

ON THE WAY: THE U.S. FIELD ARTILLERY IN THE INTERWAR PERIOD

A Dissertation

by

DAVID ADAMS SHUGART

Submitted to the Office of Graduate Studies of  
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December 2002

Major Subject: History

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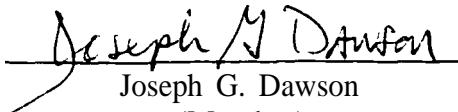
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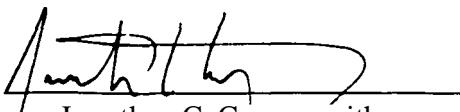
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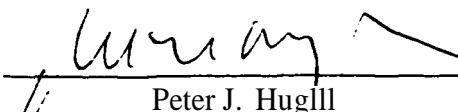
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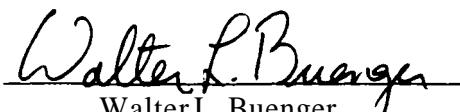
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## ABSTRACT

On the Way: The U.S. Field Artillery in the Interwar Period. (December 2002)

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Some U.S. military historians have viewed the interwar Army as stagnant and unimaginative. However, if this was so, why did the U.S. Army become rapidly effective in World War II? This study explores how one organization, the Field Artillery, studied the lessons of World War I and anticipated the demands of future warfare to improve its doctrine, tactics, and equipment. American field artillery officers developed three organizations that standout as the reasons for their branch's spectacular success in World War II: the integration of the forward observer with frontline infantry units, the addition of aerial observers spotting artillery fire from small sport planes, and the creation of centralized fire control at the battalion level, the Fire Direction Center (FDC). Yet, implementation of these changes created friction among those within and outside the Field Artillery who clung to established methods and organizations. Surmounting these challenges, the Field Artillery emerged after two decades of peace prepared to provide effective fire support for the U.S. Army in World War II.

For E. L. S.

## ACKNOWLEDGEMENTS

I would like to thank the members of my committee who have endured this seven-year odyssey with me, as a student and soldier. Your candor, editorial critique, and academic integrity have guided my research, writing, and foray into the history profession. I am also in deep gratitude to the professionals that assisted my research at the Morris Swett Library, Donovan Research Library, the National Archives, the Combined Arms Research Library, Center of Military History, United States Military Academy Library, and the Military History Institute. Thanks to Tim Nenninger and Mitch Yockelson at the National Archives for their expertise. Special thanks to Colonel (Ret.) Cole Kingseed. Without his support, this entire endeavor would not have been possible. Equally deserving thanks are my officemates and friends for their insight, encouragement, and admonishments: Abby Delfosse, Mary Johnson, Beth & Tim Konkus, Harry Laver, Dave Tozek, Sam Watson, and Lenny Wong. Dad, thanks for providing the combat infantryman's perspective. To my family: Thank you for your prayers and support, and at times, enduring a moody husband and father. Finally, I am responsible for all errors within this work.

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## CHAPTER I

### INTRODUCTION

*All the things that everybody had known [that] were terribly defective and inadequate, inadequate for our combat purposes, all of a sudden corrected themselves just about in time for us to get into World War II.*

*General (Ret.) Williston B. Palmer  
VII Corps Artillery Commander<sup>1</sup>*

The United States Army was and is an evolving organization. Since its establishment in 1775, the U.S. Army has undergone changes in its structure, equipment, and doctrine to meet the demands placed upon it. Sometimes these changes have wrought a superbly organized, equipped, and led army to fulfill its mission, as reflected in the victory in the Persian Gulf War (1991). Yet, at other times, the American army fell short as in its lackluster performance at the outbreak of the Spanish-American War (1898). After each war, the Army, formally or informally, has assessed its performance in combat and sought to improve itself through better doctrine, tactics, and equipment to fight the next conflict. Because of its obligation to defend the United States and support its policies, the Army's ability to prepare for the next battle has been, and will be the source of debate in military, academic, public, and political circles.

Critics complain that the Army leadership often does not garner the correct "lessons" from past battles and chooses to remain anchored to the equipment and tactics

This dissertation follows the stylistic format of the *Journal of Military History*.

<sup>1</sup>Williston B. Palmer, interview by H. L. Hunter, transcript, Senior Officers Oral History Program (1971-1972), Military History Institute (hereafter MHI), U.S. Army War College, Carlisle Barracks, Pa.: 19-20.

of the past. In doing so, the Army leadership fails to make improvements and modernize itself during peace. Nowhere is this debate more controversial than in discussion concerning the Army's development of equipment, tactics, and doctrine between World Wars I and II. Some military historians have viewed the interwar Army as unimaginative and assert that it was not until the hostilities in the late 1930's that the Army rushed to prepare itself to meet the dynamics of modern armored warfare. However, this argument fails to explain why the Army was able to make such rapid doctrinal and tactical adjustments that enabled it to defeat Nazi Germany and Imperial Japan.

The prefatory quote by General Williston B. Palmer echoes the commonly held view that the Army's tactical efficiency rapidly improved after the beginning of World War II because the senior military leadership modernized the Army after watching the Germans blitz through Poland and France. His comment is misleading, and does not provide sufficient explanation for the Army's dramatic modernization. Rather than an amazing transformation, Army reform was the result of a long and arduous effort which began immediately after World War I as army officers reflected upon the American Expeditionary Forces (AEF) shortcomings and grappled with the issue of how to move the infantry over the battlefield. These progressive officers realized that a new era of warfare was on the horizon in which mechanization would begin to dominate the battlefield. To be victorious, these officers knew they had to have an agile and responsive organization.

One member of the Army combat arms team, the Field Artillery, made significant changes in its organization during the interwar period that would contribute to its

impressive battle record in World War II. So effective was the American artillery that General George S. Patton proclaimed before a May 1945 postwar artillery conference: "I do not have to tell you who won the war. You know. The Artillery did."<sup>2</sup> Whether Patton meant to flatter his audience or not, the central question remains: How could an army that has been widely seen as stagnant and poverty stricken in the interwar period developed such a highly effective artillery in World War II?

The objective of this dissertation is to explore the organizational change within the U.S. Army between World War I and II. In appraising how the Army developed as a modern fighting force in the interwar period, this study will use the Field Artillery as a case study.<sup>3</sup> Three reasons stand out. First, World War I brought the previously unrecognized field artillery widespread acknowledgement as a highly effective and valuable combat arm.<sup>4</sup> Throughout the interwar period, artillery officers remained committed to retaining this hard won status. Thus, a study of the Field Artillery provides valuable insight into how military organizations seek to preserve their stature and viability during peacetime. Secondly, after the war, the Field Artillery conducted an extensive "lessons learned" process for itself and its equipment. Senior American

<sup>2</sup>U.S. Field Artillery School. *Right of the Line: A History of the American Field Artillery* (Fort Sill, Okla.: U.S. Army Field Artillery School, 1984), 36.

<sup>3</sup>In this dissertation, when "Field Artillery" is capitalized it represents the United States Army Field Artillery, while lower case denotes the field artillery in general.

<sup>4</sup>See Mark E. Grotelueschen's *Doctrine Under Trial: American Artillery Employment in World War I* for a detailed account of American artillery operations in World War I. Grotelueschen asserts that the performance of the AEF Artillery was successful when it used the Allies' trench warfare methods of preplanned targets and rolling barrages rather than the ambiguous doctrine of "open warfare" espoused by the AEF senior leadership. Mark E. Grotelueschen, *Doctrine Under Trial: American Artillery Employment in World War I* (Westport, Conn.: Greenwood Press, 2001).

officers believed the examination and inculcation of these lessons would improve the artillery's doctrine and schooling. Consequently, a study of this process allows the researcher to determine the influence of the war experience throughout the organization. Finally, the field artillery must shoot, move, and communicate to execute its mission on the battlefield. All three mission requirements link directly to the interwar era's rapidly evolving technologies in mechanization, aviation, and communication. Thus an examination of the U.S. Field Artillery provides an ideal lens in which to evaluate an interwar army organization's ability to use its past war experience and to integrate future technology and tactics to prepare for war.

In *A Guide to the Sources of United States Military History*, Daniel Beaver asserts most military historians place the interwar U.S. military establishment "within a general stream of American institutional 'modernization' in 20<sup>th</sup> Century America."<sup>5</sup> The majority of academic debate surrounding the "modernization" or development of the U.S. Army divides into three interpretations. The first, best summarized by Russell Weigley, argues that the primary cause that impeded Army modernization after World War I was a shortage of money. Consequently, the Army languished because it was unable to procure, test, and field new technology, much less hold joint exercises to validate new equipment and doctrine. In his *History of the United States Army*, Weigley states that the interwar army's lack of funding left it "attuned to the combat styles of

<sup>5</sup>Daniel R. Beaver, "World War I and the Peacetime Army, 1917-1941," in *A Guide to Sources of United States Military History*, Supplement II, eds. Robin Higham and Donald J. Mrozek (Hamden, Conn.: Archon Book, 1986), 101.

1918 rather than to the war of armor and aircraft that the Germans were about to unleash.<sup>6</sup> Another view, typified by David E. Johnson's *Fast Tanks and Heavy Bombers*, contends that the Army's own "internal barriers to change and the myopic vision of single-issue constituencies that contributed significantly to the Army's unpreparedness for World War II – perhaps more so than the external challenges."<sup>7</sup> A third interpretation disagrees with the internal one, and argues that the American armed forces, despite external constraints imposed by scanty resources and an indifferent citizenry, did exceptionally well in preparing for future warfare.<sup>8</sup> Thus, a detailed study of the U.S. Field Artillery offers a way of examining and testing the existing, and conflicting, historical interpretations of the interwar Army.

The Field Artillery also offers a relatively unstudied means of exploring the interwar U.S. Army. Boyd Dastrup's *King of Battle: Branch History of the United States Field Artillery* is an official history which focuses almost entirely on technological and organizational changes. Mirroring Weigley's assessment of interwar development, Dastrup blames Congress's failure to fund development as the Field Artillery's primary

<sup>6</sup>Russell F. Weigley. *History of the United States Army* (New York: Macmillan Co., 1967), 419. Martin Blumenson, "Kasserine Pass, 30 January - 22 February 1943," in *America's First Battles*, eds. Charles E. Heller and William A. Stofft (Lawrence: Univcristy Press of Kansas, 1986), 226-27.

<sup>7</sup>David E. Johnson, *Fast Tanks and Heavy Bombers: Innovation in the U.S. Army, 1917-45* (Ithaca, N.Y.: Cornell University Press, 1998), 2.

<sup>8</sup>Ronald H. Spector, "The Military Effectiveness of the US Armed Forces, 1919-39," in *Military Effectiveness, Volume II: The Intenvar Period*, eds. Allan R. Millett and Williamson Murray (Boston: Allen and Unwin, 1988), 70-97. Millett proffers four areas that must be addressed when studying interwar innovation: strategic calculations among national military planners, technology-innovation relationship, the organizational politics of innovation, and civil-military collaboration on technology development. Millett, "Patterns of Military Innovation in the Interwar Period," in *Military Innovation in the Intenvar Period*, 329-68.

obstacle in developing weapons and doctrine. Perhaps because it is an official history, Dastrup's work tends to downplay institutional and personal rivalries. In contrast, this study focuses on personal, institutional, and organizational rivalries and devotes far more attention to the crucial areas of centralized fire direction, aerial observation, and mechanization that were instrumental to the Field Artillery's success in World War II.<sup>9</sup>

This work will concentrate on three primary questions. First, what was the artillery's tactical, technological, and organizational status immediately after World War I? Second, how did the U.S. Army perceive, study, and adopt the evolving technology and doctrine of the era in light of its World War I experience? Finally, what were the causes that encouraged or inhibited the artillery's preparations for future hostilities?

Chapter II, "After the Smoke Clears," examines the American artillery doctrine and organization immediately after World War I to analyze the postwar debates and developments, and concludes with the interwar Army's capstone doctrinal guide – *Field Manual 100-5, Operations*.

Chapter III "Eliminating the Middleman: The Fire Direction Center," traces the development of perhaps the most acclaimed innovation in the interwar field artillery. The establishment of a centralized gunnery team at battalion level revolutionized the

<sup>9</sup>Boyd L. Dastrup, *King of Battle, A Branch History of the U.S. Army's Field Artillery* (Fort Monroe, Va.: Office of the Command Historian, United States Army Training and Doctrine Command, 1992). Before Dastrup's work, the only other book to solely focus on the history of the U.S. Artillery was Fairfax Downey. *Sound of Guns* (New York: David McKay Company, Inc., 1956). Peter Mansoor's *The GI Offensive in Europe: The Triumph of American Infantry Divisions, 1941-1945*, refutes the common notion that the American units were tactically successful because they fought a beleaguered and poorly supplied enemy. He convincingly argues that American divisions were tactically effective and that the "artillery was the American army's greatest asset in World War II." Peter R. Mansoor, *The GI Offensive in Europe: The Triumph of the American Infantry Divisions, 1941-1945* (Lawrence: University Press of Kansas, 1999), 121.

scope and speed of the artillery's effectiveness, an effectiveness that proved itself in World War II. The chapter begins with prewar theorizing to the tests conducted by the Gunnery Department at the Field Artillery School at Fort Sill, Oklahoma, in 1929.

Chapter IV, "The Forward Observer: The AEF Legacy," and Chapter V, "The Forward Observer: In Combat," analyze the infantry and field artillery relationship. Beginning with World War I through the interwar period, Chapter IV tells how army officers sought to solve the shortcomings of the field artillery to provide close fire support for the infantry in World War I. The chapter also examines how the infantry and artillery tried separate solutions to surmount the close support problem and shows how competition for scarce resources and service parochialism inhibited effective cooperation. Chapter V discusses how the artillery forward observer in World II enabled the artillery to provide the close and effective fires that the infantry had longed for in World War I.

Chapter VI, "The Flying OP: From Kittyhawk to Post Field," and Chapter VII, "The Flying OP: From Post Field to Battlefield," examine the field artillery's prolonged campaign to develop its own aerial observers, one of the critical components to the field artillery's success in World War II. Chapter VI begins with the Signal Corps and Field Artillery's first attempts to train aerial observers in 1911, then provides an overview of the AEF's aerial observation experience in World War I, followed by the Air Corps and Field Artillery feud over who should train and command aerial observers throughout the interwar period. Chapter VII begins with the Chief of Field Artillery Brigadier General Robert M. Danford's attempt to renew the air OP debate in 1938. Once European

hostilities commenced in 1939, the artillery and aviation feud over aerial observation intensified against the backdrop American training exercises. The chapter concludes with a review of the artillery air OP's combat record.

Chapter VIII, "Modernizing the Movers and Shakers," studies the artillery's attempts at motorization, mechanization, communication, and weapon development in the interwar period. In contrast to the efforts to change its organization with an effective forward observer and aerial observer, the slow modernization of field artillery equipment conforms to the stereotypical images of an obsolescent force equipped with World War I surplus.

Chapter IX, "Conclusion," reviews the study and the state of the Field Artillery just before it entered World War II. This chapter finalizes my answers to the question posed about the field artillery and the Army's interwar development. Chapter IX seeks to place in context how the Army has looked upon its past to find a basis for development, yet at the same time looked forward and considered the changing world and technology that it would use and confront in future wars.

No doubt, the focus on outdated AEF doctrine and tactics and equipping itself with World War I stocks contributed to the interwar Army's image as a woefully prepared force for modern mobile warfare. Few military scholars will deny that these were not legitimate factors that inhibited the advancement of the Army. To state the American army remained a monolithic, bureaucratic, and a static organization throughout the interwar period is too simplistic. The fact remains that the Army had in

place at the outbreak of World War II the organizations, doctrine, tools, and tactics to win the war.

This was especially true concerning the Field Artillery. Immediately after World War I, the Field Artillery leadership identified its tactical shortcomings and sought to improve itself effectiveness. The Field Artillery's shortcomings did not "all of sudden correct themselves" as Palmer intimated, but had been the result of a concerted and continuous effort. As in the words of the battalion fire direction radio operator telling the forward observer that his requested mission was "On the Way," the Field Artillery made tactical and technical improvements throughout the interwar period which enabled it to become the effective fire supporter that could meet the tactical demands of an American corps advancing across the plains of Europe or an infantry patrol slogging through a Pacific island jungle.

## CHAPTER II

### AFTER THE SMOKE CLEARS

*The importance of well-organized and trained artillery was recognized in Army circles before United States declared war. . . The Nation boasts of its wonderful achievement in building ships and turning out munitions of war, but in no less a sense, is the development of the Field Artillery one of the greatest achievements of this country.*

*Major General William J. Snow  
Chief of Field Artillery  
14 October 1919<sup>10</sup>*

Reviewing the Army's chaotic mobilization and its uneven military record in the Spanish-American War (1898), Congress made a concerted effort to reform the Army to better prepare it for the nation's next war. Under the leadership of Secretary of War Elihu Root, the War Department in the ensuing decade founded the Army War College, created the General Staff, modernized weapons, and strengthened relations between the Regular Army and the National Guard.<sup>11</sup> The artillery was not exempt from the Army's organizational overhaul. In 1907, after years of senior officer lobbying, Congress recognized the disparate missions of the Coast and Field Artillery within the Artillery Corps and passed legislation "to reorganize and to increase the efficiency of the artillery of the United States Army."<sup>12</sup> The Field Artillery and Coast Artillery were now

<sup>10</sup>U.S. War Department, *Annual Reports, 1919*, 3 vols. (hereafter *1919 WarDept. Annual Report*) (Washington: GPO, 1920), 1:5056.

<sup>11</sup>Weigley. *History of the United States Army*, 307, 311-18; Secretary of War, Annual Reports for the War Department for the Fiscal Year Ending June 30, 1899, 56<sup>th</sup> Cong. 1<sup>st</sup> Sess. H. Docs., 2:45.

<sup>12</sup>As mandated by Congress, "the coast artillery is the artillery charged with the care and use of the fixed and movable elements of land and coast fortifications, including the submarine torpedo defenses" and "the

officially two separate branches which no longer required officers to rotate between them. The congressional act also organized the independent field artillery batteries into field artillery battalions and regiments in order to permit the creation of positions for senior field artillery officers.<sup>13</sup>

Independence as a separate branch meant that Field Artillery officers could now concentrate on establishing the branch as a member of the Army line and codify field artillery tactics and techniques. But tactically and doctrinally, the field artillery remained wedded to those methods refined in the Civil War. Its first manual as an independent branch, *Drill Regulations for Field Artillery (Provisional) 1907* retained the 19<sup>th</sup> Century warfare tactics of direct fire, with only modest reference to the revolutionary gunnery technique used in the Boer and Russo-Japanese wars – indirect fire. With direct fire, the artillery battery commander positioned his guns hub to hub on a ridgeline and fired his battery in direct view of the enemy. But the growing lethality of small arms forced artillery commanders to emplace their guns behind protective hills, use observation parties to scan the battlefield for targets, and send firing commands to the guns. This technique was known as indirect fire and became the primary means of fire for the field artillery in the 20<sup>th</sup> century. Indirect fire brought a new challenge for the artillerymen:

field artillery is the artillery which accompanies an army in the field, and includes light artillery, horse artillery, siege artillery, and mountain artillery." U.S. War Department, General Orders No. 24, 2 February 1907, *General Orders and Circulars*, 1907 (Washington: GPO, 1908), 1-2.

<sup>13</sup>Alexander D. Schenk, "The Field Artillery of the Artillery Corps," *Journal of the United States Artillery* (hereafter JUSA) 19 (March-April 1903): 136; Dastrup, *King of Battle*, 158-59, 176.

how could they support the infantry when they could no longer see the effects of their fires or the soldiers they were supporting?

