj: Study of Field Artillery Operations, undated, p. 87.

87. Report, The General Board, USFET, subj: Study of Field Artillery Operations, undated, pp. 84-87; Report, The General Board, USFET, subj: Ammunition Supply for Field Artillery, undated, pp. 18, 19, 24, 26, 27, 29, 30.

To the north of Lorraine, the American First Army also blasted the the German army. Field artillery and tank destroyers neutralized enemy pieces and strong points and pinned down the Germans to permit friendly infantry and armor to advance. After weeks of hard fighting, First Army approached Aachen, Germany. On 11 October the Americans assaulted. That day corps and division artillery bombarded the city with over 169 tons of shell as the infantry attacked. The following day American artillery expended five thousand more rounds to support the continued advance. After forcing the Americans to employ tank destroyers, 155-mm. howitzers, and 155-mm. guns in street fighting for almost ten days, German resistance finally ended, but not until field artillery and tank destroyers had pulverized the city. Thirty division batteries with eleven attached batteries and thirty-three corps batteries fired upon Aachen and its environs to help subdue the Germans. Not counting field artillery under the control of First Army or adjacent divisions, the Americans employed at the minimum seventy-four batteries (296 guns) to defeat the Germans at Aachen.[89]

In the meantime, the right wing of First Army pushed towards Schmidt, a crucial crossroads atop one of the highest ridges in the Huertgen Forest west of the Roer River. After failing to capture the village in October, the V Corps tried again. On the second of November, field artillery poured more than four thousand rounds on the village during a preliminary barrage. Fifteen minutes before the ground attack, division artillery shifted to targets to the immediate front of the infantry and armor. Because of difficult terrain and German artillery and small arms fire, many American infantry assaults dissolved into small unit actions. Despite aggressive fighting, the Americans did not take Schmidt from the Germans until February 1945.[90]

The battles along the Siegfried Line, such as at Aachen and Schmidt, reflected the American reliance upon fire support. Encountering strong defenses, rugged terrain that favored the defenders, and poor weather that restricted tactical air support, the field artillery massed barrages, fired TOTs, cleared paths for the infantry and armor, and repulsed local German counterattacks. Reflecting on the effectiveness of American artillery work, a captured German soldier commented that his comrades could see American aircraft coming in time to dive into a trench and could hit American tanks with antitank weapons. Yet, they could not withstand American field artillery fire because it smothered their positions without warning. With armor augmenting artillery First Army simply relied upon firepower in its attempts to break through the Siegfried Line. Even though ammunition rationing curtailed shelling to a degree, fire direction centers permitted commanders to exploit existing ammunition.[91]

As the Allies closed in on the German borders, the Germans unleashed a desperate offensive to breakthrough to Antwerp, Belgium, and split the British and Americans into two parts. Under cover of inclement weather, the Germans formed two panzer armies and one infantry army. On 16

88. Report, HQ Third Army, subj: A Brief Summary, 10 Jun 1945, p. 5.

89. Report of Operations, First Army, 1 Aug 1944-22 Feb 1945, Annex 4, pp. 6-7, in Morris Swett Library; Charles B. MacDonald, *The Siegfried Line Campaign* (Washington: Office of the Chief of Military History, US Army, 1963), p. 318.

90. MacDonald, *The Siegfried Line Campaign*, pp. 348, 373-74.

91. Report of Operations, First Army, 1 Aug 1944-22 Feb 1945, Annex 4, pp. 1, 24-25.

December 1944 German tanks pierced the Ardennes Forest of Belgium and Luxembourg on an eighty-mile front (the weakest point in the Allied lines), rolled over green American divisions of First Army, and forged onwards in a devastating surprise attack. The invasion overran forward observations posts and sound-and-flash bases, deprived corps artillery of observation and counter-battery capabilities, and forced forward positions to be abandoned. The inexperienced American 106th Infantry Division with eight battalions of corps artillery from VIII Corps in position to reinforce its artillery, for example, held a relatively quiet front when the Germans struck. Because division leaders prohibited field artillery battalions from firing into another battalion's sector to hit targets of opportunity, division artillery had difficulties massing fire on 16 December. Unable to respond effectively with field artillery or small arms fire, the 106th Division's defenses eventually collapsed as the Germans pushed around the division. By 17 December the Germans had trapped the division in a pincer movement and cut it off from other units. VIII Corps artillery also had difficulties resisting the attack. Positioned forward to support the 106th Division, corps artillery could not react to the fast-moving ground offensive. As the enemy swept around the 106th Division, corps artillery had to displace rearward. Towed 155-mm. and 8-inch howitzer battalions took long to limber and to find a place on the crowded roads that led west. As a result, some fell victim to German infantry and tanks.[92]

Despite these reverses and others, some field artillery units succeeded, if only temporarily, in checking the onslaught along part of the front. In the 99th Infantry Division's sector division artillery massed fire until V Corps artillery took over and bombarded the Germans with over 11,500 rounds during the night of 17 December. On the American right division howitzer batteries retained their link with their observation posts overlooking the Sure River and succeeded in delaying the German bridging efforts for many hours.[93]

Of all the artillery operations during the first days of the Battle of the Bulge, action centering around Monschau, Germany, in the northern sector illustrated the decisive impact of massed field artillery fire. When German tanks attempted to smash through the area, a thin screen of mechanized cavalry with artillery support stopped them. The hostile tanks launched a second heavy assault, but stout American defenses threw them back once again. By the time that the Germans mounted a third attack, V Corps had four battalions of 105-mm howitzers, six battalions of 155-mm. howitzers, one battalion of 4.5-inch guns, two battalions of 155-mm. guns, two battalions of 240-mm. howitzers, and one battery of 8-inch howitzers on line. Even though this German drive had greater strength than the two previous ones, American field artillery decimated it so badly that only one enemy battalion breached the American cavalry screen. This tough defensive show by the field artillery contained the Germans and eventually crushed them.[94]

Although bad weather restricted air and ground observation for the next five days on the American left, the field artillery managed to provide support. As the 7th Armored Division moved with little organic artillery towards St. Vith, a vital road center, VIII Corps artillery slowed down

92. Hugh M. Cole, *The Ardennes: Battle of the Bulge* (Washington: Office of the Chief of Military History, Department of the Army, 1965), pp. 141, 151-57, 196-97, 657-58.