Woefully unprepared for modern warfare, the United States Field Artillery floundered in the same mobilization torrent that swept through the War Department in the late spring of 1917. In July, large numbers of men began to pour into training camps across the United States to find that there existed little or no equipment at all for them to learn how to fight on the battlefields "over there." At Fort Sill, Oklahoma, the incoming School of Fire commandant, Colonel William J. Snow, discovered most of his personnel and equipment gone – the War Department had sent the troops and their guns to participate in General John J. Pershing's punitive expedition into Mexico (1915-1916).<sup>14</sup> Equipment and troops shortages were not Snow's primary problem. His greatest deficiency was the lack of trained American artillerymen able to learn and teach the tactics and techniques necessary for modern combat.<sup>15</sup>

On 13 September 1917, Snow wrote to the War Department's Adjutant General emphasizing the urgent need of the Field Artillery to have its own branch chief. Snow believed only a qualified artilleryman could enact a coherent training system to provide competent artillerymen for the American army in France. He warned that "the immense

<sup>14</sup>William J. Snow. *Signposts of Experience: World War Memoirs* (Washington: United States Field Artillery Association, 1941), 143, 158. Snow graduated from West Point in 1890 and was commissioned a second lieutenant of Artillery. His various assignments before World War I included duty in New York City, Louisiana, and the Philippines. He rose through the ranks and commanded three field artillery battalions before he became the Commandant of the Field Artillery School of Fire in September 1917. William J. Snow, General Officer Files, Center of Military History, Historical Records Branch, Fort Lesley J. McNair, Washington, D.C. (hereafter CMH).

<sup>15</sup>1919 War Dept. Annual Report, 1:5053, 5150.

expansion that is taking place in the regular field artillery results in many inexperienced officers being in responsible positions, while officers of no experience at all are in command of organizations of the organized Militia and National Army... The entire field artillery of the Army of the United States in general is to-day [sic] without any efficiency, and it is incapable of taking part in a campaign.<sup>16</sup> Underscoring Snow's argument, of the one hundred artillery officers sent with the AEF in July 1917, only forty-nine of the officers were considered trained field artillerymen. The schools Pershing, now commander of the AEF, established in France suffered the same problems as their stateside counterparts – the absence of knowledgeable American officers and noncommissioned officers (NCO's) to serve as instructors. Manpower and equipment shortages may have further impeded the AEF's inability to train its forces, but the critical failure of American artillery was its tactics and techniques.<sup>17</sup>

At rudimentary levels, American artillery prewar technical manuals were conceptually sound – there are only so many ways for a cannon crew to service their piece and move it on the battlefield. This held true for firing battery operations, whether American or Allied, because all regulations involved creating an organization that could

<sup>16</sup>Field Artillery Board, Subject: Urgent needs of Field Artillery, 13 September 1917, Report No. 15052, 1 October 1917, Records of the War Department General Staff, Office of the Chief of Staff Correspondence, 1907-1917, Box 158, Entry (hereafter E) 5, Records of the War Department General and Special Staffs, War College Division and War Plans Division, Record Group (hereafter RG) 165, National Archives, College Park, Md. (hereafter NARA). To conceptualize the artillery's expansion in the war, one should realize that on 6 April 1917, the total strength of the Field Artillery (Regular) was 275 officers and only 5,253 enlisted men. By 11 November 1918, the branch numbered 22,393 officers and 429,760 men.

<sup>17</sup>Snow, *Signposts of Experience*, 49, 225; 1919 War Dept. Annual Report, 1:5073, 5193, 5196-207; Robert L. Bullard. *Personalities and Reminiscences of the War* (Garden City, N.Y.: Doubleday, Page and Co., 1925), 60-61,293-96.

move and shoot four guns in an efficient manner. Since the publication of its own manual as an independent branch in 1907, Field Artillery manuals provided the technical guidance to efficiently drill, move, and shoot a battery and even mentioned the new technique of indirect fire introduced in the Russo-Japanese War. But neither the 1907 or the 1916 artillery manuals addressed the key artillery problem in World War I – massing fires for the infantry at the divisional, corps, and army levels.

As the AEF awoke to a fuller realization about its ignorance of modern artillery in mass warfare, it commenced a hurried training program. AEF artillery brigades underwent a six-week course at French administered and instructed training camps. While gun crews trained at the camps, French and AEF headquarters arranged for the artillery regimental commanders and their staffs to observe the work of corresponding French officers engaged on the frontlines. After completing camp training, the artillery brigade commander deployed his battalions into different sectors of the Western front from ten days to two weeks. Unfortunately for most U.S. units, this six-week training program was rarely accomplished. AEF Headquarters placed most units into quiet sectors well before all required training was completed. Prepared or not, AEF artillery units deployed to the front and fought with their respective divisions. Through their battlefield experience, the American artillerymen discovered, learned, and then executed their fire support mission as a part of a modern mass army.<sup>18</sup>

<sup>18</sup>Memorandum, 16 July 1918, Subject: Artillery Training, in U.S. Army, 1<sup>st</sup> Division, *World War Records: First Division, AEF, Regular*, ed. P. L. Ransom, 26 vols. (Washington: Army War College, 1930-1933) (hereafter FDWR), vol. 21; *1919 War Dept. Annual Report*, 1:5210-11. The 1<sup>st</sup> Division volume set contains copies of actual divisional unit documents with only editorial comments for incorrect

By November 1918, the American field artillery was no longer the tactically outdated and hastily organized branch it had been in April 1917. At the time of the November 1918 Armistice in France alone, the U.S. had eighty-five artillery regiments composing its various divisional, corps, and army units along with flank and sound ranging battalions, various specialty schools, and an Artillery Information Service. Trying to capitalize on learning the lessons of its transformation, Major General Ernest Hinds, the AEF Chief of Artillery, asked Pershing's headquarters to authorize him to form a board to study the lessons learned by the AEF artillery combat operations just two weeks after the armistice. This board would be the first of several panels and would set the precedent in how the American artillery officers would perceive the war's lessons and the changes needed to improve the future of their organization.<sup>19</sup>

Meeting on 9 December 1918, Brigadier Generals Andrew Hero and John W. Kilbreth and Lieutenant Colonel Curtis H. Nance studied the "experience gained by the Artillery of the AEF and to submit recommendations based upon such study."<sup>20</sup> Taking the name of its senior member, the Hero Board sent questionnaires to the wartime commanders of AEF artillery brigades, regiments, field trains, and schools to gather

spelling of proper names. Pages are unnumbered. Memorandums, orders, maps, tables, and war diaries are generally listed by unit name and chronologically by date.

<sup>19</sup> 1919 War Dept. Annual Report, 1:5051, 5103-4; Report of Hero Board: Proceedings of the Board of Offices Convened by the Following Order, General Headquarters American Expedition Forces, Office, Chief of Artillery, 22 March 1919 (hereafter Hero Board), Morris Swett Library (hereafter MSL), Fort Sill, Okla., 1.

<sup>20</sup> Hero Board, 1.

relevant information.<sup>21</sup> The questionnaire sought "recommendations for changes in organization, armament, transport, equipment, training, supply, etc., based on your experience, or the experience of officers under your command."<sup>22</sup> The completed questionnaires covered a myriad of subjects on the organization of artillery from battery to corps. Generally, the respondents were positive about AEF equipment and personnel, with the conspicuous exception of aerial observation. Artillery officers harshly criticized the Air Service for its inability to provide adequate liaison support. Among all areas studied, the Hero Board concluded that the infantry and the artillery needed to understand each other's capabilities and limitations, and to work closely together.<sup>23</sup>

On 27 March 1919, after four months, the Hero Board submitted an 840-page report to the AEF Chief of Staff and the AEF Chief of Artillery. Its major recommendations included keeping the field and coastal artillery as separate branches, motorizing heavy and medium field artillery units, assigning trench mortars to the infantry, and providing artillery units with their own aerial observers. Hinds endorsed the report, and forwarded it "to the War Department for consideration in connection with the study of the future organization, armament, equipment and training of the Field

<sup>21</sup>Some respondents would figure prominently in the interwar field artillery and army: Ernest Hinds, the first significant postwar Field Artillery School Commandant, Charles P. Summerall, Army of Chief of Staff (1926-1930), Brigadier General Dwight E. Aultman, commandant of the Field Artillery School (1928-1929); Brigadier General Harry G. Bishop, Chief of Field Artillery (1931-1934); Major General William I. Lassiter, Assistant Army Chief of Staff. *Official Army Register* (Washington: GPO, 1923), 11, 22, Special Collections, United States Military Academy (hereafter USMA), West Point, New York.

<sup>22</sup>*Hero Board*, 22.

<sup>23</sup>Ibid., 20, 663, 674.

Artillery.<sup>24</sup> Though the report reflected many lessons to "learn" from its experience, the Board's findings were a confirmation of World War I tactics and techniques, rather than a vision for a future field artillery organization. All recommended changes to the battery, battalion, regiments, and brigades tables of equipment and organization were minor or pertained to the peculiarities of the war. The Board's equipment recommendations were the logical extensions of the desire to find better trucks and tractors to pull field artillery pieces. Focused only on materiel solutions, they omitted any discussion on improving the artillery's ability to compute accurate and timely firing data for its guns, the merits of centralization or decentralization of planning fires for operations larger than a division, and the optimal methods of tactical fire direction by battalion, regimental, and brigade commanders.

After the Hero Board, perhaps the most significant postwar artillery board met to examine equipment and weapons – the Westervelt Board. Also called the Caliber Board, this board, composed of senior AEF artillery officers, convened in the early spring of 1919. Board members interviewed Allied officers, toured factories in Europe and the United States, and scrutinized the field artillery's wartime materiel. Concluding its work in May 1919, the Caliber Board's final report served as the guide for the development field artillery vehicles and weapons throughout the interwar period.<sup>25</sup>

<sup>24</sup>Ibid., i, 2-18, 30.

<sup>25</sup>"Study of the Armament and Types of Artillery to be Assigned to a Field Army," *FAJ* 9 (July-August 1919): 289-347; Dastrup, *King of Battle*, 181-83; Larry D. Roberts, "American Field Artillery, 1930-1939" (master's thesis, Oklahoma State University, 1977), 14; Report of the Board on Motorization of Field Artillery, 2 July 1919, Box 3, E 23, Records of the American Expeditionary Force, RG 120, NARA.

Contemplating the tactical and organizational changes that occurred within the AEF, Pershing appointed a board, known as the Superior Board, in April 1919 "to consider the lessons to be learned from the present war in so far as they affect tactics and organization."<sup>26</sup> Chaired by Major General Joseph T. Dickman, the board was to review the findings and recommendations from the previous individual branch boards (e.g., Field Artillery, Heavy Artillery, Cavalry, Infantry, and Medical Corps). Unhappy with the cumbersome AEF infantry division, Pershing instructed the board to propose a more maneuverable tactical unit. The Field Artillery representative was Major General William I. Lassiter from Third Army Artillery. Lassiter's study of the AEF Artillery was one of ten major studies conducted during the Superior Board proceedings and was also known as the Lassiter Board. Arriving at Pershing's headquarters, Lassiter believed initially that his task would be to determine the "degree to which artillery should hereafter be motorized."<sup>27</sup> Meeting on 1 May, the group found itself without a specified agenda. Neither Pershing nor his Chief of Staff, Major General James W. McAndrew, provided clear guidance as the purpose of the board, and consequently after Lassiter's urging, the members drafted an outline of study and then decided to meet later. Convening three weeks later, the board soon found itself embroiled in intra-branch

<sup>26</sup>American Expeditionary Forces, *General Orders and Bulletins, 1917-1919*, General Headquarters, AEF, General Orders No. 68, 19 April 1919, USMA. Report of Superior Board on Organization and Tactics, AEF Boards, Box 12, E 23, RG 120, NARA.

<sup>27</sup>William I. Lassiter, Notes and Diaries, Volume XI, War Experiences in France and Germany, 1 December 1917 to 6 August 1919, 96-97. Headquarters Third Army, American Expeditionary Forces, General Order 36, 26 April 1919, Notes and Diaries, Volume XII, Miscellaneous Documents 1919 both found in Box 3, William I. Lassiter Papers, USMA; Report of Superior Board on Organization and Tactics, AEF Boards, Box 12, E 23, RG 120, NARA. The Superior Board Report is available online: <http://carlisle-www.army.mil/usamhi/DL/chron.htm#AWorldWarI19141918>.

disagreements on the organization of its proposed army. Lassiter commented it was a "silly sort of business" and that the board members "don't concern themselves about the substance. They want the form."<sup>28</sup>

Having "argued practically on everything," Lassiter and his fellow Superior Board members finished their work on 1 July 1919.<sup>29</sup> In regards to the Field Artillery, the Superior Board echoed many Hero Board recommendations and stressed that a chief lesson of the war was that the cooperation between combat arms was essential. Other recommendations concerned the artillery's organizational structure and ammunition supply. The Superior Board realized that AEF combat operations had demanded a flexible organization able to provide various amounts of artillery support and recommended that army artillery consist of four levels of fire support: division, corps, army, and a general reserve of artillery. Within these four organizational levels, the senior field artillery commander could easily shape his artillery force through adding and subtracting battalions from corps and above units to augment the firepower for a division, corps, or army.<sup>30</sup> Emphasizing that the brigade divisional artillery was "urgently necessary," the Superior board recommended that a division's artillery should be "an organic part of the division and should not be separated from it except when such

<sup>28</sup>Notes and Diaries, Lassiter Papers, USMA, 11:107.

<sup>29</sup>Ibid.

<sup>30</sup>Notes and Diaries, Lassiter Papers, USMA, 11:108; "An Artillery Study Made in the AEF," parts 1 and 2. *Field Artillery Journal* (hereafter FAJ) 10 (January-February 1920); 10 (March-April 1920): 104, 108.

separation is absolutely unavoidable."<sup>31</sup> With an established organic relationship within the artillery-infantry team, the Superior Board ensured that an infantry division always had a minimum level of internal fire support. Asserting that the "infantry and artillery which are to work together in combat must train together and must live together to the greatest extent possible," the board again followed the AEF artillery organization and recommended the addition of a liaison team within each field artillery battalion to work with their assigned infantry headquarters.<sup>32</sup>

In the AEF, non-divisional artillery, whether corps, army, and reserve units, were not permanently assigned to specific units as were the organic divisional regiments. To meet or augment the artillery support for a corps or army, the army Chief of Artillery could assign regiments and battalions in one corps or army to move and attach itself to a new command. The Superior Board followed the AEF practice and assigned the corps artillery to neutralize and destroy enemy artillery, interdict and eliminate enemy reinforcements, and neutralize and disrupt lines of communications and command posts immediately behind the frontlines. Organic units within the corps would include two regiments of 155-mm (6-inch, howitzer and gun), a regiment of 4.7-inch (120-mm) guns, and three battalions of various types of anti-aircraft artillery. Also, a fixture among the corps field artillery units were liaison teams attached to an infantry headquarters or an artillery battalion command post that coordinated their unit's reinforcing fires. Army

<sup>31</sup>"An Artillery Study Made in the AEF," part 2, 94-96.

<sup>32</sup>"An Artillery Study Made in the AEF," part 1, 53-54. Notes and Diaries, Lassiter Papers, USMA, 11:94-96, 104-6.

artillery, using long-range guns, would fire on targets well beyond the immediate frontline and strike at railroad junctions, airfields, enemy camps, and war production facilities. The Superior Board explained that the current artillery organization lacked such units and was merely a headquarters. The General Reserve of Artillery would consist of guns of all calibers and be used to supplement army artillery. Influenced by the massive amounts of artillery used in the American offensive campaigns in the war, the Superior Board recommended that reserve artillery exist to meet the operational requirements that their proposed artillery organization would need using the Meuse-Argonne offensive operational scenario.<sup>33</sup>

Artillery ammunition supply for the AEF had been a logistical monster. The Superior Board admitted that "we did not soon enough grasp the magnitude of the task involved and provide the large numbers of skilled personnel needed for receiving, sorting, and issuing this ammunition at dumps, and for forwarding it to the guns; moreover, we did not provide an adequate number of well-equipped dumps."<sup>34</sup> To supply ammunition, the AEF Chief of Artillery had to estimate the amount of ammunition to request from the Supply Staff Office (G-4) for the entire force. The army artillery chief needed to calculate the daily consumption rate and amounts needed for

<sup>33</sup>In addition to the Hero and Superior Boards, the Caliber Board recommended the organization of a field army's artillery of a division, corps, and army. Reserve artillery was a contentious issue for the Field Artillery leadership. Prior to the Superior Board's recommendations, the long standing philosophy of the Field Artillery was as the 1916 regulation stated: "The true reserve of Field Artillery is the ammunition train." Those who opposed an artillery reserve cited the fact that unused artillery units robbed the infantry commander of potentially decisive assets. By World War II, the idea of a reserve artillery fell out of favor and was not used in World War II. *1916 Field Artillery Drill and Service Regulations*, 4:11.

<sup>34</sup>"An Artillery Study Made in the AEF," part 2, 98.

specific missions and then balance this against ammunition already on hand at army, corps, and division depots, not to mention the ammunition already on hand at the batteries. Too much ammunition would tax the resupply system beyond its carrying and handling capacity. Too little ammunition and an artillery commander could find his guns idle, unable to support the infantry. Evaluating the AEF's ammunition problems with the multiple middlemen in the supply chain, the board surmised that the best solution was "to fix the responsibility for the working of this whole complex process as closely as possible on one definite agency."<sup>35</sup> For the Superior Board Artillery Committee, that one definite agency would be the division artillery ammunition train equipped with a fleet of trucks. As with most of its proposals, the artillery leadership discounted reliance upon other branches and sought to solve its own problems with its own internal organizations and equipment.<sup>36</sup>

A year after the Superior Board released its report, a critical Pershing attached his own endorsement before sending it to the Secretary of War. Though recognizing the

<sup>35</sup> Ibid., 98. In the AEF ammunition supply system, corps artillery commanders allocated the ammunition supply rate (number of shells, fuzes, and projectiles) to divisional commanders, who similarly allocated a ammunition supply to regimental commanders, who in turn finally distributed the ammunition to their batteries. Corps commanders moved the ammunition with army ammunition trains (trucks or light rail) from army level dumps (ammunition holding areas) to corps dumps, and sometimes divisional dumps. From the divisional dumps, or if the unit was a member of the corps, the regimental artillery trains would then deliver the ammunition to the batteries. Board members dismissed the recommendation that the Ordnance Corps be the responsible agency for resupplying the Field Artillery.

<sup>36</sup>"An Artillery Study Made in the AEF," part 1, 59-60; "An Artillery Study Made in the AEF," part 2, 95-96, 105-106; General Service Schools, *Tactical Employment of Field Artillery* (Fort Leavenworth, Kans.: The Command and General Staff School Press, 1936), 51-53, 166. In addition to recommending the ammunition system and organizational structure, the Superior Board proposed that the divisional artillery brigade motorize one 155-mm regiment and one of the two 75-mm regiments. The Board specified that the divisional artillery ammunition train should be comprised of one depot company and four ammunition companies with each company having twenty-seven three-ton trucks.

ability and expertise of those officers who composed the Board, Pershing wrote in June 1920, "that the members were unduly influenced by the special situation which existed during our participation in the World War... Thus in my opinion, the recommendations of the Superior Board are based upon the necessities of stabilized warfare in Western Europe rather than upon the requirements of warfare of the character and in the theater upon which we are most likely to be engaged."<sup>37</sup> Pershing's views "materially" differed from those of the Superior Board. In his endorsement, the AEF commander and future Chief of Staff of the Army (1921-1924), stressed that the new division organization should be "elastic" to "permit rapid and greatest practicable expansion."<sup>38</sup> Pershing had now determined that the AEF infantry division was too large and immobile and he recommended cutting the division personnel from over twenty-eight thousand to twenty-thousand men. In doing so, he reduced the division's organic artillery from two 75-mm regiments to one. Pershing reasoned "every division at rest and in training should invariably have its organic artillery with it; the only way that this result can be secured is to reduce the artillery permanently assigned the division to the lowest possible limits."<sup>39</sup>

<sup>37</sup>Wrapper Indorsement, Forwarding Report of AEF Superior Board on Organization and Tactics, GHQ, AEF, Washington, D.C., 16 June 1920. AEF Boards. Box 12, E 23, RG 120, NARA.

<sup>38</sup>Ibid.

<sup>39</sup>Ibid.. 1-4. At the War Department, the General Staff recognized that the differences between Pershing and the Superior Board were so acute that it appointed Colonel Lassiter (reduced from his wartime rank) to head a committee to resolve the dispute.

His proposal sharply differed with Superior Board's belief that there should be "no very radical changes in artillery organization."<sup>40</sup>

The influence of the postwar review boards upon the development of artillery doctrine and tactics is difficult to determine. Largely a senior officer after-action review of AEF artillery combat operations, the Hero Board contributed primarily as a referral document for the Superior Board. On the other hand, the Superior and Caliber Boards did cast perceptible shadows upon the development of interwar artillery equipment and tactics. Though it largely recommended the same organizational structure of the AEF and the Hero Board findings, the Superior Board avocation of a flexible artillery force which enabled a senior artillery commander to structure his artillery force to best provide the necessary fire support for an infantry or cavalry commander remained the basis of all interwar discussion of the artillery force structure. Another Superior Board legacy was its proposed ammunition system that closely paralleled the ammunition resupply organization outlined in *Field Artillery Field Manual* (1931) and other branch manuals throughout the interwar period.<sup>41</sup> In his annual Field Artillery lecture before the Army War College students in 1934, the Chief of Field Artillery, Major General Upton Birnie, remarked that of the postwar boards that: "The reports of two of these Boards [Superior and Caliber] are of especial interest to us today. The Caliber Board studied and reported

<sup>40</sup>Wrapper Indorsement. Forwarding Report of AEF Superior Board on Organization and Tactics, GHQ, AEF. Washington. D.C.. 16 June 1920, AEF Boards. Box 12, E 23, RG 120, NARA. "An Artillery Study Made in the AEF," 104.

<sup>41</sup>U.S. War Department, *Field Artillery Field Manual, Tactics and Technique*, 2 vols. (Washington: GPO. 1931). 2:450-60; General Service Schools, *Tactics and Technique of Field Artillery*, with Changes #1, 1 July 1931 (Fort Leavenworth, Kans.: The General Service Schools Press, 1927), 56-69.

on armament for the field artillery, while the Superior Board [studied] on Organization and Tactics ... Our efforts ever since the War, have been directed towards carrying out such of their conclusions and recommendations as have been found feasible and possible of fulfillment.<sup>42</sup> Undoubtedly, the Caliber remained the Field Artillery's most influential board with successive Chiefs of Field Artillery continually referring to it as the benchmark on what type of future howitzers and guns the field artillery would need. Not until the War Department's mobilization efforts in 1939 did Chief of Field Artillery Major General Robert M. Danford initiate a study to reevaluate the results of the Caliber Board.<sup>43</sup>

Along with the AEF equipment and tactics, American artillery officers also debated whether what they had learned of World War I trench warfare methods should be incorporated in postwar doctrine. Pershing and many AEF commanders believed that the trench warfare they had encountered on the Western Front could be overcome with "open warfare." Finding the precise definition of "open warfare" is unattainable. For Pershing, it conveyed the idea of mobile warfare with the fire and maneuver infantry units with their rifles and the bayonets.<sup>44</sup> For Chief of Field Artillery Snow, the meaning

<sup>42</sup>Upton Birnie, Jr., Chief of Artillery, "Developments in Organization, Armament and Equipment of the Field Artillery," Army War College (here after AWC) Lecture (hereafter AWCL), 20 September 1934, G-3 Course No. 5, 1934-1935, MHI, 1.

<sup>43</sup>See Chapter VIII, "Modernizing the Movers and Shakers." for a complete discussion of the Caliber Board. Birnie, "Field Artillery Developments in Employment, Armament and Organization," AWCL, 14 October 1937, G-3 Course No. 13, 1937-1938, MHI, 5; Restudy of the Caliber Report, March 1939, MSL, 2.

<sup>44</sup>On 5 September 1918, the AEF Headquarters issued *Combat Instructions* in response to AEF units ignoring Pershing's early guidance on how to employ "open warfare" tactics. The AEF pamphlet stated that "the essential difference between open and trench warfare, so far as effect upon formations is

of open warfare was any method found in the pages of the American *1916 Field Artillery Regulations* – tactics and techniques not corrupted by European trench warfare.<sup>45</sup> In his autobiography *Signposts*, Snow never defined "open warfare," but called trench warfare methods "evil."<sup>46</sup> Trench warfare methods, sometimes called "map firing," likewise cannot be precisely defined. Generally, it was those artillery tactics that involved calculating firing data via map coordinates, shooting at suspected targets without observation, and firing barrages (e.g., rolling, standing, and box barrages). Ultimately, American field artillery officers equated trench warfare methods with those tactics and techniques used by the Allies and the AEF. For senior artillery officers, many of whom had remained stateside during the war, trench warfare tactics squashed the initiative and aggressiveness of the field artillery.<sup>47</sup>

concerned, is characterized by the presence or absence of the rolling barrage ahead of the infantry." In the pamphlet's "open warfare" example, an infantry platoon would use its scouts moving well forward (hundreds of meters) of the platoon to "compel" enemy machine guns to open fire or bypass the enemy position. Under the scouts' covering fire, the platoon would advance individually or in small groups to reinforce the scout line using every possible advantage of the ground to obtain cover. Using frontal and flanking fire, the platoon used its rifle and automatic rifle fire to pin down the enemy machine gunners, and at the appropriate time, the platoon leader sent elements of his platoon to envelop the position using short rushes. U.S. War Department, *Combat Instructions*, Document No. 868 (Washington: GPO, October 1918). 7-9.

<sup>45</sup> According to War Department divisional training guidance, "open warfare" for divisional artillery required it to "move quickly from position to position and to promptly open fire in its new position; to prepare firing data by rapid methods; to establish rapidly various classes of communications and to maintain them with minimum of inconvenience to other troops and to establish and operate a proper artillery intelligence service." U.S. War Department, Training Circular (hereafter TC) No. 12, *Combined Training of a Division* (Washington: GPO, 1918), 19.

<sup>46</sup> Snow, *Signposts of Experience*, 45.

<sup>47</sup> John J. Pershing, *My Experiences in the World War*, 2 vols. (New York: Frederick A. Stokes, 1931), 2:358; Preliminary Report of the Commander-in-Chief, G-3, General Headquarters, American Expeditionary Forces, 16 January 1919, in Center of Military History, *United States Army in the World War*, 17 vols. (hereafter USAWW) (1948; reprint, Washington: GPO, 1988), 12:21-22; Headquarters,

Writing the lead article in the first post-war edition of the *Field Artillery Journal*, Snow fired the first editorial shot in the artillery doctrinal debate with his defense of the prewar open warfare oriented doctrine.<sup>48</sup> He blamed three factors on what he saw was the unfortunate effect of the war on the technical thinking of field artillery officers. The first factor was that the U.S. Army leadership, realizing that it was sending its troops to a static front, chose to train its forces in trench warfare methods rather than taking time to teach the open warfare methods it might or might not confront later. According to Snow, "newly commissioned officers – ignorant alike of open and of trench warfare, their ears ringing with ideas concerning the latter enunciated on all sides – naturally considered trench warfare of paramount importance." Secondly, he believed that the experienced officers, immersed in an environment dominated by trench warfare talk on all sides, "were naturally prone to believe that they had wasted years in learning something which was obsolete in so far as this war was concerned." The Chief thought this was a natural, but unfortunate, consequence that had warped the technical and tactical thinking of the field artillery's commissioned leaders and now prevented them from relearning or

AEF, General Orders No. 4, 5 January 1918, USAWW, 16:157-58; Snow, *Signposts of Experience*, 45; Roger D. Swaim, "The Field Artillery – Progress or Retrograde," FAJ 9 (April-June 1919): 218-19.

<sup>48</sup>Snow was not alone in his belief that trench warfare tactics squashed the fighting spirit of artillerymen, and thus the effectiveness of his branch. Writing to the Chief of Field Artillery, Brigadier General Dennis H. Currie, School of Fire Commandant, bemoaned the fact that his Tactics Department director favored trench warfare methods: "Kennedy must have had excellent service in France and may be a better man for head of that department than I think. But he appears to me to lack the aggressiveness to impress his views upon the student officers, even if he has pronounced views on the question of the tactics of field artillery. If anything has been impressed on us by reports of our best officers in France, it is the lack of aggressiveness on the part of most of our field artillery in the support of the infantry after getting beyond the trenches." Dennis H. Currie to William J. Snow, 25 June 1919, Miscellaneous Correspondence Pertaining to Fort Sill, Oklahoma, 1911-1924 (hereafter Miscellaneous Correspondence), MSL, 2. Currie assumed command of

adapting to "open-warfare" methods. Finally, Snow blamed the French and British instructors who had advised and instructed in American artillery training camps: "these officers rendered us valuable assistance, and there is no desire on my part to belittle their services; but they undoubtedly added to the strength of the trench-warfare camp."<sup>49</sup>

Though Snow did not serve in the AEF and experience the futility of "open warfare," he maintained that he "never wavered from his stand that the foundation of all field-artillery training lies in the teachings of open warfare, and that the few new developments of the war calling for close shooting and trench-warfare methods were but a passing phase, easily acquired by any field artillery possessing sound open-warfare knowledge."<sup>50</sup> With little supporting evidence, Snow claimed those officers he trained in prewar methods at the School Fire proved themselves as competent and able field artillerymen in France. Again, he maintained that an officer trained in "open-warfare" could easily adapt to the trench warfare methods, and therefore, was always prepared to support the infantry in any type of situation.

Open warfare proponents, whether the Chief of Field Artillery or his aspiring disciples, provided that edition of the *Field Artillery Journal* with one more salvo. In an anonymous editorial, "Wanted – A Permanent Chief of Field Artillery," the writer

the School of Fire from 24 December 1918 to 10 June 1919; Riley Sunderland, *History of the Field Artillery School: 1911-1942* (Fort Sill, Okla.: Field Artillery School, 1942), 77-78.

<sup>49</sup>Snow, "Field Artillery – A Retrospect," *FAJ* 8 (October-November 1918): 478.

<sup>50</sup>Ibid., 481.

claimed that Snow's School of Fire had proved the prewar doctrine of open warfare was valid. By insisting that the school use "open warfare" as its doctrine, Snow had ensured that the "teaching at Fort Sill was sound" and the "faculty were never led astray by the fetishes of 'map firing' and 'trench fighting.'"<sup>51</sup> This writer chided American field artillery officers for embracing trench warfare and neglecting observed fire: "Unless cured of such heresy, our artillery commanders will be timid about getting the guns forward and into the fight when the war of movement begins and consequently will not give the infantry the support it has the right to expect."<sup>52</sup>

To provide an AEF veteran's response, the editor published two articles in the April-June 1919 *Field Artillery Journal*. In "The Field Artillery – Progress or Retrograde," Major Roger D. Swaim asserted that "open warfare will hereafter be based on so-called trench warfare methods and that instruction should proceed from those methods to open warfare and not in the old open warfare methods with trench warfare methods as of secondary importance." Swaim remarked he often heard newly arrived officer in France ask: "Why did we not receive the 'real thing' (trench warfare techniques) at home?"<sup>53</sup> He refuted Snow's claim that trench warfare methods were slow and explained that a skilled officer could employ so-called trench warfare methods to fire artillery just as fast as those who used open warfare methods. In a further

<sup>51</sup>"Wanted – A Permanent Chief of Field Artillery," *FAJ* 8 (October-December 1918): 629. Congress authorized the permanent establishment of the Office of the Chief of Field Artillery in the passage of the Army Reorganization Act of 1920. Snow served as Chief of Field Artillery until 1928.

<sup>52</sup>Ibid., 630.

<sup>53</sup>Swaim, "The Field Artillery," 218-19.

challenge to Snow and the School of Fire, he argued that the next edition of the *Artillery Firing* (the gunnery manual) should follow the translated French manual used in American artillery training camps in France.<sup>54</sup> For the AEF veteran Swain, current American artillery doctrine was obsolete.

In the second article, Lieutenant Colonel John B. Anderson charged that those officers who advocated position warfare methods as the foundation of future training had "not followed closely the criticisms of our army in the present war, nor have they appreciated our deficiencies and mistakes as pointed out by prominent officers of the Allied and enemy armies."<sup>55</sup> Using AEF battlefield reports and translated German documents as evidence, Anderson pointed out that the AEF artillery had too often chained itself to inflexible map firing techniques, which had often led to inaccurate and ineffective artillery fire on targets that did not support the advancing infantry. Anderson concluded that the war lessons must be retained, but the proven basic principles must "be

<sup>54</sup>Swaim, "The Field Artillery," 219-21. Not missing an opportunity to support the President of the Field Artillery Association and *de facto* president of the *Field Artillery Journal*, the Chief of Field Artillery himself, the editor. Lieutenant Colonel Arthur F. Cassells, had his own editorial barb for Swaim. After Swaim's comment that newly arrived AEF artillery officers often asked why stateside training had not taught them the "real thing," Cassells added a footnote from a "Field Artillery Officer who has had considerable experience abroad as well as at home before the war." This experienced war veteran explained that he was once one of those "misguided youths who thought Sill was not keeping up to date, and I now realize that had we conducted the schools in France more along the line of the Sill course, we would have had greater success on the front." Arthur F. Cassells, "Discussions," *FAJ* 9 (April-June 1919): 218.

<sup>55</sup>John B. Anderson, "Are We Justified in Discarding 'Pre-War' Methods of Training?," *FAJ* 9 (April-June 1919): 222.

the foundation of our training, with position-warfare refinements and methods as an important, but subordinate, addition to 'pre-war' methods.<sup>56</sup>

Lieutenant Colonel Oliver O. Spaulding wrote in the January-February edition that there was "only one system of artillery tactics" and "[W]here a distinction between the two conception becomes unavoidable, for the purpose of clearness and convenience of discussion, it is highly essential that 'open' be taken as stand, and 'position' as a special modification. *The adoption of the 'position' point of view is fatal.*"<sup>57</sup> Spaulding repeated Pershing's and Snow's judgment that position warfare "must be recognized as a temporary and as a necessary evil" with the "first and best chance to win, for artillery or any other mobile arm, is by speed, flexibility and accuracy of maneuver."<sup>58</sup>

Officers may have debated the technical and tactical merits of open and trench warfare methods in the pages of the *Field Artillery Journal*, but for the interwar Field Artillery, the true test of whether it would use Snow's "proven" prewar doctrine or trench warfare methods would occur at the newly renamed Field Artillery School at Fort Sill. Amid the chaos of a demobilizing army, the school itself experienced a turbulent

<sup>56</sup>Ibid., 230.

<sup>57</sup>Oliver O. Spaulding, "Preparation and Conduct of Fire," *FAJ* 10 (January-February 1920): 27.

<sup>58</sup>Ibid. The idea of "open warfare" still figured prominently in the thinking of senior army leaders just before the outbreak of World War II. In a March 1939 letter to Brigadier General Lesley J. McNair, Brigadier General George C. Marshall wrote to McNair, the incoming Command and General Staff College commandant, that he should institute simplified school texts focused on instructing National Guard officers to prepare them adequately for M-Day [Mobilization Day]. Marshall contended that: "We know what kind of an army we are going to have on M-day, and *we must presume that open warfare will be the rule rather than the exception;* therefore, it seems to me that should govern the basic policy for the training of our people, because if we can successfully survive the first three or four months, we will have plenty of time to absorb the technique of leadership adapted to full war strength organizations, with completely

transition period with four different commandants in nine months. Finally, stability arrived in late October with the appointment of the former AEF Chief of Artillery, Brigadier General Ernest Hinds. The postwar Field Artillery School consisted of the Departments of Gunnery, Tactics, Materiel, and Equitation. Combining the officer's basic and advance courses, the first course of instruction was a shortened thirty-five week course. After students completed the first half of the course, the faculty gathered to review the school's progress and planned instruction for the second half. Hinds' instructors decided to shorten and simplify technical subjects (chemistry and interior ballistics) and "allow more time for tactics and liaison, thought highly desirable by officers with front experience."<sup>59</sup> The change in the curriculum marked the beginning of the introduction and influence of World War I experience in the Field Artillery School and a different arena for the Field Artillery community to grapple with its ante and post bellum heritage.

In his opening remarks to the student officers entering the school in January 1920, Hinds directed his attention on this divisive issue: "The impression prevails to some extent that the principles laid down in *Field Artillery Drill Regulations* are obsolete and should be superseded by the so-called "trench warfare" methods ... Trench

equipped ranks of seasoned, disciplined men." Letter, George C. Marshall to Lesley J. McNair, 4 March 1939, Box 6, E 58, Records of Headquarters Army Ground Forces, RG 337, NARA.

<sup>59</sup>Letter, Currie to Snow, 25 June 1919, Miscellaneous Correspondence, MSL. U.S. War Department, *General Orders and Bulletins*, 1920. No. 7, 30 January 1920 (Washington: GPO, 1921), 3; "Field Artillery School," *Army and Navy Journal* (hereafter ANJ) 57 (22 November 1919): 361; *Annual Report, Commandant of Field Artillery School, 1919*, 13 August 1920, MSL; Sunderland, *History of the Field Artillery School*, 74-78.

warfare is merely an application of the principles of open warfare to a peculiar case ... the refinements of trench warfare will not be taught until the principles of open warfare have been thoroughly mastered."<sup>60</sup> Hinds' speech attempted to convince his incoming students, many of them undoubtedly recent veterans, that the current Field Artillery's doctrine and methods were not far removed from the ones they had used in the Great War.

Although Hinds had stressed that trench warfare was corollary to the prewar doctrine, Snow questioned whether the school should teach it at all. Hinds defended his school's curriculum, pointing out that in addition to map firing, these were course requirements that required students to call for fire using quick methods, lateral, and forward observations. He declared that to stop teaching the "so-called trench warfare methods" would be "vitally wrong" and "to eliminate consideration of deliberate methods — even of the preparation and conduct of unobserved fire — would in my opinion be equivalent to throwing away some of the evident lessons of this war."<sup>61</sup> Hinds' reply to Snow reveals, at least at the artillery school, that the practical experience of the war created a need to update the techniques and tactics found in the *1916 Field Artillery Drill Regulation*.

Hinds also recommended that students should learn high burst, sound ranging, and flash ranging techniques introduced in the war. Lacking technical literature on the

<sup>60</sup>Enclosure 2, "Lecture by Major General Ernest Hinds, U.S. Army, Commandant, Field Artillery School, Fort Sill, Oklahoma, to the Class of Student Officers entering the School, January 10, 1920," in Letter #8, Ernest Hinds to Snow, 15 January 1920, Miscellaneous Correspondence, MSL.

<sup>61</sup>Letter #8, Hinds to Snow, 15 January 1920, Miscellaneous Correspondence, MSL, 3.

equipment and needing "officers who used this equipment abroad... to assist in the installation, and to give instruction in its use," the school managed to use all three target location methods in the final semester.<sup>62</sup> Hinds had brought his and his fellow AEF officers' experience from Europe and ensured that the methods developed in the war became a part of Field Artillery School curriculum.