93. Cole, *The Ardennes*, *pp.* 658-59; Report of Operations, First Army, 1 Aug 1944-22 Feb 1945, Annex 4, pp. 1, 24-25.

94. Report of Operations, First Army, 1 Aug 1944-22 Feb 1945, Annex 4, p. 9.

an enemy column by massing fire on it. This permitted the 7th Armored Division to win the race to St. Vith. American artillery effectively used every round of a diminishing supply, but the German onslaught finally penetrated east and south of the town and compelled the Americans to evacuate the salient on 21 December.[95] Meanwhile, just north of Elsenborn, American 1st, 2nd, and 99th Infantry Divisions concentrated sixteen artillery battalions. Division artillery shot massive barrages to break up three German attacks as the infantry counterattacked and dug in. This infantry-artillery team held the critical Berg-Butgenbach-Elsenborn area for future use and prevented the German right from sweeping through.[96]

On the American right near Bastogne, Belgium, another critical road junction, a combined arms team of infantry, field artillery, and armor also contained a strong German offensive. Caught in the town as the Germans surged past on both sides and eventually encircled, the Americans gathered together approximately 130 field pieces of varying sizes and calibers and shelled the enemy with direct fire. After pounding the beleaguered garrison and requesting it to surrender, which it refused, the Germans launched a full-scale attack on Christmas Day. Together, air power and ground defenses in Bastogne kept the town from being overrun. After fighting its way from the south with fire support from thirty-five artillery battalions, the 4th Armored Division made contact with Bastogne on 26 December to help lift the siege. In the meantime, Third Army concentrated 108 artillery battalions along the left flank of the bulge and shelled the German thrust, while First Army massed one hundred battalions on the opposite side of the bulge. One of First Army's battalions, the 18th Field Artillery Battalion with three batteries of 4.5-inch rockets fired from twelve-tube launchers blasted the Germans. As it had done earlier in the Huertgen Forest in November 1944, the 18th Field Artillery Battalion laid down rocket barrages. On one occasion the battalion blasted the Germans with approximately 1, 800 rockets within eighteen minutes to blunt an attack. Hit by staggering firepower from tube and rocket artillery, the German offensive in the Ardennes finally collapsed.[97]

As soon as they had assessed the German threat, the Allies organized an overwhelming counterattack. On the German northern flank the Allies gave General Sir Bernard Montgomery temporary control of the American Ninth Army and all but one corps from the American First Army. On the southern the Allies unleashed the American Third Army. Employing projectiles with recently introduced variable time (VT) fuses that detonated the round a given distance from the target through reflected radio waves, American field artillerymen helped to erase the Bulge after a hard-fought campaign, destroy the Germans' ability to wage war, and launch the Allies' last offensive that ended the war.[98]

95. *Ibid.*

96. Report of Operations, First Army, 1 Aug 1944-22 Feb 1945, Annex 4, p. 9; Joseph R. Reeves, "Artillery in the Ardennes," *Field Artillery Journal,* Mar 1946, p. 178.

97. Comparato, *Age of Great Guns,* pp. 257, 295; Charles B. MacDonald, *A Time For Trumpets: The Untold Story of the Battle of the Bulge* (New York: William Morrow and Company, Inc., 1985), p. 503; Office of Scientific Research and Development, *U.S. Rocket Ordnance: Development and Use in World War II* (Washington: Joint Board on Scientific Information Policy, n.d.), pp. 45-47; Report, The General Board, USFET, subj: Study of Field Artillery Materiel, 1946, p. 4; Ltr, HQ 18th Field Artillery Battalion to CG, 1st Army, subj: Rockets, 11 Feb 1945, in Report, the Rocket Board, subj: Review of Rocket Board's Activities, 1 Mar 1944-10 Aug 1945, 14 Aug 1945, Enclosure 5, in Morris Swett Library.

98. Comparato, *Age of Great Guns,* p. 267; Green, Thomson, and Roots, *The Ordnance Department,* pp. 365-66.

Reflecting upon the war in Europe, US Forces, European Theater (USFET), concluded late in 1945 that firepower and maneuver were the fundamental elements of combat. The application of firepower preceded successful maneuver to permit the infantry and armor to take objectives without serious loss of life or injury. Operations were quick when ammunition was plentiful and when massed artillery fires were employed to the maximum extent possible. To prevent hampering operations the field artillery required an unrestricted supply of ammunition. The American Sixth Army Group reaffirmed the necessity of huge ammunition expenditures. Commenting on rationing, the group wrote that a larger supply of rounds in the hands of the field artillery than it had had during operations in Europe would have reduced friendly casualties, would have killed more Germans, and would have ended the fighting sooner. Although the field artillery had adequate supplies of ammunition and delivered devastating barrages, field artillerymen desired even more ammunition since nothing substituted for massed fire and the lavish use of rounds."

Combat operations in North Africa and Europe indicated the fire direction center, organic air and ground observers, and self-propelled and towed artillery brought a new dimension to the field artillery. While motorized field pieces gave the field artillery mobility to stay abreast of infantry and armor columns, the fire direction center and observers with radios permitted massing fire, shifting it rapidly and accurately from one point to another, keeping field artillery battalions dispersed to protect them better from counterbattery fire, exploiting the available ammunition, and supporting the other combat arms.The combination of motorized guns, the fire direction center, and forward observers supplied the Army with unprecedented firepower and mobility and integrated the combat arms into an effective team for the first time since the introduction of indirect fire.