In 1921, the Chief of Field Artillery appointed a Training Regulations Board to expedite the rewriting of the branch's regulations. The Board would address what Snow saw as a major problem: "During the World War, our Field Artillery literature fell into great confusion. Information needed by the arm became badly scattered – a little in one book and a little in another... Some of the literature was in English and some in French. Some ideas were in accordance with American practice and ideals, and some were not."<sup>63</sup> The next year, the Adjutant General published five Field Artillery training regulations in 1922. This series superseded various sections of its 1916 *Field Service Regulations* and eliminated the need for AEF, Allied, and training camp drill and service manuals for weapons (75-mm and 155-mm), and firing battery operations. Including trench warfare tactics and techniques, the updated firing battery manual instructed how to sound a gas attack alarm and provided instructions for using a rocket board to fire a standing barrage for the frontline infantry. These technical changes were minor

<sup>62</sup>Letter #14, Hinds to Snow, 27 May 1920, Miscellaneous Correspondence, MSL. *School Catalogue. Schedules of Battery Officers' Course for the Year Nineteen Hundred and Twenty* (Fort Sill, Okla.: Field Artillery School, n.d.).

<sup>63</sup>"Annual Report of the Chief of Artillery for Fiscal Year 1922," *FAJ* 12 (November-December 1922): 479-80.

compared to the publication of what Snow called "the most important pamphlet of the series," the updated gunnery manual.<sup>64</sup>

Released on 9 August 1922, *Field Artillery Firing* established trench warfare tactics and techniques as a part of the authorized gunnery procedures for the interwar field artillery. Surreptitiously defending the Field Artillery's prewar gunnery guidance and open warfare, Snow wrote in the manual's introductory paragraph:

More space is devoted in this pamphlet to the deliberate preparation of fire by topographic means and, generally, to methods which can be used only in situations more or less stabilized, than is devoted to the more difficult problems of rapid preparation and conduct of fire without maps... The reader must, therefore, not be misled by the space devoted herein to different methods of fire as to their relative importance. But, on the contrary, all field artillerymen must bear in mind that the vital part of a battery officer's education can not be learned from books, but comes from practical instruction under skilled instructors in solving numerous concrete problems in a war of movement.<sup>65</sup>

Despite the disclaimer, the manual represented the Field Artillery's confirmation of the proven and refined principles of calculating artillery data and transferred the AEF's

<sup>64</sup>Annual Report of the Chief of Artillery for Fiscal Year 1922," 479. U.S. War Department, Training Regulation (hereafter TR) 430-70, *Field Artillery. The Firing Battery* (Washington: GPO, 20 March 1922); U.S. War Department, TR 430-15, *Service of the Piece, 75-mm. Gun, Model 1897* (Washington: GPO, 5 January 1922); U.S. War Department, TR 430-20, *Service of the Piece, 75-mm. Gun, Model 1916* (Washington: GPO, 8 February 1922); U.S. War Department, TR 430-25, *Service of the Piece, 75-mm. Gun, Model 1917* (Washington: GPO, 31 January 1922); U.S. War Department, TR 430-65, *Service of the Piece, 155-mm. Howitzer* (Washington: GPO, 5 January 1922). A rocket board was simply a board marked with a semi-circle radius (about twelve inches) with an arrow pivoted at the center which mirrored the range fan of the battery. The semi-circle on the rocket board was further divided into sectors to correspond with the rocket posts established by the frontline infantry. Upon the seeing a signal rocket launched, the battery sentinel would point the arrow at the rocket, record the rocket post indicated, and then announce "Barrage" to the battery gunners. Thus, the battery would provide a protective wall of fire for its supported infantry unit, better known as a Final Protective Fire (FPF). U.S. War Department, TR 430-70, *Field Artillery. The Firing Battery*, 12-13.

<sup>65</sup>U.S. War Department, TR 430-85, *Field Artillery Firing* (Washington: GPO, 9 August 1922), 1. "Training Regulations Field Artillery, U.S. Army" AM 57 (17 July 1920): 1416; John W. Kilbreth, "The New Edition of Field Artillery Firing," FAJ 12 (July-August 1922): 335.

technical methods to the pages of the postwar tactical doctrine. *Field Artillery Firing* provided detailed step-by-step guidance on how to prepare data for a rolling barrage, conduct fire by aerial observation, select the proper weapon caliber for a specific target types, and determine target location through triangulation of sound and flash readings. *Firing* incorporated the new techniques into American doctrine and was a succinct compilation of the progression of the gunnery.

Perhaps remembering his experience as a commander of an artillery training center in World War I who had confronted the problem of training new leaders and soldiers without any military experience, Snow directed that the regulations board ensure the new regulations and manuals had detailed instructions. The Training Regulations Board President and former member of the Hero Board, Lieutenant Colonel Kilbreth, explained that: "In the past, drill regulations have given rather brief rules to serve as guides to experienced officer in the instruction of their subordinates – in writing *this* pamphlet, the board was ordered by the Chief of Field Artillery to keep constantly in view the case of the noncommissioned officer of some isolated unit of the National Guard or Reserves studying the pamphlet without immediate access to an instructor."<sup>66</sup> More than updated, the manuals provided the guidance to lead, train, and use field artillery in a mass army.

The debate between the advocates of open-warfare and those trench warfare methods diminished as the Field Artillery School melded both within its curriculum.

<sup>66</sup>Kilbreth. "The New Edition of 'Field Artillery Firing,'" 336.

Likewise, as the school updated its gunnery curriculum each year, the lines between old and new gunnery methods blurred with the publication of the 1922 and 1931 editions of the *Field Artillery Field Manual*. Certainly by the time of the formal introduction of the battalion Fire Direction Center (FDC) instruction in the Gunnery Department 1934, the debate was long forgotten.<sup>67</sup>

In 1922, the Artillery Sub-Section at the Command and General Staff College, Fort Leavenworth, Kansas, published and distributed a new two-volume artillery guide for its students. Entitled *Tactics and Technique Artillery*, it replaced various Allied wartime publications and represented the Field Artillery's refinement of the lessons it learned in combat and the necessary organization to fight in a modern war. Intended for the school's Line Class Course, the first volume defined artillery equipment, missions and organizations from the gun section to the regimental headquarters. The second volume, written for corps and army commands, "is a crystallization of what has been taught at the General Service Schools since its reopening after the war" and "represents an earnest effort at taking the experience gained by all Armies in The [sic] World War with artillery and at readjusting and readapting it to the needs of American officers, having mainly in mind the style of warfare in which our country is likely to be engaged."<sup>68</sup>

<sup>67</sup>U.S. War Department, *1931 Field Artillery Field Manual*, 2:155-60.

<sup>68</sup>General Service Schools, *Tactics and Technique Artillery*, vols. 2 (Fort Leavenworth Kans.: General Service Schools Press, 1922), 2:iii.

Outlining the general principles of the tactical employment of the field artillery, the Leavenworth texts used the same words of the *1916 Field Artillery Regulations'* field artillery mission statement: "to assist to other arms, especially the Infantry, upon the field of battle."<sup>69</sup> The Leavenworth textbooks also repeated the 1916 doctrine of the field artillery's four basic characteristics: great fire power concentrated in a relatively small tactical unit, rapidity of fire, long range, and the ability to act from concealed positions. What was revolutionary, was the new tactics and organizations that emerged within the Field Artillery as a result of World War I: the rolling barrage, chemical warfare, aerial observation, flash and sound battalions, Corps and Army artillery units, and the Artillery Information Center (A. I. S.).<sup>70</sup>

Organizationally, the establishment of corps and army artillery units, not even hinted at in the 1916 artillery manual, were now the significant organizational changes found in the AEF, and on paper, part of the postwar American army. Consequently, Leavenworth went to great lengths to explain the purpose and missions of corps and army artillery units. A corps or army commander could use these gun units to augment a division's organic artillery, deepen the battlefield through extending the range of the counter preparation or the rolling barrage, and provide extensive counter battery work. The primary targets for corps and army artillery units were enemy guns – counter-battery missions. Logically, elimination of the opponent's artillery greatly enhanced the ability

<sup>69</sup>1916 *Field Artillery Drill and Service Regulations*, 1:13. General Service Schools, *1922 Tactics and Technique Artillery* 1922, 1:134, 255.

<sup>70</sup>1916 *Field Artillery Drill and Service Regulations*, 4:7; General Service Schools, *1922 Tactics and Technique Artillery* 1922, 1:135-37.

of the infantry to retain captured terrain and withstand counterattacks. Following the observations of the Hero and Superior Boards, the Leavenworth texts highlighted that modern combat operations necessitated that the organic artillery unit attached to the "the great combat unit of the combined arms," the infantry division, and that it "be organized for immediate fire support of designated infantry units, and for fire concentration along any portion of the division front, in accordance with the development of the action."<sup>71</sup> Divisional artillery, the student guide explained, supported the infantry's attack by concentrating its fire on critical points, executing a rolling barrage, neutralizing enemy artillery, and firing on targets of opportunity.<sup>72</sup>

1922 also marked the year that the War Department consolidated all Field Artillery basic officer schools at Fort Sill and moved the Field Artillery Field Officers'

<sup>71</sup>General Service Schools, *1922 Tactics and Technique Artillery*, 1:255. Counter-battery remains the primary mission for U.S. Army corps artillery units when they are not reinforcing divisional artillery fires. At the time of its publication, *Tactics and Techniques* explained that a corps artillery unit included: three regiments of 155-mm howitzers, one regiment of 155-mm guns, one observation battalion (sound and flash ranging), and one ammunition train.

<sup>72</sup>General Service Schools, *1922 Tactics and Technique Artillery*, 2:217. The Command and General Staff College was not the only Army school to consider the organizational changes in the field artillery after the war. The Army War College curriculum also introduced and used the large artillery units in their instruction. The AEF's use of corps and army artillery units in employing heavy artillery in battle was an obvious consideration for a postwar student to tackle in a War College map problem. Before the war, a student would not have been expected to know about the complexities of employing a heavy artillery brigade, much less two artillery brigades composed of two 155-mm howitzer battalions and a 240-mm howitzer battalion. For example, in one mid-1920's War College problem, the student received four "Important Considerations" before attempting his solution on using army artillery: use army artillery as a fire reinforcement under control of the army commander and employ it to obtain fire superiority through the concentration of its fire; remember to plan for the time when using heavy artillery because it is slow-moving and requires considerable time for emplacement; simplify moving army artillery movement by turning control of the movement over to the corps concerned; and finally, army artillery fire requires considerable planning time requiring several hours of work when used in the close support of an advance. Course at the AWC. 1924-1925, Command, Documents Nos. 36-40, Volume VII, Part III, Committee Reports, Studies, Map Problem, Lectures, AWC; "The Artillery in the Attack," Chapter VIII, Command Course No. 40, 11 March 1925, both found in Box 23, E 5, RG 165, NARA.

School from Fort Bragg, North Carolina. The advanced course concentrated on tactics, with 1075 of the 1404 total hours of instruction on regimental artillery tactics and a "number of field exercises involving firing."<sup>73</sup> As in the basic course, advanced course students received instruction on topics that had evolved during the war, but from the perspective of the artillery brigade level operations. Field grade officers participated in conferences on artillery intelligence, fire direction by the battalion commander, and refresher courses on the use of fire control equipment. Student field exercises included "Liaison, communication and fire direction—division artillery in an attack" featuring one half of the class with the infantry and the other with artillery units.<sup>74</sup> By the end of 1922, the Chief of Field Artillery continued his campaign to update school texts and manuals and correct the wartime publications that espoused "fallacious and erroneous methods of training."<sup>75</sup> Snow asserted that the corrected training regulations and the revised instruction at the Field Artillery School had vastly improved the quality of graduating officers and would have far reaching results within the branch. Snow's last significant oversight concerned his branch's "how to field artillery guide": Training Regulation 430-105, *Tactical Employment of Field Artillery*.

<sup>73</sup>"Annual Report for School Year 1923-1924," June 1924, *Annual Reports of the Commandant, 1923-25, 1926-27* (Fort Sill, Okla.: Field Artillery School, n.d.), MSL. Sunderland, *History of the Field Artillery School*, 89.

<sup>74</sup>Master Schedule for the Advance Class, 1928-1929, MSL. Master Schedule for the Advance Class, 1927-1928, MSL.

<sup>75</sup>"Annual Report of the Chief of Field Artillery," *FAJ* 14 (January-February 1924): 45.

Published in September 1924, *Tactical Employment of Field Artillery* was the successor to the 1916 *Artillery Drill Regulations* guidance on how to employ the Field Artillery in battle. Representing the Chief of Field Artillery's vision, this capstone regulation defined field artillery's *raison d' être*: "to assist other branches, especially the infantry, upon the field of battle."<sup>76</sup> As with *1916 Regulations*, the 1924 edition explained that, with its long-range guns, the field artillery could concentrate its firepower throughout the entire battlefield without moving its personnel or materiel. This flexible characteristic made "it possible to obtain the three essential elements of the tactical employment of field artillery fire – power, depth, and continuity."<sup>77</sup> Following the Hero and Superior Board's recommendations, the 1924 regulation codified the four levels of artillery support units (division, corps, army, and G. H. Q. reserve). Not only did the regulation mirror the structure of the AEF artillery, the revised guide was essentially a compilation of the tactics and techniques of the AEF. In its guidance for offensive and defensive operations, the manual stressed the importance of maintaining continual support for the infantry unit: preparation and supporting fire. It provided detailed guidance on attacking fortified positions, using standing barrages, employing trench mortars, firing counter-battery, and fighting on a "stabilized front involving large forces deployed on broad, deeply organized fronts."<sup>78</sup> The regulation also introduced the

<sup>76</sup>U.S. War Department, TR 430-105, *Tactical Employment of Field Artillery* (Washington: GPO, 5 September 1924), 16. *1916 Field Artillery Drill and Service Regulations*, 4:7.

<sup>77</sup>U.S. War Department. TR 430-105, *1924 Tactical Employment of Field Artillery*, 16.

<sup>78</sup>Ibid, 41.

wartime innovations such as using artillery in support of infantry accompanied by tanks and using airplanes for reconnaissance and the adjustment of artillery fire.<sup>79</sup>

*Tactical Employment* (1924) formed the basis of all subsequent revisions of Field Artillery School and General Service School texts. At the General Service Schools, the Field Artillery Liaison section revised their 1922 version of *Tactics and Technique of Field Artillery* with a 1927 edition that eliminated the detailed technical gunnery discussion, cutting the five hundred-page two-volume set to 250-page book. *Tactics and Technique of Field Artillery* (1927) served as the base document for the subsequent editions of the artillery's Leavenworth text and remained essentially unchanged through its various editions until the outbreak of World War II.<sup>80</sup>

The Army's 1923 *Field Service Regulations* (FSR1923) was the first postwar revision of the Army's primary operational doctrine.<sup>81</sup> Major General John L. Mines, Acting Chief of Staff, stated the purpose of the manual was to serve "as the basis of

<sup>79</sup>Ibid., 18-22, 30-31, 37, 50, 73, 78-79, 81, 126, 137. Not all the regulation's paragraphs pertained to artillery support for large armies in open warfare or on a stabilized front. In the section that discussed artillery in special operations, the regulation provides guidance on artillery operations in the attack and defense of river crossings, landing operations on the coast, minor warfare (irregular operations), and domestic disturbances. Though it noted that artillery could "take little part" in street fighting, the regulation did suggest that light guns might be useful in breaking down walls or doors of strongly-held buildings and recommended posting trench mortars in city outskirts or plazas for use against "special buildings or areas." U.S. War Department, TR 430-105, 1924 *Tactical Employment of Field Artillery*, 64-65.

<sup>80</sup>General Service Schools, 1927 *Tactics and Technique of Field Artillery*, 46-47; "Annual Report of the Chief of Field Artillery for 1923-1924," FAJ 15 (January-February 1925): 27.

<sup>81</sup>The U.S. Army recognizes three levels of war: tactical, operational, and strategic. At the lowest level, the tactical, are those operations that involve units in direct combat, usually division and below. The operational level of war occurred at the corps, where an army or a corps commander transformed a nation's strategic objectives into military objectives. For the purpose of this discussion, the operational level of war is the level at which a corps commander employs and uses his assets (e.g., general support artillery, aviation, signal, engineers, supply and support battalions and companies) and divisions.

instruction of the combined arms for war service.<sup>82</sup> *FSR 1923* asserted that "the coordinating principle which underlies the employment of the combined arms is that the mission of the infantry is the general mission of the entire force."<sup>83</sup> Following the established artillery doctrine suggested by the postwar review boards and Field Artillery regulations and school texts, *FSR 1923* reinforced the obvious when it described that the "principle mission of artillery is to support the infantry by fire."<sup>84</sup> Working for the infantry commander, the artillery fired at targets deemed most dangerous to the infantry. *FSR 1923* also highlighted the flexible nature of the artillery to intervene "over a zone of great width and depth and of rapidly transferring its fire in accordance with the requirements of combat" and signaled that artillery technology had increased depth of the modern battlefield with advances in munitions, communications, and ordnance delivery systems. Using the same organizational structure espoused by the Superior Board, *FSR 1923* explained the roles of the four tiered artillery system: divisional artillery provided direct support for the infantry, corps artillery destroyed or neutralized hostile batteries, army heavy artillery fired "against material objectives of an especially resistant nature," and finally, G.H.Q. reserve artillery to be used to supplement the fires of armies and corps.<sup>85</sup> With its long-range ability, artillery fire was a flexible force that made it

<sup>82</sup>U.S. War Department. *Field Service Regulations United States Army, 1923* (hereafter *FSR 1923*) (Washington: GPO, 1924), iii. William O. Odom, *After the Trenches: The Transformation of US Army Doctrine* (College Station: Texas A&M University Press, 1999), 7-8.

<sup>83</sup>Ibid.. 11.

<sup>84</sup>Ibid., 15.

<sup>85</sup>Ibid.. 16.

possible for a commander to concentrate large masses of fire with annihilating effects on critical objectives from the enemy's first line defenses to his reinforcement staging areas and logistical centers deep in the rear.<sup>86</sup>

Without a successor until 1939, the *FSR 1923* remained the Army's operational guide for the employment of artillery throughout the interwar period. There was one notable exception. In 1930, the War Department published *A Manual for Commanders of Large Units (Provisional) (MCLU)*, as an accompanying guide to *FSR 1923*.<sup>87</sup> Senior officers reasoned that the *FSR 1923* lacked detailed guidance for large unit commanders (the manual defining a large unit as a division, corps, army or an army group). Based upon a 1921 French manual, and undoubtedly a compilation of French lessons learned from the war, the *MCLU* stressed throughout its guidance for the various command levels the importance of the Field Artillery support in their operations, open or stabilized warfare, defense or offense. The *MCLU*, as the *FSR 1923* had, made the artillery an integral part of all its operations, offensive or defensive. More than *FSR 1923*, *MCLU* instructions were direct decedents of the French trench warfare experience. In Army offensive operations, all attacks, whether surprise or deliberate, began with an extensive artillery preparation. The army group commander was expected to "extend the action of

<sup>86</sup>Ibid., 14-16, 77-78, 82,96-97.

<sup>87</sup>U.S. War Department, *A Manual for Commanders of Large Units (Provisional)* (hereafter *MCLU*), vol. 1, *Operations* (Washington: GPO, 1930), iii; U.S. War Department, *Manual for Commanders of Large Units*, vol. 2, *Administration* (Washington: GPO, 1935), iii-iv. Not published until 1935, *Manual for Commanders of Large Units, Administration*, Volume II, provided guidance on personnel actions: promotions, reclassification, replacements, discipline, mail, prisoners of war, martial law, and reporting procedures.

the corps and division artillery" with army artillery, use corps artillery for counter-battery and augment the fires of divisional artillery, and directed that corps and army commanders should spare no efforts to secure to each division the support of its own artillery brigade on the day of battle.<sup>88</sup>

*Field Service Regulations 1923*, and to a much lesser degree the *MCLU*, represented the Army's doctrinal guidance on army operations until the publication of *Field Service Regulations 1939 (FSR 1939)* and *FSR 1941*. Recognizing that "No one arm wins battles," *FSR 1939* reconfirmed the primacy of the infantry stating it was "charged with the principal mission in battle ... When the situation so requires, elements of other arms are attached to Infantry for combat."<sup>89</sup> Little changed in the updated manual's explanations for it repeated the artillery's 1931 field manual, which in turn, were only modifications of regulation paragraphs found in the postwar manuals. Aware that progress had been made in military mechanization, *FSR 1939* distinguished two principal artillery missions: one, support the Infantry and Cavalry; and two, give depth to the battlefield through counter-battery and destruction of enemy reserves, command centers, and lines of communication.<sup>90</sup>

<sup>88</sup>*MCLU*, 1:21,30.33.

<sup>89</sup>U.S. War Department. Field Manual (hereafter FM) 100-5, *Operations*, Tentative Field Service Regulations (Washington: GPO, 1 October 1939). 5-6.

<sup>90</sup>*FSR 1923*, 14; *FSR 1939*, 11; U.S. War Department, *1931 Field Artillery Field Manual*, 1:1; U.S. Field Artillery School, *Tactical Employment of Field Artillery*, Book 224, 1934 ed. (Fort Sill, Okla.: The Field Artillery School, 1934), 1.

In combat operations, *FSR 1939* designated two types of artillery command relationships that corresponded to the four different organizational levels of artillery units: direct support and general support. Direct support artillery battalions provided fires for specified infantry and cavalry units within a division. These units were also known as organic artillery because they were assigned to the same division as the infantry and cavalry units they supported. The remainder of artillery units, those at the corps, army, and GHQ reserve, received the mission of general support. A unit with the mission of general support would use its guns in support of those units specified by its senior artillery commander, whether the unit belong to an artillery brigade at the corps or army. To employ artillery effectively and ensure prompt concentration of fires, an artillery commander controlled the fires centralized control of his units, whether he was a battalion, brigade, or corps commander. Interestingly, even with the superior ability of the fire direction center to control fires and liaison teams with advanced radios, *FSR 1939* retained the AEF practice of decentralization and advised that in the event that "unusual extension of frontage, restricted terrain, or insufficiency of signal communication, the superior commander cannot efficiently direct the fire of the supporting artillery, he should promptly place it under the orders of the commanders of the units supported."<sup>91</sup>

<sup>91</sup> *FSR 1939*, 12. In August 1939, McNair, then the Commandant of the Command and General Staff School, wrote to Chief of Staff Marshall about the *FSR 1939*. McNair believed that *FSR 1939* represented a "long step forward" and thought it was necessary for "such a publication is to be abreast of the times, it necessarily must deal boldly with the newer and more controversial aspects borne of modern developments. If it ducks them, it loses much of its value, and the service drifts – as it has done in the past." He wanted to see it approved immediately and use it at the school. The commandant conceded that "it may prove wrong in spots, but at least we'll pull together, and the errors can be corrected later and

Also in 1939, the Field Artillery School published its first new gunnery manual in almost a decade, FM 6-40, *Firing*. A culmination of the Gunnery Department's previous decade of advances in computational and battalion fire direction procedures, *Firing* was a pure technical fire direction manual. With simplified procedures, *Firing* explained how to convert an observer's request for fire into firing commands for gun crews to fire on targets. More importantly, the gunnery manual now instructed how to establish the battalion FDC.<sup>92</sup>

After the German *Wehrmacht* unleashed its *blitzkrieg* warfare in September 1939, the Field Artillery Chief of Field Artillery Robert M. Danford commented that the: "artillery lesson of the Polish campaign, if it can be stated in a single sentence, is that the artillery employment was strictly orthodox and in accordance with our own teachings for open warfare."<sup>93</sup> Regardless of his assuredness, the Field Artillery reexamined its manuals and updated them in light of the German attack. In July 1940, the Chief of Field Artillery Office published a new version of *Tactics and Technique*. Earning the War Department title as Field Manual 6-20, this guide mirrored previous Field Artillery publications and the 1939 *FSR*, but limited discussion on technical instructions because of the earlier release of the gunnery manual, FM 6-40, *Firing*. Doctrinally, FM 6-20

advisedly." McNair to George C. Marshall, 3 August 1939 in *The Papers of George C. Marshall, Selected World War II Correspondence* (hereafter *Marshall Papers*), ed. Robert E. Lester (George C. Marshall Library, Lexington, Va.; Bethesda, Md.: University Publications of American, 1992), microfilm. Reel 24, 922. Odom, *After the Trenches*, 135-37,241-42.

<sup>92</sup>See Chapter III, "Eliminating the Middleman: The Fire Direction Center." U.S. War Department, FM 6-40, *Firing* (Washington: GPO, 1939).

<sup>93</sup>*Annual Report of the Chief of Field Artillery* (Fiscal Year 1940), MHI, 6.

defined fire direction as its predecessor regulations and texts had. In short, it was the art of employing artillery fire in combat. *Tactics and Technique* stated that fire direction was: "the tactical command of one or more fire units for the purpose of bringing their fire to bear upon the proper targets at the appropriate time. In a more restricted sense, it comprises the tactical employment of artillery fire to include the location and selection of targets on which fire is to be placed, technique of delivery of fire thereon, and allocation of ammunition to fire missions."<sup>94</sup>

In March 1941, after several Army-level practical field exercises, the Field Artillery School formed a board to update its regulations. It focused once again on the two primary manuals that explained how employ artillery in combat: FM 6-20 and FM 6-40. With minor revisions to both, the Chief of Field Artillery Office established the technical and tactical instructions that formed the basis of its doctrine on the eve of the American army's entry into World War II.

In May 1941, the Army released a new capstone doctrine: *Field Service Regulation 1941*. As with *FSR 1939*, *FSR 1941* retained listing the maneuver branches first, infantry and cavalry, with the artillery following. Departing from *FSR 1939* which only mentioned artillery and "other branches" to augment the Infantry, *FSR 1941* took a page from the German *blitzkrieg* manual and warned that the infantry's limited firepower

<sup>94</sup>U.S. War Department, FM 6-20, *Tactics and Technique*, with Change No. 1, 2 January 1941 (Washington: GPO, 10 July 1940). 111. U.S. Field Artillery School, *Tactics and Techniques* (Fort Sill, Okla.: The Field Artillery School, 1938), 121-22. FM 6-20 omitted discussion or reference of the FDC though it did update how higher level artillery commanders exercised general control by allocating and organizing reinforcing artillery, assigning targets to subordinate units, and assigning zones of responsibility for their units. Change 1 included an extensive update of the radio communication nets with artillery-infantry intercommunication and liaison and forward observer radio nets.

"must be adequately reinforced by the support of artillery, tanks, combat aviation, and other arms."<sup>95</sup> Clearly, the new manual reflected an army coming to grips with mobile, mechanized warfare. In its description of the artillery, *FSR 1941* echoed *FSR 1939* with few noticeable changes such as moving the artillery mission statement to the first regulation paragraph in the artillery subsection.<sup>96</sup> Not surprisingly, *FSR 1941* amplified interwar field artillery guidance to habitually associate an artillery battalion with a infantry or cavalry unit, but increased its fire support guidance to a higher level of importance by repeatedly emphasizing the necessity to coordinate between the supporter and the supported: "the best guarantee for success in the attack is effective cooperation between the troops in the attack echelon, the supporting artillery, and any supporting combat aviation."<sup>97</sup> *FSR 1941* represented the Army's vision of what modern combat demanded to be successful. For the field artillery leadership, *FSR 1941* was the capstone of their interwar effort to update tactics and techniques, what remained was how they would implement the doctrine in combat.

<sup>95</sup>*FSR 1939*; U.S. War Department, FM 100-5, *Operations* (Washington: GPO, 22 May 1941; reprint, Fort Leavenworth, Kans.: U.S. Army Command and General Staff College, 1991), 5-6.

<sup>96</sup>*FSR 1941*, i, 8-10. *FSR 1941* retained the Field Artillery's two part mission: one, supporting infantry and cavalry units by fire; and two, expanding the depth of the battlefield through deep fires. Major new changes in *FSR 1941* included guidance on airborne forces and armored divisions. *FSR 1941*, 241-47, 263-77.

<sup>97</sup>*FSR 1941*, 109.

## CHAPTER III

### ELIMINATING THE MIDDLEMAN: THE FIRE DIRECTION CENTER

*There was also much opposition on the part of older officers to the theory of the battalion commander taking over control of the battery from the battery commander. Many held to the old idea that a battery commander was king in his own right, and that no one but the battery commander could give orders to the battery executive.*

*Sidney F. Dunn  
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21 February 1944<sup>98</sup>*

Perhaps the most acclaimed innovation in the American interwar field artillery was the Battalion Fire Direction Center (FDC). Though one could point to articles that hinted at the idea of a centralized technical and tactical fire direction before and during World War I, one can assert that the definable genesis of the American FDC began in 1929 as the musings of Gunnery Department instructors at the Field Artillery School at Fort Sill, Oklahoma. There, a select group of field artillery officers created an efficient organization that could mass a battalion's, and eventually, a corps' artillery fires. The implementation of the FDC ignited a generational feud between the old school and the new school artillerymen. The FDC was a radical departure for the branch's traditionalist officers who held tightly to the artillery techniques and procedures they had learned as junior officers before World War I. Younger officers, with the experience of modern mass warfare as their guide, sought to improve firing efficiency and volume with

<sup>98</sup> Sidney F. Dunn to Commandant, Field Artillery School, Subject: Development of the Field Artillery Fire Direction Center, 21 February 1944, Correspondence on the Development of the Firing Direction Center, 1944 (hereafter FDC Correspondence), MSL. 4.

centralization and specialists. After a decade of theorizing, experimenting, and schooling, members of the Gunnery Departments instituted their school solution to solve the tactical problem of massing artillery fire. Yet, it would not be until the late 1930's that all artillery officers accepted the FDC as a permanent fixture among their battalions.

Whether the creation of the FDC represents a revolution or evolution in technical and tactical fire direction is debatable; perhaps the answer is both. What is certain is that the FDC is an American triumph in organizational skill: combining improving radio technology and gunnery techniques to increase the lethality and speed of field artillery fires. The establishment of the battalion-level FDC did two things for the artillery. First, it provided a means of determining firing data for the firing batteries accurately and quickly. Second, it provided a system that enabled a battalion to mass its fires simultaneously on one target. However, the FDC was not immediately accepted in the field artillery community and many institutional roadblocks hindered its implementation.<sup>99</sup>

<sup>99</sup>For a short explanation of the FDC's development in the interwar years consult Boyd Dastrup's *King of Battle*, 196-98. A favorable view of Orlando Ward and his role in the modern FDC development can be read in Robert O. Kirkland's "Orlando Ward and the Development of the FDC," *Field Artillery* (June 1995): 39-41. An excellent work on the interwar development of the British system for massing fires can be found in Shelford Bidwell's *Gunners at War: A Tactical Study of the Royal Artillery in the Twentieth Century* (London: Arms and Armour Press, 1970), 130-44. Russell A. Gugeler wrote two unpublished accounts of the development of the FDC. The first account is *Fort Sill and the Golden Age of Artillery*, a manuscript at the Field Artillery School, Fort Sill, Oklahoma. Gugeler appears to have used material from the Field Artillery School Commandant's collection of "Correspondence on the Development of the Firing Direction Center, 1944," also obtainable from Morris Swett Technical Library. Gugeler's second work, essentially the same manuscript, is Chapter VII of his Orlando Ward biography. This work, with note cards of sources and interviews, is in the Military History Institute, Carlisle Barracks, Pennsylvania, in the Orlando Ward Papers.

Gunnery, in simple terms, is aiming and firing a weapon at a target. For much of the gunpowder revolution, the gunner aimed the weapon directly at the target through a system of sights attached to the weapon system that compensated for the range to his target – a direct fire weapon system. Whether a Civil War musket or a field gun, direct fire enabled a commander to see where and how his unit's fire could influence the battle. However, with the increased ranges and lethality of small arms at the end of the 19<sup>th</sup> century, artillery units found their traditional battlefield position on hilltops and ridges untenable. Consequently, the artillery had to seek cover behind the hills and ridges it once fired from and develop a new system to allow their weapons to hit the target – indirect fire.

Discussed theoretically in the middle 19<sup>th</sup> century, indirect fire did not become tactical reality until the turn of the 20<sup>th</sup> century. In 1904, the Japanese in Manchuria emplaced or "masked" their guns behind hills and placed observers forward and on the flanks of their artillery units. Then, using a rudimentary system of communications, telephones and/or semaphore flags, the Japanese adjusted their guns and silenced the Russian artillery. The Japanese, and eventually the Russians, validated indirect fire methods in combat. Half a world away in South Africa, the British, losing their artillery crew members to long-range Boer sniper fire, emplaced their artillery behind hills for protection and employed indirect fire in their campaigns.<sup>100</sup>

<sup>100</sup>By 1905, the U.S. Army included the "indirect mode" along with the "direct mode" in its drill regulations. In its first issue, the *Field Artillery Journal* published a Bavarian artillery lieutenant's article entitled "What Lessons in the Employment of the Field Artillery Should Be Deduced From the Experiences of the Russo-Japanese War." Concentrating on the advantages of placing howitzers in "masked" positions and using forward observers, the Bavarian extolled the tactical virtues of indirect fire.

After the Boer and Russo-Japanese wars, artillerymen around the world discussed the implications of indirect fire: how to destroy targets and coordinate their artillery fires in support of their infantry. Few American field artillerymen went beyond these problems inherent in indirect fire to theorize about a potential third step: massing artillery fires with battalions. One officer who did was William G. Haan. Studying the "scientific methods" used by the Russians and Japanese to mass artillery fires with their battalions, Haan concluded that the American reliance on a single firing battery was inefficient and impractical. Serving as an umpire at the U.S. Army maneuvers in 1904, he observed the division commander's chaotic attempts to control individual batteries. Consequently, he proposed that the artillery should reorganize itself into regiments so that "they may be controlled by the commanding general in a way that will insure the proper co-operation with the other branches of the service."<sup>101</sup> This article perhaps is the earliest hint of any American move to centralized fire control above the battery level.

The idea of fire direction, the computation of firing data and the tactical employment of the guns, remained essentially unchanged in American field artillery from the publication of its *Drill Regulations for Field Artillery (Provisional) 1907* until

William Neufer, "Field Artillery Lessons from the Russo-Japanese War," trans. G. LeRoy Irwin, *FAJ* 1 (April 1911): 197-213. P. Van Berchem, "Notes on the Artillery in the South-African War," trans. William I. Lassiter, *JUSA* 20 (May-June 1904): 307-8; John P. Wisser, "The Second Boer War," *JUSA* 15 (January-February 1901): 164-65; Dastrup, *The Field Artillery: History and Sourcebook* (Westport, Conn.: Greenwood Press, 1994), 43; Dastrup, *King of Battle*, 146-49; Curt Johnson, *Artillery* (London: Octopus Books Limited, 1975), 39. Shelford Bidwell and Dominick Graham, *Fire-Power: British Army Weapons and Theories of War 1904-1945* (Boston: George Allen and Unwin, 1982), 10-14.

<sup>101</sup> William G. Haan, "Remarks on the Use of Field Artillery in General and the Need of a Reorganization of Our Field Artillery," *JUSA* 22 (September-October 1904): 144-46. An American field artillery regiment was composed of two battalions, with each battalion having three batteries of four guns each.

its 1917 entry into the World War I.<sup>102</sup> The primary individual responsible for fire direction was the battery commander. With a firing battery masked – weapons placed behind a terrain feature that prevented the enemy a direct line of sight to see the battery – the gunners aligned their fire control sights on an aiming point other than the intended target. This aiming point could be a terrain feature that could be seen by all guns, such as a hilltop or church steeple, or the battery commander's aiming circle (a surveying instrument able to measure angles and magnetic directions as compass).<sup>103</sup> After the battery commander laid the guns, aligning all the guns on the same azimuth of fire, he then selected his observation post to the front and/or flank of his guns to find targets. An observation point, usually located on a high terrain feature that overlooked the battlefield, enabled the battery commander to establish his observation team with communications equipment (telegraph, telephones, and semaphore flags) to relay commands to the battery and observing equipment (binoculars, periscopes, and range finders). Though the observation post was a place, an OP could also refer to the person manning the position. Through the Mil System (a mil composes one sixty-fourth-hundredth of a circle) a battery commander could determine his guns' firing data through trigonometry. Simply, if he knew the angle from the target to the battery aiming point, he then could determine the angle to the target and his guns. Thus knowing the angles,

<sup>102</sup>U.S. War Department, *Drill Regulations for Field Artillery (Provisional)*. United States Army, 1907 (Washington: GPO, 1907); *1916 Field Artillery Drill and Service Regulations*.

<sup>103</sup>An aiming circle is similar to a surveyor's theodolite. Mounted on a tripod, the aiming circle could measure angles to objects or a gun's fire control site. Using these measured angles and principles of trigonometry, a battery commander could determine directions to objects and thus eventually distances.

the battery commander calculated the range and direction between from the gun to the target and computed this trigonometry data into the corresponding elevations and deflections for his howitzers – firing data.<sup>104</sup> Once the battery commander determined the target for his battery, computation of firing data at the battery observation post was either deliberate or rapid. A commander could prepare firing data with or without a map. Deliberate preparation required a thorough reconnaissance, laying out orienting lines, plotting firing angles, and precomputing gun data. Rapid fire method was a simplified version of the deliberate method, but it made radical adjustments in relationship between the target and the impacting rounds. Regardless the method, it was the battery commander who sighted the battery's aiming point with his aiming circle, spotted targets with the aid of his observers, computed the gun firing data, and controlled the firing of his howitzers.<sup>105</sup>

Evident throughout the *1907 Drill Regulations for Field Artillery* were instructions for direct and indirect methods for field artillery fire.<sup>106</sup> The only hint at the need for massing a battalion's fires was found in a paragraph discussing firing over the heads of friendly troops: "Freedom is thus gained to post artillery so as to cover effectively the whole front of combat, to realize the power of concentrating the fire of

<sup>104</sup>Harry G. Bishop, *Elements of Modern Field Artillery* (Menasha, Wis.: George Banta Publishing Company, 1914), 50-53; Arthur H. Carter and Archibald V. Arnold, *Field Artillery Instruction: A Complete Manual of Instruction for Prospective Field Artillery Officers* (New York: G. P. Putnam's Sons, 1920), 522.

<sup>105</sup>Carter, *Field Artillery Instruction*, 531.

<sup>106</sup>1916 *Field Artillery Drill and Service Regulations*, 3:74-76. 80, 85, 88-94, 164.

widely separated units, and to avoid dangerous massing of guns.<sup>107</sup> The regulations met the requirements for an artillery organization designed for a national army built and maintained as a constabulary force – the largest tactical unit discussed was the field artillery regiment – two battalions of three four-gun batteries.<sup>108</sup>

A Field Artillery School Commandant's study on the development of the American FDC stated that the first idea of a centralized fire control center was found in an article by Major Brooke Payne published in the 1913 *Field Artillery Journal*.<sup>109</sup> Using the few vague paragraphs in the 1911 *Drill Regulations of Field Artillery* that addressed fire control as a foundation, Payne proposed a centralized fire control method in which the battalion commander would manage the fires of his battalion from an observation post. The battalion commander, after his reconnaissance of the battlefield, established his observation post to over watch the battlefield. Connected by a telephone system, the battalion commander's observation post and the three firing batteries established a system for massing an artillery battalion "whether you talk to a battery commander a few feet from you or phone to him a half mile away, it matters not so far as

<sup>107</sup>Ibid.,3:164.