War in the Pacific

Field artillerymen in the Pacific theater had the same guns, equipment, organization, and doctrine as their peers in Europe had, but the terrain forced them to adapt. Employing little used or even discussed techniques and fighting on small fronts and at close ranges, gun crews massed fire to clear the way for the infantry and armor to attack.

Even though the European theater received priority, Japanese activities in the Pacific forced the United States to direct its attention there. Beginning in December 1941 and continuing through mid-1942, the Japanese experienced repeated successes in their bid to create their Greater East Asia Co-Prosperity Sphere. They bombed Pearl Harbor in December 1941 and conquered Guam, Wake Island, and Hong Kong in December 1941, Singapore in February 1942, Java in March 1942, and the Philippines in May 1942. In the meantime, Japanese forces moved into Burma, seized the Solomon Islands and the Bismarck Archipeligo, threatened India and Australia, and controlled much of the Pacific Ocean by mid 1942.

The Battle of the Coral Sea in May 1942 marked the high point of the Japanese initiative in the Pacific and opened the way for the United States and Great Britain to strike. Hoping to break

99. Report, The General Board, USFET, subj: Study of Field Artillery Operations, undated, pp. 22, 87, 95, 96, 106, 107; Report, The General Board, USFET, subj: Ammunition Supply for Field Artillery, undated, pp. 46-47.

the Japanese hold on the Solomons and the Bismarcks, the Army and the Navy planned an offensive against Rabaul, a heavily fortified Japanese port, on New Britain Island. When intelligence reports showed that the Japanese were constructing an airstrip, later called Henderson Field, on Guadalcanal, the Americans invaded that island in August 1942 and seized the airstrip.[100] Preoccupied with their own offensive in New Guinea, the Japanese reacted slowly to the landing because they thought that the Americans were merely conducting a raid. When the Japanese realized that American activity was not a raid, they dispatched six thousand soldiers to push the Marines off the island.[101] On 23 October the Japanese struck Henderson Field. Savage fighting broke out. American field artillery and small arms fire repulsed the attacks that night only to face more the following night. Although the Japanese failed to capture the field, they inflicted heavy casualties and began what turned out to be several weeks of intense fighting that lasted through mid November.[102]

After receiving command of the newly formed American XIV Corps composed of the 2nd Marine Division and the Army's Americal and 25th Infantry Divisions, Lieutenant General Alexander M. Patch opened a drive in December 1942. Early in the morning of 27 December, field artillerymen opened a barrage to knock out Japanese pillboxes on the hill overlooking Henderson Field. After the artillery preparation had lifted, the infantry rushed up the hill under the cover of 155-mm. howitzer fire. As the Americans approached the summit, cross fire from Japanese small arms cut down many attackers, while enemy mortars pinned down others. Unable to move, forward observers called in more supporting fire. Within minutes American gun crews from positions less than two thousand yards from the enemy increased the intensity of their barrages on Japanese positions on the forward and reverse sides of the hill's steep slopes and finally compelled the enemy to withdraw.[103]

Early in 1943, Patch launched a major offensive to seize the island. Supported by naval guns, twenty-eight 75-mm. pack guns, thirty-six 105-mm. howitzers, twelve 155-mm. howitzers, and six 155-mm. guns, Patch's corps pushed towards the southwestern portion of the island.[104] Close support from artillery facilitated the infantry advance and caused the Japanese to evacuate the island by February 1943.[105]

Combat on Guadalcanal presented field artillerymen with difficulties employing official field

100. Fairfax Downey, *Sound of the Guns: The Story of American Artillery* (New York: David McKay Company, Inc., 1955), p. 241.

101. Ronald H. Spector, *Eagle Against the Sun: The American War with Japan* (New York: The Free Press, 1985), p. 197.

102. Report, Col Henry C. Demuth, subj: The Battle of Guadalcanal, 24 Feb 1943, pp. 1-2, in Morris Swett Library, hereafter cited as Demuth Report; Spector, *Eagle Against the Sun,* pp. 210-13; The Field Artillery School, "Artillery in Combat," Jul 1945, p. 4.

103. Spector, *Eagle Against the Sun,* pp. 213-14; Demuth Report, pp. 1-2; Cpt John F. Casey, "An Artillery Forward Observer on Guadalcanal," *Field Artillery Journal,* Aug 1943, pp. 56465; Report, Headquarters Americal Division Artillery, subj: Employment of the Field Artillery on Guadalcanal, 21 Mar 1943, p. 2, in Morris Swett Library.

104. Spector, pp. 213-14; Demuth Report, pp. 1-2.

105. Spector, pp. 213-14; Demuth Report, pp. 1-2, 43; Report, Headquarters Americal Division Artillery, subj: Employment of the Field Artillery on Guadalcanal, 21 Mar 43, p. 2; Lt Col Robert C. Gildart, "Guadalcanal's Artillery," *Field Artillery Journal,* Oct 1943, p. 339.

artillery doctrine. Facing the Japanese army that used encircling tactics, American field artillerymen had to provide fire over a 360-degree circle.[106] Taught at the Field Artillery School to fire on a 180-degree arc, gun crews had to position a battery of guns in an irregular diamond pattern to fend off attacks from any direction.[107] Fortunately, the Japanese launched only one major attack (October 1942) that could have forced the Americans to fire in a 360 degree circle. Moreover, sniper fire and infiltration tactics compelled the Americans to surround their batteries with foxholes, machine gun nests, and barbed wire obstacles. Safe positions far to the rear of the front lines did not exist on Guadalcanal. As a result, field artillerymen had to protect themselves while simultaneously furnishing fire support and conducting counterbattery fire.[108]

Fighting in dense jungles and at close ranges on Guadalcanal also compelled employing high-angle fire to hit targets. Outside of brief references to high-angle fire for jungle or mountainous warfare in training manuals, Army field artillerymen of the twenties and thirties concentrated on learning low-angle fire that was suited for long ranges. In fact, the Field Artillery School paid scant attention to high-angle fire and devoted most of its time to low-angle fire. Because of this, field artillerymen were poorly prepared for combat on Guadalcanal and had to learn to move their guns up close and employ high-angle fire during the heat of battle.[109]

Once Guadalcanal, Papua, and Tulagi had been seized, the Americans completed plans for operations along the New Guinea coast and up the Solomon Islands to neutralize Rabaul.[110] In mid-1943 Admiral William F. Halsey landed two forces near Munda, a Japanese airstrip on New Georgia in the Solomons. The Marines came ashore at Rice Anchorage to prevent Japanese reinforcements from nearby Kolombangara Island from reaching Munda. Meanwhile, to the south of Munda, the 169th and 172nd Regiments of the Army's 43rd Infantry Division advanced on the main Japanese forces surrounding the airstrip.[111] As the regiments closed in, Marine and Army field artillerymen from 155-mm. and 105-mm. howitzer batteries on neighboring islands opened fire on rear areas, lines of communications, suspected bivouac areas, and command posts.[112] In one hour Brigadier General Harry F. Barker's division artillery poured over 5,800 high-explosive rounds onto the Japanese. Even though artillery fire tore apart Japanese positions, the 169th and 172nd Regiments' offensive of early July stalled because of poor leadership, inexperience, the lack of food, and a resolute enemy defense.[113]

106. Military Intelligence Division, "Reports on the United Nations," 15 Oct 1943, p. 25; Casey, "An Artillery Forward Observer on Guadalcanal," p. 740, 744.

107. Casey, "An Artillery Forward Observer on Guadalcanal," p. 744.

108. *Ibid.*

109. The Field Artillery School, *Tactical Employment of the Field Artillery,* 1938, pp. 366-67.

110. Spector, *Eagle Against the Sun,* pp. 225-26.

111. *Ibid.,* pp. 234-37.

112. Report, Brig Gen Harold R. Barker, Corps Artillery Commander, XIV Corps, subj: Artillery Operations Report Covering the New Georgia Campaign, British Solomons, undated, pp. 1-4, in Morris Swett Library, hereafter cited as Barker Report; John Miller, Jr., *Cartwheel: The Reduction of Rabaul* (Washington: Office of the Chief of Military History, Department of the Army, 1959), p. 110.

113. The Field Artillery School, "Artillery in Combat," Jul 1945, pp. 7-9; Artillery Operations Report, Munda Campaign, New Georgia Occupation Force, undated, pp. 45, 58, in Morris Swett Library; Miller, *Cartwheel,* p. 111.

The Americans launched another attack on Munda late in July 1943 after the initial one had failed. Artillery barrages hit enemy strongholds, ripped away foliage concealing Japanese positions, sometimes penetrated pillboxes, or drove the enemy into the open where they could be cut down by machine gun or rifle fire.[114] After this a rolling barrage fell one hundred to two hundred yards in front of the infantry and cut paths through the jungle. By keeping the rolling barrages close to the attacking troops, gun crews minimized casualties from Japanese automatic weapons and rifles and helped drive the enemy from the Munda airstrip to Kolombangara Island.[115] Commenting on the field artillery's contribution on New Georgia, General Barker noted, "One of the most gratifying results of the. . .Campaign from the Artillerymen's viewpoint was the *confidence and enthusiasm displayed by the Infantry for its Artillery."*[116]

Although pre-war doctrine noted that field artillery was unsuited for jungle warfare, combat on Guadalcanal and New Georgia indicated otherwise. In fact, the field artillery played a major role. Constant artillery shelling demoralized the Japanese because their counterbattery work could not silence the American guns. During an interrogation, one of the few Japanese prisoners-of-war commented on his army's fear of American field artillery.[117] The hostile jungle terrain might have restricted the field artillery's mobility, but gunnery techniques, especially high-angle fire, and the extensive use of organic air observation permitted hitting targets with uncanny accuracy.[118]

Field artillery work on Bougainville reaffirmed the lessons of Guadalcanal and New Georgia. Once Army and Marine gun crews had waded ashore, they set up their battery positions, established strong perimeter defenses, and laid out 360-degree fields of fire. Once again, high-angle fire predominated because the rugged terrain and short ranges left no other choice. Supporting the infantry with massed fire from 190 field pieces, field artillerymen blasted paths through the jungle and destroyed Japanese defenses. In one particular instance, an artillery barrage in December 1943 placed over four tons of rounds onground targets.[119] By the time that the fighting had stopped in March 1944, American field artillerymen had shot over 250,000 rounds and demonstrated once more their ability to provide support in the jungles.[120]

As the field artillery struggled in Bougainville and New Guinea, the Joint Chiefs of Staff revised its plans for Rabaul. Rather than invading Rabaul, it decided to bypass the island and directed General Douglas MacArthur to continue his advance up New Guinea. Following MacArthur's triumph in the Admiralty Islands in March 1944 that forced the Japanese to withdraw their fleet and air units that had survived the air bombardments to the Marianas, the Philippines, Formosa, and Southeast Asia, the Joint Chiefs of Staff added the Philippines as an objective.[121]

114. Artillery Operations Report, Munda Campaign, New Georgia Occupation Force, undated, p. 28; The Field Artillery School, "Artillery in Combat," Jul 1945, p. 9; Barker Report, pp. 18-19.