<sup>108</sup>In 1916, a field artillery brigade was composed of two field artillery regiments and a field artillery regiment is composed of two field artillery battalions. A field artillery battalion consisted of three firing batteries of four guns each. School texts and manuals defined "concentration" as a general and inclusive term that referred to a volume of artillery fire placed upon a limited area for a limited time. 1916 *Field Artillery Drill and Service Regulations*, 3:149.

<sup>109</sup>Soon after assuming command of the Field Artillery School during World War II, Major General Orlando Ward sent a letter to former members of the Gunnery Department. Ward asked each recipient to supply information that explained "the origin and development of the fire direction center now employed in the field artillery." Eighteen officers responded – among them were Brigadier General R. G. Barkalow, Major General Carlos Brewer, Lieutenant General Jacob L. Devers, Lieutenant General Lesley J. McNair,

your control of him is concerned."<sup>110</sup> Payne proposed two steps to mass a battalion's fires. First, the battalion commander would adjust all the batteries upon the target, then have each fire upon it. Second, the battalion commander would adjust one of his batteries upon the target, then transfer the firing corrections to each battery and then have the batteries "uniting in the end in the fire for effect."<sup>111</sup>

The 1916 American *Artillery Drill Regulations* disregarded the contemporary developments in artillery on the Western Front. Instead, it was a virtual recapitulation of the 1907 edition – with thirty-three pages of bugle call sheet music added. One important addition was expanded volume on firing instructions.<sup>112</sup> The 1916 manual discussed at length the gunnery principles, definitions, and indirect fire procedures. The computation of data and tactical decisions of employing the firing batteries weapons remained with the battery commander.<sup>113</sup> The only guidance given for massing fires was "accurate and skillful cooperation of several batteries under a single command is the foundation of proper fire direction."<sup>114</sup> The American field artillery thus remained wedded to the idea of a small, mobile, light artillery organization centered on the battery

Major General Ralph McT. Pennell, and Major General Orlando Ward. Subject: Development of the Field Artillery Fire Direction Center, dated 25 January 1944, FDC Correspondence, I.

<sup>110</sup>Brooke Payne, "Practical Suggestions as to the Conduct and Direction of Fire by a Battalion Commander," *FAJ* 3 (January-March 1913): 65-66.

<sup>111</sup>All three firing batteries firing together at the same target is known as a "Battalion Fire for Effect." Payne. "Practical Suggestions." 70; FDC Correspondence, 1.

<sup>112</sup>1916 *Field Artillery Drill and Service Regulations*, 2:147-80.

<sup>113</sup>*Ibid.*, 3:40,63-69.

<sup>114</sup>*Ibid.*, 3:69.

commander's tactical and technical skill. Despite the Regulations' guidance to senior artillery officers on how to mass artillery fires, it provided no technical and tactical instructions on managing and directing fires of multiple artillery units. The practical and critical "how to" instructions for massing artillery units would not emerge until the late 1930's American gunnery manuals.<sup>115</sup>

The establishment of a modern FDC edged forward during World War I. Without a modern artillery organization or the necessary equipment, the Americans turned to the Allies. Regardless of the adamant attempts to retain its ideals of "open warfare," the AEFs artillery in many respects became a mirror image of the French. As with their textbooks and manuals, Americans followed the French in the establishment of the battery and battalion reconnaissance officers. The reconnaissance officer determined basic data for his respective howitzer units (e.g., the minimum angle to clear the first object or terrain feature and the azimuth of fire), followed the tactical situation, and supervised scouts (forward observers). While the U.S. Army 1907 and 1916 regulations stated that the reconnaissance officer precomputed data for commanders, the French version prescribed that the reconnaissance officer shouldered more of the computational burdens. Thus, in theory, under the French system, the reconnaissance officer freed the battery and battalion commanders to concentrate their efforts on supporting their respective infantry units without having to worry about computing gunnery data. At the battalion level, the reconnaissance officer aided in identifying

<sup>115</sup>Ibid, 3:73.

future battery positions, studied the battalion's zone of action (the sector that their infantry occupied), tracked the current tactical situation, and ensured accurate firing data throughout the day.<sup>116</sup>

In the static environment of trench warfare, artillerymen on both sides of No Man's Land plotted, computed, and distributed firing data to their guns before their infantry, and later tanks, advanced across the battlefield. Artillery units sometimes calculated artillery fires lasting days in order to "soften-up" the enemy command posts and fortifications before an attack. Fire direction – termed at the time "direction of fire" – for divisional artillery consisted of two types: Predetermined Fire and Eventual Fire. Predetermined Fire was target data precalculated before an offensive or defensive by a brigade, division, or corps headquarters. Eventual Fire referred to those artillery targets that could not be predetermined before a battle, such as the adjustment of the advance of a rolling barrage to compensate for an unexpectedly slow or rapid infantry advance across the battlefield.

Once the infantry moved forward of their preplanned artillery targets, their ability to continue their advance required artillery units to move forward to provide continuous fire support. Once an artillery unit moved, even if it could negotiate the churned-up battlefield and reach a new firing position, the known points and established communication lines that had made calculation and centralization of mass fires possible

<sup>116</sup>Paul S. Bond and Michael J. McDonough, *Techniques of Modern Tactics*, 3<sup>rd</sup> ed. (Menasha, Wis.: George Banta Publishing Company, 1916), 104; U.S. War Department, *Compilation of Notes from the French Artillery Schools and by the French Military Mission, Designed for Use in the School of Orientation* (Fort Jackson, S.C.: Field Artillery Replacement Depot, 1917), 3.

no longer existed. The ability to mass artillery fires thus ceased. Consequently, the infantry battalion or regimental front command post became the clearing station for directing its own artillery and initiated artillery fire requests from its own advancing or retreating infantry.<sup>117</sup>

To provide effective artillery fire support for the infantry commander, it became the practice in the AEF to give tactical fire direction authorization to the infantry regimental commander, who now became the artillery's "Fire Director." With the consultation of his attached artillery liaison officer, the infantry commander directed the planned and unplanned artillery fires. Despite the fact that the artillery liaison officer (usually a lieutenant) kept the infantry commander (battalion or regimental) apprised of the status of artillery support, the system had a number of drawbacks.<sup>118</sup> The AEF senior leadership believed that delegating artillery fire direction responsibilities to the infantry commander would allow him to respond more rapidly and would increase the effectiveness of his artillery support. However in practice, infantry commanders seldom had the training or the experience to use artillery effectively. Often, the infantry commanders were involved with their own unit's fight and did not have the time to direct their artillery support. The artillery further exacerbated this problem by assigning

<sup>117</sup>George P. Hays, "Fire Direction of Artillery Supporting Infantry," *Infantry Journal* (hereafter *IJ*) 18 (May 1921): 508-9. Hays' ideas for massing artillery fires were not new. Brigadier General Aultman, the AEF's 2<sup>nd</sup> Army Artillery Commander, remarked that the adopted infantry directed artillery fire system was inefficient and that all artillery should be under the collective control of the divisional artillery commander with an effective liaison system. For most artillery officers, only this system could ensure responsive and massed fires. *Hero Board*, 739-49; Grotelueschen, *Doctrine Under Trial*, 137-39.

<sup>118</sup>FDC Correspondence, 1.

inexperienced liaison officers. Even if the LNO was competent and experienced, he did not have the authority to request additional fire support from other artillery units in his sector.<sup>119</sup>

To solve the infantry-artillery support problems, George P. Hays, First Lieutenant, 10<sup>th</sup> Field Artillery, proposed that the artillery reclaim its role as the army's primary fire directors and centralize the fire control within the artillery command. In his 1921 *Infantry Journal* article, Hays suggested that the Field Artillery should permanently assign only experienced artillery officers to frontline battalion headquarters, that artillery LNO's should control all fire direction (planned and unplanned targets), that they should report through the division or group artillery commander, and that the LNOs be in direct communication with all artillery units within their sector. Hays also recommended that "Infantry officers [be] relieved from all direction of artillery fire, and required to supply the necessary advice and information to their artillery officers."<sup>120</sup> Recognized in the Field Artillery School commandant's 1944 study as a landmark article in the development of centralized fires, Hays' suggestions were not incorporated into manuals until years later.

In the middle 1920's, the Tactical Department at Field Artillery School moved closer to Hays' concept of centralized fire control when it began *Field Artillery Notes*, which provided a regularly published school house guidance on the Field Artillery's

<sup>119</sup>Hays. "Fire Direction," 509-10.

<sup>120</sup>Ibid., 510.

regulations and doctrine. In September 1927, the Tactical Department's "Fire Direction" chapter provided detailed discussion of the meaning of fire direction. The chapter noted *Training Regulation TR-430-105* (paragraph 2) now defined fire direction as "the tactical command of one or more fire units with a view to bringing their fire to bear from a suitable position upon the proper targets at the appropriate time."<sup>121</sup> Additionally, the chapter expanded the regulation definition and stated that fire direction was now a "part of artillery tactics which has for its purpose the bringing of the maximum fire power of the guns in a manner best to assist the infantry in the accomplishment of its missions."<sup>122</sup> The school text stressed that the relationship between fire direction and artillery tactics was so closely related that it defined artillery tactics (TR 430-105, paragraph 18) as the "art of dispositioning artillery troops, guns, ammunition and signal communications in the presence of the enemy as to assist the infantry in accomplishing its mission."<sup>123</sup>

In the 1920's, the Tactical Department's *F. A. S. Notes* ordained that the field artillery battalion commander was the "fire director." As the fire director, the commander should be familiar with the means by which artillery accomplished its supporting elements with neutralization, interdiction, harassment, and destruction fires. He should keep himself constantly informed on his unit's effectiveness, monitor

<sup>121</sup>The Field Artillery School, *Field Artillery School Notes*, Book I (Fort Sill, Okla.: Fort Sill Artillery School, 1922-27), I-I-D, 2. *Field Artillery School Notes*, published throughout the school year, updated guidance and instruction for artillery tactics and techniques until the release of new school publications or new regulations.

<sup>122</sup>Ibid.

<sup>123</sup>U.S. War Department, TR 430-105, 1924 *Tactical Employment of Field Artillery*, 16.

judiciously the expenditure of ammunition, select the type and amount of ammunition for missions, and ensure his battalion's overall preparation to fire at predesignated targets. Indeed, within the battalion commander resided the centralization of tactical and technical fire direction. In short, Field Artillery School doctrine conferred the responsibility of fire control upon the artillery battalion commander and *de facto* made him a one-man FDC.<sup>124</sup> However, he lacked one critical function: he did not compute gun data for each of his three batteries. That task was still left to the battery commander.

The idea of another individual besides the battery commander computing data for the guns was not foreign. Battery commanders realized that their wide-ranging responsibilities demanded continual attention, which would be further increased during combat. Consequently, with the continual improvements in gunnery procedures and a school system that produced competent technicians, it became common for a battery commander to assign one his lieutenants to do the duties of computing gun data. Clearly, it made sense to have an officer, recently graduated from the Field Artillery School and well versed in current gunnery procedures, to become the primary gunnery data computer for the battery.<sup>125</sup> In essence, the battery commander established his own FDC at his battery with his lieutenant as the battery fire direction officer.<sup>126</sup>

<sup>124</sup>Notes freely interchanged the names battalion commander and fire director. 1922-27 *Field Artillery School Notes*, Book I, 4-6.

<sup>125</sup>Palmer. Senior Officers Oral History Program, MHI, 19.

<sup>126</sup>Jacob L. Devers recalled that when he was a second lieutenant at Fort D.A. Russell, Wyoming (1909-1911), that his battalion commander, Leroy Lyon, developed a firing chart very similar to the one used in 1944. Devers, FDC Correspondence, 1.

Army school texts in the mid-1920's reflected the field artillery prewar doctrine of the senior artillery commander controlling his unit's artillery fires while the battery commander executed technical fire direction. American artillery adhered to its fire direction techniques despite its known deficiency in combat. In the Command and General Staff School manuals, artillery brigade and regimental commanders prescribed the nature, duration, and type of fires of their subordinate units. In theory, the battalion commander supervised his unit's fire direction through "close and continuous observation and close contact with his batteries, as well as on intimate liaison with the supported unit and good tactical judgment.<sup>127</sup> School texts reveal an artillery doctrine moving closer to the establishment of the battalion FDC, yet these manuals still reflected an artillery community that had not grappled with its demonstrated inability to provide continuous and timely fire support for the infantry and cavalry.

Interwar discussion pointed to a fluid and speedy future battlefield dominated by motor vehicles. Realizing that their World War I system of directing fire was inadequate, American officers turned their attention to improving the artillery's ability to deliver responsive fire support. In the mid 1920's, the Field Artillery School Commandant, General William P. Ennis, emphasized reconnaissance, selection and occupation of positions, and the necessity of an artillery battalion to provide prompt fire.<sup>128</sup> The school made a special effort to rid itself of the trench warfare methods that

<sup>127</sup>General Service Schools, 1927 *Tactics and Technique of Field Artillery*, 153-54.

<sup>128</sup>Devers, *FDC Correspondence*, 1.

so many senior officers believed inhibited the field artillery's fighting spirit and shackled its initiative on the battlefield.<sup>129</sup> Major Carlos Brewer, Gunnery Department director, argued that using grid coordinates for targets was sufficient for static warfare, but inadequate in a fast-moving environment or when maps were not available. Adjusting and firing at targets observed from a battalion commander's observation post with supporting individual battery commanders was too unreliable and slow. Brewer observed that if each battery adjusted successively on a battalion target it could work, but "when it was attempted to adjust them simultaneously, there was confusion of rounds [each of the three batteries' adjusting projectiles] fired its which generally resulted in poor effect."<sup>130</sup>

At the Field Artillery School, faculty and students both recognized that the established techniques to control and mass artillery fires were unsatisfactory. Captain Sidney F. Dunn recalled that as a student attending the 1928 Advanced Course that his Tactical Department instructor took the class to the 1<sup>st</sup> Battalion, 18<sup>th</sup> Field Artillery

<sup>129</sup>Letter #8, Hinds to Snow, 15 January 1920, Miscellaneous Correspondence, MSL.

<sup>130</sup>Brewer. FDC Correspondence, 1. Carlos Brewer (1890-1976) graduated from USMA in 1913 and was commissioned a field artillery second lieutenant. Assigned to the Fort Sam Houston, Brewer served along the Texas-Mexico border during the Mexican Revolution until moving to West Point for five years as an instructor, assistant, and associate professor in the Department of Mathematics (1916-1921). Brewer served the next three years three years in Hawaii with the 8<sup>th</sup> Field Artillery and returned to the U.S. to work with the reserves in Colorado. Afterwards, Brewer attended the Field Artillery School and Command and General Staff School. After two years as a student, he became an instructor in the Gunnery Department, Field Artillery School. In August 1929, Brewer became the Gunnery Department's Director until 1934, where upon he became the Professor of Military Science at Purdue University. In World War II, he was the 12<sup>th</sup> Armor Division Commander (1942-1944) and became the commander of the 7<sup>th</sup> Army Field Artillery Group.

Battalion live-fire demonstration of massing battalion fires.<sup>131</sup> For this exercise, the 18<sup>th</sup> Field Artillery established their battalion and battery OPs near each other on the same ridge line and spent four hours adjusting their guns and surveying targets before the students arrived. Whether the battalion commander wanted to fire at a registered target or target of opportunity, a target not previously registered on or surveyed, he called one of his battery commanders to identify the target through a periscope or binoculars at the battalion's OP. After identifying the target, the battery commander adjusted rounds on the target and then had his entire battery shoot. To no one's surprise, all targets fired at, whether by a battery or batteries, were easily hit. But at no point in the demonstration did the battalion commander mass all three of his units on one target. However, when the 1928 Advanced Class tried to duplicate the 18<sup>th</sup> Field Artillery results:

students found that their lack of knowledge of the terrain was a great handicap. In nearly every case the batteries called upon to fire, fired upon the wrong target or missed the target entirely. Even with four hours of survey work, officers could not identify a number of targets from a point near the battalion OP, and then go to another point three or four thousands yards away and identify the same target. The communication system then prescribed, included one line between switchboards and one line to each OP. Usually, the battalion sent a line to the auxiliary [sic] OP, which was at the far end of the long base. This system of communications was cumbersome and time-consuming. Quite often, in observed fires, it took twenty to thirty minutes to place a battery on the correct target.<sup>132</sup>

<sup>131</sup>The 18<sup>th</sup> Field Artillery Battalion was an actual tactical unit, however, its primary mission was to support the Field Artillery School. The use of regular units shooting and supporting the school remains today a primary mission for the rocket and cannon battalions assigned to the two field artillery brigades at Fort Sill.

<sup>132</sup>Dunn, FDC Correspondence, 2.

Because of their failure to mass battalion fires accurately, Dunn's classmates "left with a feeling that fire direction in combat, from a battalion commander's standpoint, was worthless."<sup>133</sup>

Confirming Dunn's account of the Field Artillery School's inability to solve the fire direction and massing fires problem was the *Field Artillery Field Manual* of 1931. As with the 1928 Advanced Class mass fire demonstration, the manual designated the battalion commander as the primary fire director – a tactical decision maker – who decided when to have one or more of his units fire upon the chosen targets at the appropriate time. From the battalion observation post, the battalion commander, assisted by his staff, established a designated reference point in a zone that he believed that the maneuver element would need his unit's fires.<sup>134</sup> To attack the targets from his observation post (OP), the battalion commander, or his representative, could relay a target to the battery observation posts to be fired at by each battery. Because the battery commanders were initially near the battalion commander at the battalion OP, all

<sup>133</sup>Ibid.

<sup>134</sup> *Command and Staff Functions* (1933) outlined the following for the composition of a battalion observation post: Battalion Commander – observes the battalion zone of fire; directs and observes the battalion's fires; S-2 – locates enemy targets, supervises the readings and recordings of the instrument readers (B.C. scopes and range finders), assists in the preparation of the firing chart, and may assist in the transmitting of fire direction to the firing batteries; Instrument operator – operates the B.C. scope; Instrument corporal – operates the range finder; Scout corporal – assists the reconnaissance officer in survey work and assists in recording target data; Reconnaissance Officer (RO) – performs survey work, prepares and updates the firing chart, calculates battery firing data, records firing data on Fire Direction Form, and performs the duties of the RO, S-2, or S-3 when they are absent; Instrument sergeant – assists the RO; S-3 – assigns missions to batteries for firing; supervises the target assignments on the Fire Direction Form; Telephone operators – located near the S-3 with sufficient wire slack to move their telephones from observation points within the battalion observation post area; Battery agents (with horses) – stationed near the Battalion OP to take messages to the their respective batteries. U.S. Field Artillery School, *Command and Staff Functions*, Book 221, 1933 ed. (Fort Sill, Okla.: The Field Artillery School 1933), 97.

commanders, battalion and battery, would decide upon the common battalion targets that they could see and fire to facilitate the battalion commander's ability to conduct fire direction. As with the September 1928 18<sup>th</sup> Field Artillery demonstration, the manual recommended that the "battalion commander should if practical have at least one battery commander near at hand."<sup>135</sup> In short, the 1931 centralized fire direction by grouping all the observation posts in one area. It was an impractical solution. Functional on Fort Sill's school ranges, the observation post technique could easily break down in combat situations that required the battery commanders to be arrayed across a wide front – far from the direct reach of their battalion commander.

The *1931 Field Artillery Field Manual* retained the status of the firing battery commander as "king" of his unit and its fires. Although it stated that the battalion commander controlled the battalion's fires, the manual specified that the "battery commanders are permitted a high degree of independent action ... Conduct of fire is normally the role of the battery commander."<sup>136</sup> The primacy of the battery commander was also recognized by the Chief of Field Artillery Harry G. Bishop in his book *Field Artillery: King of Battles*: "The functions of the battalion are primarily tactical, in counter-distinction to those of the battery which are technical and administrative. The

<sup>135</sup>U.S. War Department, *1931 Field Artillery Field Manual*, 2:362-63.

<sup>136</sup>Ibid., 2:361.

battalion commander normally *directs fire*; while the battery commander normally *conducts fire.*<sup>137</sup> Beyond the organizational culture that placed the battery commander as the technical manager of his unit, and the tactical liberty given him to fire at targets of his own choosing, was technology itself. Until the introduction of reliable radios in the late 1930's, the artillery leadership could not rely upon wire communications to direct a firing battery in combat. Institutionally, artillery officers believed, with good reason, that only a battery commander could direct his unit's fires at a target and that he could not rely upon gun data calculated at a distant battalion OP.

The printed word supposedly ignites societal revolutions. For the U. S. Army Field Artillery's revolution in fire direction, it would be the World War I diary of a Royal Field Artillery (R.F.A.) battery commander, Neil Fraser-Tytler. In *Field Guns in France*, Fraser-Tytler recounted his daily thoughts and actions as a howitzer battery commander from October 1915 until he relinquished command in December 1917. Originally published in 1922, *Field Guns in France* received little notice among American artillery officers until 1929 when a member of the Gunnery Department found

<sup>137</sup>Harry G. Bishop. *Field Artillery: King of Battle* (Cambridge, Mass.: The Riverside Press, 1935), 40. Major General Harry G. Bishop (1874-1934), Chief of Field Artillery from 1930 to 1934, graduated from USMA in 1897 as an Artillery Corps second lieutenant. He fought in the Philippine Insurrection, served as a civil service tax collector in Manila, commanded coast and field artillery units throughout the United States, and went to Leavenworth as a student and instructor from 1910 to 1912. He commanded field artillery troops at El Paso during the Mexican Border incidents. In World War I, he commanded the 3<sup>rd</sup> Infantry Division Artillery in the Meuse-Argonne and the advance into Germany. After the war, Bishop served as a staff officer at the War Department and commanded brigade artillery units in Maryland and Hawaii until he became the Chief of Field Artillery. In addition to *Field Artillery: King of Battle*, Bishop wrote two other books. *Elements of Modern Field Artillery* and *Operation Orders, Field Artillery*. "Major General Retires as Chief of Field Artillery," FAJ 24 (March-April 1934): 105-12; "Major General Harry G. Bishop," FAJ 24 (September-October 1934): 417.

it at the school library.<sup>138</sup> By the end of 1929, the entire fourteen-member Gunnery Department had read it. What struck the group, beyond Fraser-Tytler's day-to-day descriptions of firing and being fired at, was his establishment of a forward Observation Post (OP) during the Battle of the Somme on 17 July 1916. Instead of the traditional practice of placing the battery commander's post in the rear, Fraser-Tytler established his well forward with his infantry. Dissatisfied with his battery's unobserved fire missions and their inherent inaccuracy, he decided to take his battery's signalers and lay a wire from his battery to a "forward" or "frontline" OP:

After about six hours' hard work we got a line carefully laid to our most advanced point, and then began one of the most amusing twenty-four hours I have ever spent. You know that when hunting one sometimes feels there will be good run, so this day I felt we were going to have good luck and a successful kill. My first act was to locate a new enemy trench full of Huns: I sent down the map reference to the battery, telling them to engage it and if possible not to hit me, as I was lying out in a shell-hole in front of our line, and the target was barely 150 yards further on.

A really good "target" is only too often wasted, being merely frightened away instead of destroyed, so in order not to alarm the Hun I registered the trench with the minimum number of shells, and then having informed Group, I also registered the 18-pdr. batteries of our brigade. It was a rather ticklish job shooting other people's batteries so close to our lines. That done, I phoned the officer at the guns to arrange a zero hour in five minutes' time, and then speedily crawled into a safer hole to watch the last act of the drama.

The trench meanwhile was crowded as ever with quite unsuspicious Boches. Then down came the curtain. It was glorious to hear the shells of four batteries all at "gun-fire," swooping down close

<sup>138</sup>Neil Fraser-Tytler, *Field Guns in France* (London: Hutchinson and Co., 1929). Dunn, FDC Correspondence, 2. Dunn commented that Fraser-Tytler "made a game out of his method, and appeared to have taken as much interest and enthusiasm in it, as if he had been shooting ducks on a pond." Throughout *Field Guns in France*, Fraser-Tytler makes light of his ability to kill Germans with his artillery fire directed from his forward observation post. In the appendix is a "Gamebook of German Casualties from Personal Observation" that itemizes each battle's body count – a total of 412 dead "Huns."

over one's head and to see the havoc they were making in the trench, a great portion of which we enfiladed.<sup>139</sup>

News of his forward observation post spread to adjacent units, and after a few days, Fraser-Tytler found himself registering and firing multiple batteries within and outside his brigade. In October 1916, he cited the example of a forward OP that he had used for three days that had expanded from calling the fire for just his battery to directing an additional four batteries and a brigade headquarters. Units had laid a direct communication line to him "so that they can chat straight to us when they want to be helped by our ever-moving front line OP's."<sup>140</sup> With multiple units to adjust and fire, Fraser-Tytler's OP became a hive of activity with his telephonists adjusting multiple units, "exactly like a busy afternoon in the American market on the Stock Exchange, when New York is in a panic."<sup>141</sup>

Impressed with the possibilities of Fraser-Tytler's forward observation post, Brewer decided that his staff would replicate the OP during the Saturday morning gunnery instructor practices.<sup>142</sup> Constructing two splinter-proof bunkers on a ridgeline,

<sup>139</sup>Fraser-Tytler, *Field Guns*, 90-91. Brewer in his 1944 reply to the Field Artillery School Commandant did not mention Fraser-Tytler's book as a catalyst that led to his department's FDC experiments. In a June 1932 memorandum to the Assistant Commandant, LTC McNair, Brewer did note Fraser-Tytler's book as "enlightening" and an inspiration to experiment with centralized fire direction. Brewer to McNair, Subject: Recommendations for Changes in Gunnery Instruction and Battalion Organization, 2 June 1932, FDC Correspondence, 1.

<sup>140</sup>Fraser-Tytler, *Field Guns*, 114.

<sup>141</sup>Ibid.

<sup>142</sup>As its name implies, the Field Artillery School used Gunnery Practice to ensure that its instructors maintained their proficiency in adjusting and calling for fires. These Saturday morning sessions provided Brewer and Ward an excellent laboratory to test new methods and theories developed during the week in their offices and the classrooms.

the instructors began experimenting from a forward OP and trying to concentrate a battalion's fire with one adjusting battery. After varying degrees of success, Gunnery Department officers then experimented with the idea of adjusting a battery and firing a battalion concentration with no maps.<sup>143</sup> In the AEF, the common practice was to subtract the weather effects from adjusting battery's firing data, plot the target on the map, and then compute data for the remaining two batteries from the map.<sup>144</sup> Brewer realized that this method was "obviously too slow for warfare of movement even presupposing that maps were available."<sup>145</sup> He then postulated that because the adjusted corrections for all a battalion's batteries closely matched each other, and because each battery was positioned near the other, that it would be unnecessary to subtract the weather corrections and plot a target accurately on a map. Therefore, Brewer proposed that the quick and accurate solution was to plot the target with the adjusted range and deflection and then compute the basic data for the remaining two batteries. For Brewer, the "beauty" of this solution was it required no actual maps. If all the batteries were on a common survey, then an officer could compute accurate firing solutions on plain or grid

<sup>143</sup>Battalion concentration fire was a general term used to describe an artillery unit's target effects in to a specified circular target area that ranged in size from 50 to 300 meters.

<sup>144</sup>Weather corrections or meteorology factors, commonly referred to as the "MET" or "Metro," accounted for the effects of air density, wind speed, and atmospheric temperature upon the flight of a round. A modern MET accounts for these factors and others such as the rotation of the earth.

<sup>145</sup>Brewer, FDC Correspondence, 2-3.

paper. Brewer's idea materialized into what would become known as the "observed" firing chart.<sup>146</sup>

After solving the battalion massing of fires with Brewer's observed fire chart, two significant related problems remained for the Gunnery Department Officers: wire communications to the observer and the inefficient and inaccurate forward observer adjustment methods. As Fraser-Tytler and countless other artillery observers in World I experienced, the observer's communication team had the time consuming job of laying wire between the observer and the battalion command post. Not only could wire break because of enemy action or friendly movement, it became a leash for the observer which prevented him from moving rapidly around the battlefield. Using improved technology, the Field Artillery crossed the communication gap with the introduction of the SCR-161 portable radio. Carried by the observer and operated at the command post, both parties using the SCR-161 now had an instantaneous, flexible, and reliable communications before the installation of wire.<sup>147</sup>

Equipped with SCR-161's and the "observed fire chart," Brewer tested his theory on a cold March 1930 morning during the school's weekly gunnery practice.

<sup>146</sup>Brewer stated that his adjust fire chart method was taught to students in fall term 1931 without approval from the Chief of Artillery, General Harry G. Bishop. Ward, working with Blanchard and Siebert (the qualified aerial observers) also developed methods of improving air photos as firing charts. In 1931, Blanchard and Seibert worked out how to use mosaic photos as one firing chart, while Brewer created a firing chart from a single vertical photo. The generally accepted standard for the grid paper was 1/20,000 (1 yard equaled 20,000 yards). Brewer, FDC Correspondence, 2; John M. Devine, FDC Correspondence, 1.

<sup>147</sup>Brewer remarked that the SCR-161 permitted "very effective" means of communication, however, wire remained the preferred communications link for the Field Artillery in World War II. Brewer to David E. On, letter, 18 August 1976, FDC Correspondence, 1.

Establishing a rudimentary battalion FDC in an old reconnaissance car at Range Tower 2 at the Signal Mountain training area, two gunnery department officers acted as plotters with only their firing chart (no map) and another officer served as the forward observer with a radio. Using the SCR 161's, the FDC personnel and observer successfully adjusted one battery, used Brewer's adjusted plot method to calculate firing solutions for the remaining two batteries, and then fired the remaining batteries for the battalion concentration mission. Watching the demonstration of the "first" FDC was the Assistant Commandant (1929-1933), Lieutenant Colonel Lesley J. McNair.<sup>148</sup> Despite Brewer's success, the methods of determining the initial data to their targets were highly inaccurate. The traditional methods of axial and lateral adjustment did not work because the short ranges between the observer and the target made the computation of the observer-target angle difficult and slow.<sup>149</sup>

<sup>148</sup>When the Gunnery Department actually established the first FDC is difficult to ascertain. Brewer claimed that it was in March of 1930, but most department members point to early 1932 when Ward's idea of using a base point to adjust and shoot a battalion fire for effect mission. There is no doubt that Brewer and his instructors conducted shoots using improved and enlarged versions of Fraser-Tyler's forward observation post. It is possible that either Brewer made a mistake in his account or Ward wanted to deny Brewer any credit for the establishment of the "first" FDC. Most likely, each group believed that their improvement upon the observation post marked the founding of the first true FDC. In November 1932, the Chief of Field Artillery congratulated Brewer: "As the Field Artillery School states that the credit for the general conception of the methods and for many of the details involved in the use of the SCR-161 short wave radio set in the matter of delivery of fires belongs primarily to you, I desire to commend you for this very progressive step, which will be of great value to the Field Artillery." Harry G. Bishop to Brewer. Memorandum. Subject: Commendation. 8 November 1932, FDC Correspondence. Brewer. FDC Correspondence, 2-3; Sunderland, *History of the Field Artillery School*, 133.

<sup>149</sup>Dunn, FDC Correspondence, 2. Brewer's gunnery solution using adjusted fire data with omitted weather corrections worked and became known as the observed fire chart. The problem of the short distance of the observer-target range in lateral and axial observations was not new. Many articles in the *Field Artillery Journal* suggested various methods to try in solving the problem.

To solve the inherent inaccuracy of the axial and lateral adjustment procedures, First Lieutenant Edward L. Siebert, a fellow gunnery instructor and Aerial Observer Instructor in the Advanced Course, suggested that forward observers should try the air-ground method of adjustment.<sup>150</sup> Ideally, using the air-ground method, the observer knew the gun-target (GT) line and the unit firing already had a target designated by either map coordinates or air photo. If the air observer did not know the GT line, then the adjusting battery piece fired a specified bracket (e.g., a thousand yards parallel to the GT line). The observer then requested an adjusting round on the target in reference to the GT line – so many yards over or short and left or right of the target. After adjusting on or near the target, the observer then called for the "Fire For Effect" phase when the battery, or if needed, a battalion, all fired together on the target. On the next gunnery instructor's practice, two officers (also on flying status as artillery observers) used the air-ground method for adjustment and found that they could make timely adjustments with little effort.<sup>151</sup>

Operating an FDC at the battalion level, the two officers soon discovered that it was too much work for them to adjust the rounds with the observers, plot chart data,

<sup>150</sup>Dunn, FDC Correspondence, 2; Brewer, FDC Correspondence, 2.

<sup>151</sup>Observers gave corrections in increments of 50 yards. For example, 150 yards right, 200 yards short. In his December 1931 report to the Chief of Field Artillery, the Field Artillery School Commandant noted that progress had been made in the methods of identifying and firing on targets by a liaison officer, using no map, via radio. Brigadier General William M. Cruikshank remarked that within fifteen minutes that a liaison officer, using the air-ground methods, could direct effective fires on a target requested by the infantry. Moreover, the liaison could fire a battalion concentration with adjusting "only one" battery. Field Artillery Commandant to Chief of Field Artillery, Memorandum, Subject: Progress Report on Development Work, 16 December 1931, File #319.1/J-5/a, Box 14, E 34, Records of the Chiefs of Arms, Office of Field Artillery Correspondence, 1917-1942, RG 177, NARA. U.S. War Department, *1931 Field Artillery Field Manual*, 2:147-49.

calculate the gun data for each battery, and then relay the gun commands to each of the three gun batteries. Consequently, the Gunnery Department assigned enlisted men from the school battalion to become chart operators. The division of the communication and computation responsibilities among four to five individuals greatly enhanced the FDC's ability to handle multiple missions, reduce mission time, calculate data, and exchange the information with the observers and firing batteries. Combined together, the SCR-161 radio, the observed fire chart, and the air-ground observation method, and a FDC team, the Gunnery Department had solved the major problems of quickly massing a battalion's fire.<sup>152</sup>

Upon ending his tenure as the Gunnery Department Director, Brewer wrote the assistant school commandant, McNair, about "certain conclusions" he had reached after four years of teaching and supervising gunnery: "Some of these conclusions may seem rather radical in nature but I am convinced, after careful study, that if we expect to reap the benefit of modern developments in the employment of our artillery in case of an emergency we must resort to some radical changes from our present organization and training."<sup>153</sup> Reviewing the field artillery's efforts in World War I, Brewer contended "our artillery fell far short of attaining the maximum effect practicable from its fire power."<sup>154</sup> Brewer attributed this to reliance on the "least effective" map data missions and on rolling barrages. He also believed the AEF's officers lacked artillery gunnery

<sup>152</sup>Dunn, FDC Correspondence, 3-5; Brewer to Ott, FDC Correspondence, 1.

<sup>153</sup>Brewer to McNair, FDC Correspondence, 1.

<sup>154</sup>Ibid.

experience – even after eighteen months of intensive training – in part because their training was too filled with maintenance, training, supply, cannon operations, communications, and transportation. This curriculum might be reasonable in peacetime, but it was "impractical and wrong" for a wartime mass army composed of citizen-soldiers. The best solution would be to train selected officers to only specialize in gunnery and to consolidate these "Gunnery Officers" at the battalion command post. This group of gunnery officers would become known as the battalion Fire Direction Center (FDC). The Battalion S3, the officer in charge of the day-to-day operations of a battalion, would oversee this cell within the battalion command post. With fire direction now consolidated at the battalion level, it eliminated the need for battery every officer to be competent in technical fire direction. For Brewer, the battalion FDC was not only an organization to mass fires, but also a solution to solve the manpower and training issues encountered in World War I.<sup>155</sup>

After Brewer left the Gunnery Department in the June 1932, Major Orlando Ward became the department head and FDC development gradually accelerated.<sup>156</sup> One of the first things that Ward did was to refine and summarize the past two years'

<sup>155</sup>Ibid., 2-7.

<sup>156</sup>Whether Brewer and Ward, the number two man in the Gunnery Department, and Brewer worked well together is unknown. Brewer was known as a bright man, but had an abrasive personality. The official U.S. Army History World War II Series points out this may have been the primary cause of Brewer's relief as the 12<sup>th</sup> Armored Division commander in August 1944. What is certain is that Ward, as the Field Artillery School Commandant, initiated the study on the development of the Fire Direction Center. Within his letter to former Gunnery Department members, Ward included a chronology of FDC development as a guide. The study's chronology noted that the "Matter rested" from 1927 to 1933 – the same years that Brewer was the Gunnery Department Director. The "matter rested" comment is even more curious when one realizes that Ward, as a subordinate, joined Brewer's department in 1931 and became the Gunnery Department Director in 1932. FDC Correspondence, 2.

improvements in adjust fire procedures (actually a how to guide on adjusting artillery fire). In Field Artillery School Note Number G-47, "Gunnery Liaison Methods," Ward recognized that the arrival of the SCR-161 short wave radio provided a rapid communication link that allowed a liaison officer attached to an infantry unit to have a battalion concentration delivered within ten minutes. Ward also improved Brewer's air-ground method of adjustment and standardized the words for commands. These refinements of the Brewer's FDC work would eventually become the accepted procedures in World War II. Despite the merits of the new adjustment methods, Ward cautioned they should be considered experimental and "unorthodox until embodied in the Field Artillery Field Manual or other regulations."<sup>157</sup>

Ward also solved another complex gunnery problem: how to attack large irregular shaped targets, such as zigzag trench lines, with battalion concentration fire. Previously, the artillery officer had to compute a single firing solution for each round to ensure that its bursting radius covered the target. The Tactics Department still taught officers to use tracing paper and a long and difficult calculation process to determine gun firing data for each aiming point in a specified target oval or upon the target itself. Ward implemented a far more efficient system that used standard pre-calculated data for one hundred, two hundred, and three hundred yard circles. This permitted an officer to select an appropriate circle to cover the target area. Larger or irregular targets required only the

<sup>157</sup>Orlando Ward, "Gunnery Liaison Methods," *FAJ* 22 (November-December 1932): 631-35. Issued as Field Artillery School Note No. G-47, "Gunnery Liaison Methods," Ward's school note was later published in the November-December 1932 issue of the *Field Artillery Journal*. By the 1933-1934 school year. Ward implemented his liaison method as required Gunnery Department instruction. Dunn, FDC Correspondence, 4; Description of Courses and Master Schedules, 1933-1934, MSL.

use of overlapping multiple circles. Thus, the new Gunnery Department system, a marked improvement over the previous Tactical Department method, increased the mission speed and improved target effects.<sup>158</sup>

Streamlining gunnery procedures even further, Ward oversaw the reform of the cumbersome World War I method of computing firing data to account for weather conditions. Once a battery commander received the target coordinates, he then had to adjust the firing solution for air temperature, humidity, wind, and powder temperature. Without considering these "corrections for the moment," a round could miss its target by hundreds of yards. Yet, even an experienced instructor took ten to twelve minutes, often incurring many errors, to derive a firing solution for the guns. A gunnery instructor remarked that upon the receipt of an updated meteorology report that "student battery commanders, on tactical exercises, wasted many sleepless nights calculating the 'corrections of the moment.'"<sup>159</sup>

Two solutions emerged to solve this bottleneck of calculating metrological corrections. The first solution was similar to Brewer's and was based upon the

<sup>158</sup>Brewer and Ward both realized that field artillery was an area fire weapon system – it did not have to hit directly on the target to destroy it. Throughout official correspondence, personal letters, and textbooks, the effects of a battalion concentration are likened to a hammer blow. For Ward and Brewer, with the assistance of their department, they created an artillery hammer that could rapidly adjust, shift, and concentrate a battalion's fire. The Tactics Department published the Gunnery Department's circle method of concentrating fires in their 1934 edition of *Tactical Employment of Field Artillery*. U.S. Field Artillery School, 1934 *Tactical Employment of Field Artillery*, 41; Dunn, FDC Correspondence, 5.