115. Barker Report, p. 7; Miller, *Cartwheel,* p. 161.

116. Barker Report, p. 7.

117. *Ibid,* pp. 5-7.

118. *Ibid, pp. 15-17.*

119. Capt John C. Guenther, "Artillery in the Bougainville Campaign," *Field Artillery Journal,* Jun 1945, p. 331.

120. Guenther, "Artillery in the Bougainville Campaign," p. 334.

121. Spector, *Eagle Against the Sun,* pp. 276-85.

Following intensive naval and air bombardments on Japanese pillboxes, heavy guns, blockhouses, strong points, troop concentrations, and beach defenses, the American Sixth Army under Lieutenant General Walter Krueger invaded the Island of Leyte in the Philippines in October 1944.[122] The bombardments forced the Japanese to withdraw from their beach positions along the east coast. By late afternoon on the twentieth, gun crews started delivering harassing fire on all enemy installations and crossroads.[123] Over the next several weeks, the field artillery furnished lengthy preparations prior to each infantry attack. Nevertheless, field artillerymen soon discovered that much of their shelling was wasted. Whenever a field artillery barrage opened, Japanese troops immediately dug in and remained in their foxholes until the cannonade had stopped. At that time they popped out and offered stiff resistance to the American infantry. To offset this the artillery unleashed thirty minute preparations, ceased until five to ten minutes before the attack, and then fired short preparations. This tactic proved to be effective because it surprised the Japanese.[124] Equally important, the Japanese seldom massed their guns or engaged in counterbattery duels. Consequently, American field artillery could focus on supporting the infantry or harassing the rear areas and could follow the infantry closely on Leyte. This allowed the infantry to seize many well-organized and heavily manned defensive positions with light casualties during the advance towards Ormoc, the most important city on the west coast of Leyte.[125]

As the Americans drove toward Ormoc, the Japanese strengthened their defenses along the mountain approaches to the city. As they had done in other places, they dug in deeply, exploited natural camouflage, placed guns and automatic weapons in concealed positions even if this meant sacrificing fields of fire, and honeycombed the ridges with hidden trenches.[126] Early in November 1944, the Americans hurled themselves against Japanese positions along Breakneck Ridge. Adverse weather, rugged terrain, and strong enemy defenses slowed down the American offensive. Heavy artillery barrages of high-explosive and white phosphorus shells and fire on targets of opportunity tore up the ground but failed to dislodge the defenders, who now numbered as many as their attackers. As a result, the Americans could not overwhelm them with sheer numbers alone and employed field artillery to give them the edge.[127] After shelling the enemy for several days, the 226th and 465th Field Artillery Battalions finally tore up Japanese defenses sufficiently by 12 November to allow tanks and tank destroyers to drive the Japanese toward Ormoc.[128]

Shortly after, the American 77th Infantry Division opened up a second front when it landed south of Ormoc. As the Americans, who were pushing south from Breakneck Ridge, continued

122. The Field Artillery School, "Artillery in Combat," Jul 1945, p.96.

123. *Ibid,* pp. 99-100.

124. The Field Artillery School, "Artillery in Combat," Jul 1945, p. 105; Report, HQ 419th Field Artillery Group, subj: Action Against Enemy—From Marianas Campaign to Philippine Campaign (Leyte Island), p. 13, in Morris Swett Library.

125. Report, HQ 419th Field Artillery Group, subj: Action Against Enemy—From Marianas Campaign to Philippine Campaign (Leyte Island), p. 102.

126. Spector, *Eagle Against the Sun,* pp. 413-14; M. Hamlin Cannon, *Leyte: The Return to the Philippines* (Washington: Office of the Chief of Military History, Department of the Army, 1954), p. 211.

127. Spector, *Eagle Against the Sun,* p. 514; Cannon, Leyte, pp. 212-20.

128. Cannon, *Leyte,* p. 220.

their drive, the 77th Division attacked the city. After fierce fighting the division finally pushed the Japanese out.[129] Although the Japanese planned to counterattack, constant artillery shelling compelled them to break up into small groups. Using artillery concentrations, the Army then chased these small bands into the mountains.[130] Fighting continued for several more weeks, but the real contest for Leyte had ended when the Japanese split their forces into small units.[131]

Throughout operations on Leyte, the field artillery played a conspicuous role. Using radio-equipped ground and organic air observers and fire direction centers, field artillerymen massed preparatory and supporting fire, followed the infantry and armor as closely as possible despite the mud and rain, and demoralized the Japanese with TOTs.[132] Although artillerymen seldom varied from accepted doctrine, the terrain often forced them to emplace their batteries along small fronts and fire over each other from ranges as close as five hundred yards from the enemy.[133] Discussing field artillery missions on the island, the Field Artillery School wrote in July 1945 that artillery fire "enabled attacking infantry to seize many well-organized positions with light casualties" and was extremely effective in "repulsing and decimating attacking enemy forces." Even though the field artillery had difficulty destroying enemy defenses, especially along Breakneck Ridge, and occasionally faced ammunition shortages because of the problems of transporting ammunition through mountainous terrain, massed artillery fire disrupted enemy communications and observation, prevented the construction of additional defensive positions in depth, and disorganized the movement of reserves. As a result, the infantry often became too dependent upon the artillery and expected gun crews to do its work because artillery fire proved to be effective.[134]

Upon breaking Japanese opposition on Leyte, the Americans invaded Luzon in January 1945. Rather than defending Manila or the Bataan Peninsula, the Japanese withdrew to strongholds from which they could conduct a prolonged defense and inflict heavy casualties.[135] Moving to protect the left flank of the American XIV Corps, I Corps encountered stiff Japanese resistance to the north and east of Lingayen Gulf. As usual, the Japanese constructed mutually supporting defenses in caves and tunnels and concealed their field artillery in caves on high ground along the routes of advance.[136] Although they showed little offensive inclinations, the Japanese hit the Americans hard with small arms and artillery fire and refused to retreat.[137] Despite massed artillery fire's effectiveness at forcing the enemy to seek cover, I Corps could not reduce the Japanese positions and had to use flame throwers and small arms, which was slow and costly.[138]

129. Report, 77th Infantry Division, subj: Operation Summary, 23 Nov-25 Dec 1944, pp. 13-13, in Morris Swett Library; Report, 77th Infantry Division Artillery, subj: Operations Summary, 23 Nov-25 Dec 1944, in Morris Swett Library.
130. Report, CG, Eighth Army, subj: Leyte-Samar Operations, 26 Dec 1944-8 May 1945, p. 9, in Morris Swett Library.
131. Spector, *Eagle Against the Sun,* p. 517.
132. The Field Artillery School, "Artillery in Combat," Jul 1945, pp. 102-14.
133. Report, 77th Infantry Division Artillery, subj: Operations Summary, 23 Nov-25 Dec 1944.
134. The Field Artillery School, "Artillery in Combat," Jul 1945, p. 107; Cannon, pp. 211-20, 231-33, 246, 306-12.
135. Spector, *Eagle Against the Sun, p.* 519.
136. *Ibid.*
137. *Ibid.,* p. 520.
138. Report, 25th Infantry Division, 11 Jan-30 Jun 1945, pp. 8-10, in Morris Swett Library; Report, Sixth Army, subj: Luzon Campaign, 30 Jun 1945, pp. 20-21, in Morris Swett Library.

As I Corps struggled on the American left, XIV Corps advanced on Manila. After cutting through resistance just north of Manila, the Americans burst into the city's suburbs. In contrast to the rapid movement that had characterized XIV Corps' operations so far, wresting the city from the Japanese proved to be difficult. Composed of reinforced concrete buildings designed to resist earthquakes and old Spanish fortifications, the city offered the crumbling Japanese army strong defensive positions.[139] The Japanese desperately defended the thick-walled buildings and individual fortresses by locating pill boxes at key intersections, mounting field pieces atop buildings, and mining and barricading streets.[140] To dislodge the enemy the Americans called for fire by giving the names of buildings and street intersections. In many instances field artillerymen encircled a building with their pieces and fired at point-blank range with concrete piercing shells. Riflemen, grenadiers, and flame throwers then assaulted the breaches. On 23 February the field artillery reached Intramuros, the portion of the city that was ringed with thick walls. Concentrating eleven artillery battalions, ranging from 155-mm. to 8-inch guns, field artillerymen shelled the Intramuros with 7, 896 rounds to give the Americans complete control of it within twenty-four hours. Despite this, the battle for Manila still raged. For the next nine days, the Americans had to take one building at a time. Resorting to earlier tactics, they placed 155-mm. guns in a semi-circle around each building and poured in hundreds of concrete-piercing shells. The Americans finally captured Manila on 3 March after intensive artillery shelling.[141]

As in other parts of the Pacific theater, field artillerymen on Luzon faced ammunition shortages stemming from transportation problems from the ships to the front. This compelled the American Sixth Army to impose a strict rationing system. Although some units lacked the artillery support that they wanted, rationing had little impact on the outcome of the campaign since commanders had sufficient ammunition for their needs. Nevertheless, the desire for unlimited field artillery support caused infantry commanders to complain frequently about rationing because they wanted more ammunition than they were allotted.[142]

While MacArthur drove towards the Philippines, Admiral Chester Nimitz launched a campaign of amphibious assaults. In November 1943 he hit Tarawa, a tiny atoll in the Gilbert Islands. As the Americans came ashore, Japanese small arms, machine guns, and artillery greeted them. Under heavy fire from enemy artillery, the Americans shelled Japanese pillboxes that could only be knocked out by a direct hit, grenades, or satchel charges. After several days of artillery barrages and infantry attacks, the Marines seized the atoll. To provide better support on small islands like Tarawa, gun crews had to position their guns on adjacent islands, which meant seizing secondary targets before the main one, so that they could have artillery fire.[143]

139. Maj Nelson H. Randall, "The Battle for Manila," *Field Artillery Journal,* Aug 1945, pp. 453-55; Report, Sixth Army, subj: Operations, 30 Jun 1945, p. 37.

140. Report, Sixth Army, subj: Operations, 30 Jun 1945, p. 37.

141. Randall, "The Battle for Manila," pp. 452-56; Report, Sixth Army, subj: Luzon Campaign, 9 Jan-30 Jun 1945, p. 40.

142. Robert R. Smith, *Triumph in the Philippines* (Washington: Office of the Chief of Military History, Department of the Army, 1963), p. 656.

143. Spector, *Eagle Against the Sun,* pp. 259-66; Downey, Sound of the Guns, pp. 250-51.

Kwajalein reaffirmed the worth of such tactics. Following an intense naval bombardment, battalions of 105-mm. and 155-mm. howitzers went ashore early in January 1944 on adjacent unfortified islands from which they plastered Japanese defenses with high explosives. Minutes before the landings, field artillerymen moved their barrage inland to force the defense to seek cover. Because of this, Army and Marine landings did not face stiff resistance like those at Tarawa.[144]

After grabbing Saipan in June and Guam in July 1944, Nimitz's command continued its push. In the Palau Islands, the 81st Army Infantry Division invaded Angaur Island to capture it for use as a bomber base. Since there were not any nearby islands, field artillerymen had to fire at targets at less than minimum effective range. Realizing that the infantry would take heavy casualties without artillery support, gun crews fired diagonally across the island into the neighboring regiment's zone. This gave field artillerymen sufficient range and allowed them to exploit their guns' firepower to help clearthe island.[145] On Peleliu Island, another island in the Palaus, the situation again forced field artillerymen to improvise. Once Marine gun crews got their howitzers ashore, they lined them up hub-to-hub, bombarded the defense, and even employed direct fire at times. Generally, forward observers crawled to vantage points and brought barrages of rounds on pillboxes, dugouts, caves, buildings, bridges, and ammunition dumps. Seventeen days after the initial landing, the Marines completed sweeping the island of Japanese.[146]

After slugging their way across Iwo Jima, the Americans encountered totally different Japanese artillery tactics on Okinawa. For the first time, the Japanese extensively employed their field artillery. They had used field pieces to defend their other islands when the Americans hit the beaches or assaulted defensive positions. For the most part, however, the Japanese did not mass fire on targets of opportunity but only shelled pre-registered areas with one or two and occasionally four guns because they placed their obsolete guns in caves to protect them from American counterbattery fire. This practice limited fields of fire and prevented shifting from target to target easily and massing fire.[147]

In April 1945 the Marines and Army hit Okinawa. Knowing that failing to hold this island meant the possibility of the home islands being invaded, the Japanese employed every available resource to stop the Americans.[148] Although the Japanese had an abundance of well-sited artillery, they dispersed it as a defense against American bombing and shelling. Nevertheless, the Japanese integrated their field artillery into a general tactical scheme and indoctrinated their gun crews with the importance of protecting adjacent positions as well as their own. Rather than defending the beaches and two nearby airstrips, the Japanese established a system of strong concentric defensive perimeters around the town of Shuri in the south-central portion of the island. From here, they planned to fight to the last man to prevent the Americans from seizing the island

144. Downey, *Sound of the Guns,* p. 251.

145. *Ibid.*

146. *Ibid., p. 252.*

147. "Weekly Intelligence," Vol I, No. 47, 4 Jun 1945, p. 25, in Morris Swett Library; Comparato, *Age of Great Guns,* pp. 267-68.

148. Roy E. Appleman, James M. Burns, Russell A. Gugeler, and John Stevens, *Okinawa: The Last Battle* (Washington: Historical Division, Department of the Army, 1948), p. 1; Liddcll Hart, *History of the Second World War,* p. 684.

and using it as a base for offensive operations against the home islands.[149]

Under the cover of the heaviest naval fire ever to support a landing in the Pacific and field artillery fire from the 420th Field Artillery Group of two 155-mm. gun battalions and one 8-inch howitzer battalion from a nearby island, assault troops landed on Okinawa.[150] Following the assault waves, tanks, division artillery, and antiaircraft artillery rolled on to the beaches. By nightfall the Americans had established a beachhead that stretched fifteen thousand yards long and in places about five thousand yards deep and had all their division artillery in position ashore. The next day, three 155-mm. howitzer battalions of the 419th Field Artillery Group landed. Realizing that battle on the well-defended island would require more nondivisional artillery than had characterized combat in the Pacific so far, the American Tenth Army requested seven field artillery groups but received only two Army groups and one Marine group because shipping and beach operations could not support seven groups.[151]

As the Marines drove northward after pushing across the island, the Army turned towards Shuri. Early in April, the Army bumped up against the first line of defense around the city. The Americans attacked with a heavy preparation for a half an hour. Hoping to catch the enemy out of its holes, corps and division artillery shelled the defenses again. When this was finished, the 96th Infantry Division fought its way forward about three hundred to four hundred feet when Japanese machine gun fire started cutting it down.[152] Naval and air bombardment on the rear areas silenced enemy artillery, but the infantry still could not move. Commenting on the enemy's artillery fire, Colonel Bernard S. Waterman of the 96th Division pointed out that the heavy concentrations of artillery surprised the Americans because this was the first time that the Japanese had responded so intensely with field artillery. Although the defenders could not mass a large number of guns on a single target, the Americans still had to disperse their field pieces more than they had done previously in the Pacific.[153]

Once the Americans fully understood the change in Japanese artillery tactics, they started exploiting corps artillery far more for counterbattery work than they had done earlier in the Pacific. Using air spotters, sound ranging, and fire direction centers, corps artillery concentrated TOT missions.When the TOTs did not work, forward observers adjusted fire from individual pieces on guns that had been located to knock them out. If artillery and tanks could not destroy enemy pieces, the infantry had to reduce them with satchel charges, flame throwers, or grenades.[154]

After battering the defensive lines in front of Shuri for several weeks and imposing strict

149. Appleman, Burns, Gugeler, and Stevens, *Okinawa,* pp. 91, 250; Specter, *Eagle Against the Sun, p.* 533.

150. Col Bernard S. Waterman, "The Battle of Okinawa," *Field Artillery Journal,* Sep 1945, p. 523; Biennial Report, Chief of Staff of US Army, 1 Jul 1943-30 Jun 1945, to Secretary of War, p. 80, in Morris Swett Library; Weathersby, "The Field Artillery Group in Support of Corps and Field Army, 1942-1953," pp. 108-09.

151. Appleman, Burns, Gugler, and Stevens, *Okinawa,* pp. 6876; Waterman, "The Battle of Okinawa," p. 523; Weathersby, "The Field Artillery Group in Support of Corps and Field Army, 19421953," p. 108.

152. Capt Lauren K. Soth, "Cassino of the Pacific," *Field Artillery Journal,* Aug 1945, p. 465.

153. Waterman, "The Battle of Okinawa," p. 525.

154. Soth, "Cassino of the Pacific," p. 465.

artillery ammunition rationing early in April to build up a reserve that had been depleted because resupply efforts could not keep pace with the expenditure of rounds, the Americans renewed their attack. On 19 April they opened the greatest concentration of artillery ever employed in the Pacific. That day twenty-seven battalions of corps and division artillery (324 pieces), ranging from 105-mm. howitzers to 8-inch howitzers and averaging seventy-five field pieces to every mile of front, fired their first rounds at dawn. For twenty minutes gun crews blasted the Japanese. They then lifted their fire as the infantry feigned an attack. Following this, the field artillery shelled the enemy for another ten minutes.[155] Despite this tremendous barrage, the infantry could not break through. Unable to gain the initiative, the offensive stalled. Everywhere along the line, the Japanese had stopped the Americans.[156]

Denied the decisive advance, the Americans resumed their offensive. Between 20 and 24 April, the field artillery pulverized enemy artillery as the infantry attacked.[157] The constant pounding wore down the enemy. Pressed by the unremitting shelling and faced with declining reserves, the Japanese withdrew from their first line of defense on 24 April.[158]

Over the next month, the American infantry-artillery-armor team continued hitting the remaining defenses. Despite a shortlived Japanese counterattack, the Americans kept the enemy pinned down on the defensive. On 10 May 1945, XIV Corps launched a major offensive. Rather than a heavy general artillery preparation just before the jumpoff, the field artillery only shelled known artillery positions and other strong points because it realized that mass preparations had failed so far to destroy the enemy's elaborate system of underground positions and that precision fire was needed to neutralize them.[159] Although the Japanese had bolstered their sagging defense, the American 7th Infantry Division finally penetrated down the east coast to outflank Shuri. In the meantime, the 96th Division captured Conical Hill on the eastern flank of the Japanese line.[160] Those successes along with advances on the American right caused the Japanese to evacuate Shuri and fall back into a smaller enclave in the southernmost part of the island.[161] By this time the Japanese no longer could hold out as an organized force. Unable to continue the fight, the Japanese surrendered in late June.[162]

As the Battle for Okinawa came to a close, the Americans started gearing to invade the Japanese home islands. For the proposed attack they planned unprecedented artillery support because of the stiff resistance already encountered in the Pacific. Tank destroyer battalions were converted from 75-mm. to 90-mm. guns in anticipation of formidable cave defenses and new self-propelled M2 8-inch howitzers and towed Ml 240-mm. howitzers were shipped to the Pacific.

155. Appleman, Burns, Gugeler, and Stevens, *Okinawa*, pp. 194, 410-11.

156. *Ibid.*, p. 207.

157. Report, The Field Artillery School Committee, subj: Battle of Okinawa, undated, pp. 12-13, Morris Swett Library.

158. Appleman, Burns, Gugeler, and Stevens, *Okinawa,* p. 248; After Action Report, 96th Infantry Division, 28 Jul 1945, Pt VII, p. 22, and Pt VIII, pp. 3-4.

159. Appleman, Burns, Gugeler, and Stevens, *Okinawa,* p. 312.

160. Waterman, "The Battle of Okinawa," p. 527; After Action Report, 96th Infantry Division, 28 Jul 1945, Pt. VIII, p. 5.

161. Appleman, Burns, Gugeler, and Stevens, *Okinawa*, p. 387.

162. *Ibid.*, p.471.

Discarding mobility, the field artillery stockpiled heavier pieces to destroy the defenses. Before field artillerymen could use their arsenal, the United States dropped two atomic bombs on Japan in August 1945 to end the need for an invasion.[163]

Although field artillerymen had to adapt to conditions on the Pacific islands that differed significantly from those where they had been trained, they generally applied standard field artillery tactics. Employing the fire direction center, ground and organic air observers, and field artillery group, they massed fire, expended vast quantities of ammunition, taxed the logistical system's ability to supply sufficient quantities of rounds, and helped push the Japanese out of their strong defensive positions. Unlike their counterparts in Europe, gun crews in the Pacific used high-angle fire, fought at closer ranges, and faced less aggressive counterbattery fire.

As combat in the Pacific and Europe revealed, field artillerymen did not fight a war of movement that they had so desperately desired. Outside of racing across France in the summer of 1944 when the Allies were chasing a fleeing enemy, field artillerymen did not displace their pieces often during the course of a battle to stay abreast of rapidly advancing infantry and armor columns. Rather, they methodically moved their guns forward as weather, terrain, and combat permitted, overpowered the enemy with intense bombardments, slugged their way through heavily fortified enemy defenses, and demonstrated the Americans' superiority in firepower. American field artillerymen succeeded in overpowering the Germans and Japanese precisely because they could maneuver huge numbers of pieces around the battlefield and concentrate vast quantities of ammunition on a target despite rationing. Thus, after years of trying to imitate the Europeans and advance to their level of artillery sophistication, the Americans surpassed them and now set the example.

163. Comparato, *Age of Great Guns,* p. 272.

Table 6

MAJOR AMERICAN FIELD ARTILLERY PIECES IN 1942

Weapon	Range in Yards	Prime Mover
M1 105-mm. Howitzer	12,150	truck/tractor
M1 105-mm. Howitzer	12,150	motor/carriage
M1 4.5-inch Gun	20,500	truck/tractor
M1918A/M1917A 155-mm. Howitzer	12,400	truck/tractor
M1 155-mm. Howitzer	16,350	truck/tractor
M2 155-mm. Gun (GPF modified)	20,100	truck/tractor
M12 155-mm. Gun	18,750	motor/carriage
M1/M1A1 155-mm. Gun	25,715	tractor
M1 8-inch Howitzer	18,510	tractor
M2 8-inch Gun	35,000	tractor
M1918A2 240-mm. Howitzer	16,390	tractor

Source: Field Artillery School, *Characteristics of Major Artillery Weapons,* January 1943.