<sup>159</sup>Dunn, *FDC Corrections*, 5. As a battery fire direction officer in the late 1980's, the author dreaded the evaluation task of computing the MET corrections manually. He never met the standard of twelve minutes – the same time standard established by Ward's Gunnery Department more than fifty years earlier. U.S. U.S. Army, Army Training and Evaluation Program, ARTEP 6-100, *The Field Artillery Cannon Battery* (Washington: Department of the Army, 17 February 1984), 3-57.

assumption that both the adjusted data and meteorological conditions remained similar for specific ranges. Consequently, systems of successive range fans containing the metrological corrections from the gun positions were drawn on the FDC firing chart. If one imagines the weapon range fan as a pie slice, with the weapon location at the apex, and the outer edge the maximum range, then the cutting the slice into successive sections at 1000-yard intervals, each section contained a meteorological correction for drift and elevation. For example, at a range of 2000-yards, the correction could be 2 mils in direction and 2 mils in elevation; but at a greater distance, 4000 yards, in a different range fan section, the correction could be 5 mils in direction and 4 mils in elevation. If a chart operator plotted the target on the firing chart within a specific metro correction fan section, it only remained for the operator to apply data corrections for that specific metro fan to his firing solution. This solution became the standard method for the field artillery throughout the decade and World War II.<sup>160</sup> The second solution was the work of the department's statistical officer, First Lieutenant Charles C. Blanchard. He devised a Range Deflection Protractor (RDP). Essentially a ruler with a compass scale attached, a firing chart operator now could measure range and deflection (the azimuth from the gun to the target) with one instrument. The RDP speeded the calculation of a firing solution.<sup>161</sup>

<sup>160</sup>Dunn. *FDC Corrections*, 5-6; U.S. War Department, FM 6-40, *Firing* (Washington: GPO, 11 February 1942), 264-72.

<sup>161</sup>Dunn, FDC Correspondence, 5.

A final significant problem remained for Ward and his officers to solve: how to remedy the "triangle of fire" that occurred whenever a battalion massed fires upon a target. They realized that the problem stemmed from site: the difference in altitude (positive or negative values) between the batteries and the target. If one battery was higher or lower than the other, and all the batteries shot the same gun elevation, the rounds would impact at different ranges. Gunnery Department officers had isolated the error for they knew that when the site was calculated accurately for each battery that the battalion's triangle of fire disappeared. The problem then was how to eliminate this time consuming procedure of calculating each battery's site. One morning, Ward and two of his instructors, Captains Russell G. Barkalow and Sidney F. Dunn, came up with the idea of working the problem backwards – assume that all the battalion's rounds impacted on the target. Struck with the novelty of the idea, the three officers remembered the back azimuth method of determining the location of gun. Their realization of this method provided the spark that truly allowed accurate battalion fires: the "Base Point."<sup>162</sup>

On Ward's improved observed firing chart, the fire direction specialist would plot the location of all known elements, forward observers, battalion observation post, and the three firing battery locations (the gun location closest to the geographic center of the unit's firing position). After all three batteries registered their guns upon a

<sup>162</sup>Dunn, FDC Correspondence, 3. A gunnery solution already known to artillery officers was the back azimuth method. Using this method, the computer reversed the procedure for determining a target location. Instead of knowing the location of the firing battery and determining the angle/azimuth and locations target, the back azimuth method assumed the target's location was known and used trigonometry to determine angle to the location of the firing battery. Field Artillery School Commandant to Chief of Field Artillery, Memorandum, Subject: Progress Report on Development Work, 12 December 1932, File #319.1/J-7, E 34, Box 14, E 34, RG 177. NARA.

designated known point in enemy territory visible to all battery forward observers, the batteries then reported to the battalion CP their battery's adjusted compass (azimuth) to the known point. As a standard practice, all batteries' elevations were 300 mils. The registered known point became the "Base Point" that established the Base Deflection of 0 (zero) mils for each firing battery.<sup>163</sup> Using the "Base Point" allowed a computer to direct his guns through a quick shorthand commands. Instead of having to announce deflection of 1200 mils to his guns, the computer could now simply say Left 300.<sup>164</sup>

The system of using a base point to determine firing data had its true merits with the forward observers. Using the base point, or a predetermined and known identifiable checkpoint on the battlefield, the observer could then locate targets. For example, an observer identified a target (infantry in the open) that was four hundred yards right and five hundred yards beyond the base point, a road intersection. The observer then reported "Base Point, 400 right, 500 over." Plotting the target with a map pin, the chart operator calculated the initial data to the target and sent the gun data down to a firing battery. While the gun crew prepared to fire the round, the FDC sent a message to the observer that designated the target with a battalion target number (XM1234), the type of munitions (time or point denoting high explosive) to defeat the target, the number of

<sup>163</sup>To increase the accuracy of artillery fire. American artillery accepted the French practice of using 6400 mils to partition the circle instead of 360 degrees. For example, due east is 90 degrees and equates to 1600 mils. Deflection is a designated direction measurement similar to azimuth that simplifies computations and fire control instruments used on the artillery weapons. However, azimuth refers to a compass direction, while deflection is a measurement scale that is superimposed upon the azimuth scale. For example, a battery azimuth of fire is 1600 mils (cardinal direction east), yet the deflection would read 3200 mils.

<sup>164</sup>U.S. Field Artillery School, *1934 Tactical Employment of Field Artillery*, 105-10.

rounds to be fired (battery two rounds), and the unit that would fire or adjust onto the target. After the adjusting gun fired the round, the observer "sensed" the round, now in reference to the target (e.g., 100 right, 200 short), and the computer modified the gun data to hit the target. Once adjusted, the observer called for the battery's fire for effect phase – all guns firing on the target with the number and type of specified rounds. If the target required more than just the battery's fires, the observer then requested the battalion FDC for additional fires. At this point, the adjusting battery told the battalion FDC its adjusted data to the target. With this adjusted data, the battalion computer announced the common correction to the computers responsible for calculating for the remaining two firing batteries. Once they calculated the data, each battery computer sent the gun data to his respective battery. Once all three batteries reported that they were ready to fire, the battalion computer then commanded all the battery computers, in unison, to fire their guns which massed the battalion's fires on the target.<sup>165</sup>

On a Saturday morning instructor's practice in March 1932, Ward, serving as the forward observer, adjusted the 18<sup>th</sup> Field Artillery's three batteries upon a battalion base point. Instructors, serving as chart operators at the battalion FDC, plotted each battery from the base point with their respective adjusted data. Ward then called for fire on a target to the battalion FDC, which in turn designated a gun from the adjusting battery. After rapidly adjusting the gun's fire on the target, Ward then called the battalion FDC to direct that the entire battalion shoot. The Battalion FDC transferred the adjusted data for

<sup>165</sup>U.S. Field Artillery School, *1934 Tactical Employment of Field Artillery*, 105-10; Ward, "Gunnery Liaison Methods," 631-35.

the remaining batteries, and when each battery reported ready to fire, shot the battalion.

The result was so impressive that Ward compared it to "squirting a hose."<sup>166</sup> FDC chart operators now had a quick method of plotting observed fires without maps or air photos.

After a year of testing and modifying, Ward's improvement on the procedures and organization for an efficient battalion FDC closely mirrored the one that was to emerge at the outbreak of World War II.<sup>167</sup>

By combining technical and tactical fire direction within the FDC, the Gunnery Department clashed with the Field Artillery School's Tactics Department. The FDC removed the battery commander from his traditional duty of calculating data, firing his battery, and most significantly, engaging targets that he observed. Under the Gunnery Department FDC system, the battery commander was now a manager of his battery, not a director of its fires. This fundamental change eliminated the battery commander's role as an observer and thus the need for the very skills emphasized by the Tactical Department. Consequently, the Gunnery and Tactical instruction gave students conflicting guidance on the roles and responsibilities of the battalion commander, the battery commander, and the artillery representative at the infantry battalion – the liaison

<sup>166</sup>Devine, FDC Correspondence, 1-2.

<sup>167</sup>Dunn remarked that the Gunnery Department tested all techniques and computations in the FDC to ensure that it did not require an engineering degree to determine firing data. Dunn, FDC Correspondence, 4-6. U.S. Field Artillery School, *1934 Tactical Employment of Field Artillery*, 105-10; Ward, "Gunnery Liaison Methods," 631-35.

officer. Each department's classroom instruction and textbooks diverged on the proper procedures and personnel responsibilities in the conduct of fire.<sup>168</sup>

**Resistance to change at the Field Artillery School extended beyond the Tactics Department.**

Using the long established standard wire patterns among observers, guns, battery executive officer, and the battery commander, the Communications Department, following Signal Corps procedures, insisted that all wire communication lines go through the battery switchboards to route all calls for fires through the battery commander. During the school's practical exercises in "open-warfare," it adopted the *ad hoc* method of laying two lines: one, from the battery commander's OP to his guns; and the other, from the battalion OP to the battery guns. It was not until the late 1930's that the Communications Department permitted the battalion commander's OP to talk directly to all three batteries.<sup>169</sup>

Despite the battalion FDC vast improvements in massing a battalion's fires, the firing battery commander still retained the task of establishing and shooting unobserved missions, shooting at suspected targets without an observer, and using the unobserved

<sup>168</sup>A common compromise in Field Artillery School text books was for the Gunnery Department to insert a disclaimer. Ward, in the 1932 November-December issue of the *Field Artillery Journal*, explained that the new method of adjusting fire were authorized by the Chief of Field Artillery for school use only and that they should be considered experimental and "unorthodox until embodied in the Field Artillery Field Manual or other regulations." Four years later, the Gunnery Department, in the 1936 edition of its *Gunnery, Book 161*, inserted the guidance, "For use in resident instruction at the Field Artillery School only" over its procedure in addition to the traditional method of observer adjusting fire. Ward, "Gunnery Liaison Methods," 631-35. *Gunnery*, Book 161. 1936 ed. (Fort Sill, Okla.: The Field Artillery School 1936), 304-5; Dunn. FDC Correspondence, 5.

<sup>169</sup>Dunn, FDC Correspondence, 4; 60<sup>th</sup> Field Artillery Brigade, *Conduct of Fire*, 1938 ed. (Topeka: Headquarters Kansas National Guard, 15 July 1938), 38.

firing chart.<sup>170</sup> Lieutenant Colonel H. L. C. Jones, the new Director of the Gunnery Department in 1940, realized that the maintenance of two separate charts was impractical and redundant. He directed three of his department's senior instructors, Majors Wyburn D. Brown, Einar B. Gjelsteen, and George V. Keyser, to develop methods that allowed the battalion FDC to do both types of fires, adjusted and unobserved, on one chart. In effect, Jones followed Ward's example and had his team work backwards to find the solution. As Ward and his officers encountered, the problem was how to account for the different elevations among the three firing batteries and the target.

Using ideas generated from many brainstorming sessions, Jones and his team of instructors first tried a cumbersome solution in which a strip of paper recorded the plotted elevations of the adjusted battery elevations and the base point. Majors Keyser and Gjelsteen then tried using a paper scale that could allow a computer to convert the range into elevation (gun elevation or quadrant) that applied the adjusted firing data corrections (the ratio of adjusted range to map range commonly referred to as "K" in gunnery terms). These scales were impractical because the computer could not apply "K" automatically for each target. The team then experimented with various solutions during several live-fire sessions in November 1940. At these practices, Jones designated for the first time the FDC positions of the Horizontal Control Operator (HCO), who

<sup>170</sup>A firing battery used the unobserved firing chart, or survey firing chart, when targets could not be seen by the observer or the observer's location was unknown. Unobserved targets could be derived from the readings of Sound and Flash Observation battalions or refinement of intelligence information. A battery could also fire at targets located by grid coordinates. 60<sup>th</sup> Field Artillery Brigade, *Conduct of Fire*, 30; George V. Keyser, FDCC Correspondence, 2-3; Einar B. Gjelsteen, FDCC Correspondence, 2-3. U.S. War Department, FM 6-40, 1942 *Firing*, 289-91.

operated the direction chart to determine a battalion common deflection, and Vertical Control Operator (VCO), who operated the elevation chart to calculate a battalion common quadrant. Each control operator had an identical chart to verify data. It was during these live-fires that Burns conceived of the idea of creating a scale that used algorithms to determine data and created an artillery slide ruler. Burns' ingenious device became known as the Graphical Firing Table (GFT).<sup>171</sup> Instead of the time-consuming process of consulting the Tabular Firing Table (TFT) for firing data, a chart operator now moved a transparent slider with a hairline marker (manufacture's hairline, MHL) to the range announced by the HCO. The VCO, the chart operator responsible for determining the initial gun elevation for the battery computers, could then rapidly read the announced range's corresponding elevation and check his chart to determine the target's elevation. Burns' GFT now made it possible for the VCO to apply the "K" accurately to the other firing batteries' data. Jones' vision initiated the next significant step in the ability of the Battalion FDC to calculate data for all firing batteries for observed and unobserved fires on one chart.<sup>172</sup>

<sup>171</sup>Jones spent a year away from Fort Sill developing the Graphic Firing Table (GFT). Gjelsteen, FDC Correspondence, 3. The Tabular Firing Table (TFT) is as its name implies a compilation of weapon firing data for a specific weapon system and powder charge in matrix format. The initial column entry in the table is range (from the powder charge's minimum range to maximum range in hundred meter/yard increments). For example, a howitzer (155-mm) shooting Charge 4 Green bag needs to fire at a target three thousand meters away. The computer would enter the CHG 4 GB TFT and record that at a range of three thousand meters an elevation 166.6 mils was required to raise the gun tube to "hit" the target. Other data included in subsequent columns provided the round's time of flight (10.3 seconds), the Drift (16 meters) and data corrections that accounted for the weapon's muzzle velocity, air temperature, and projectile weight. U.S. Army, FM 6-40, *Tactics, Techniques, and Procedures for Field Artillery Manual Cannon Gunnery* (Washington: GPO, 23 April 1996): 7-14-7-15.

<sup>172</sup>Jones's idea of a single chart was regulation in the FM 6-40, 1942 *Firing* (paragraph 404, 258). The surveyed firing chart, with its superior accuracy over the observed chart, was deemed the primary goal

In March 1941, Keyset became the Director of Gunnery with Gjelsteen as his Chief of Fire Direction. Gjelsteen improved the FDC system so that a commander could mass his battalion which led to a technique of massing divisional and corps artillery – multiple battalions. In April 1941, Chief of Staff General George C. Marshall embarked on a four-day trip to inspect training and posts that included Fort Sill. Demonstrating the merits of the massing battalion fires, the Gunnery Department executed a four-battalion shoot for the Chief of Staff. Marshall questioned whether the field artillery could do it without a map. Gjelsteen derived a solution a week later: each battalion would have their adjusting piece register on a Division Artillery Check Point. Experimenting with his new technique during the school's special fire direction and survey courses, Gjelsteen developed a system that enabled one observer to mass divisional artillery, no matter the chart type – survey or observed. Indeed, with this system, an observer could have any size element, battalion, division, or corps mass on a target.<sup>173</sup>

after the battalion had established survey. Normally, because survey is a time consuming process and accurate locations and directions not yet established and recorded, the FDC first used an observed fire chart because accurate target locations were not required for effective fire. Once the battalion survey team established common survey among all the firing units (all firing batteries use the same battalion control point as a basis to determine their location and direction of fire) the FDC personnel then created a surveyed chart and transferred the observed chart's data corrections. Even the 1942 FM 6-40 stated that the FDC should use a survey firing chart as soon as possible (Paragraph 473, 301). By the 1945 FM 6-40 edition, the FDC maintained a surveyed chart and a observed firing chart (Paragraph 363a-c., 354). Additionally, the 1945 manual dictated that each firing battery to maintain its own firing chart so that fire control could be easily decentralized if needed (Paragraph 363d., 355). Keyser, FDC Correspondence, 2-5; U.S. War Department, FM 6-40, 1942 *Firing*, 258; U.S. War Department, FM 6-40, *Field Artillery Gunnery Manual* (Washington: GPO, 1 June 1945), 422.

<sup>173</sup> In June 1943, Gjelsteen published in the *Field Artillery Journal* his technical solution for massing the fires of divisional and corps fires. He emphasized the necessity to fire a registration on a common control point established by the command's survey team. Registration was also a necessity because most units did not use a common map to build accurate firing data charts among all the artillery battalions within the command. If done properly, a division artillery commander could mass all four of his battalions on one target within five minutes. Einar B. Gjelsteen, "Massing the Fires of Division and Corps Artillery," *FAJ*

Observing a light field artillery battalion on combined maneuvers in May 1939, Captain John J. Burns recognized that tactical benefits of the battalion FDC were not being fully realized. In his opinion, the artillery community was "still influenced by our [field artillery officers] previous conception of the battalion as three batteries capable of coordinated effort under the direction of the battalion commander."<sup>174</sup> Since the publication of its first manual (1907) to the latest edition (1931), the Field Artillery specified that the battery commander conducted the fires of his unit.<sup>175</sup> Burns declared that this "conception" needed to change. There needed to be only one agency, the battalion FDC, to answer calls for fire, collect battlefield information, and tactically and technically direct a firing battery's fires. Furthermore, the battery commander should no longer be able initiate his own fire missions because it prevented two separate batteries from firing upon the same target. Burns believed that only a battalion FDC could evaluate and prioritize the importance of calls for fire missions and systematically delegate them to a battery or to the entire battalion. Burns recommended that the battalion communications officer supervise all communications and that the battery commanders' OPs be eliminated. Converting the Battery Commander's OP into battery

33 (June 1943): 426-28; Larry I. Bland, ed.. *The Papers of George C. Marshall*, 3 vols.. *We Cannot Delay* (Baltimore: The Johns Hopkins University Press, 1986), 2:473. Gjelsteen, FDC Correspondence, 2-6; *Marshall Papers*, Reel 36, 984-85; Keyser, FDC Correspondence, 2-5. See FM 6-40, 1942 *Firing*, pages 246-47, for Gjelsteen's method of massing divisional artillery fires.

<sup>174</sup>John J. Burns, 'The Light Artillery Battalion Functions as a Fire Unit,' *FAJ* 29 (July-August 1939): 351.

<sup>175</sup>U.S. War Department, *1907 Drill Regulations for Field Artillery*, 87; U.S. War Department, *1931 Field Artillery Field Manual*. 2:193.

level FDCs (directly connected to the battalion FDC) would be an important step in making the battalion as one fire unit.<sup>176</sup>

The increasing encroachment of the battalion FDC on the battery and battalion commander's domain raised much concern among traditional artillerymen. Major Lloyd M. Hanna asserted the battery and battalion commanders were now removed "from active leadership in the fire fight" and would not be able to ensure that artillery fire adequately supported infantry units. Beyond the problem of adequately controlling fires for the infantry, Hanna wondered how an artillery community that chiefly relied on wire communications systems could embrace the battalion FDC which depended on radios.<sup>177</sup> Hanna was not alone in his objections. George V. Keyser, member of the Gunnery Department in the 1930's, remembered that "there had been a persistent complaint that the FDC infringed upon the established right of the Battery Commander to use his own battery for observed fires."<sup>178</sup> Years earlier in 1932, Brewer had anticipated resistance from the artillery traditionalists because it would "seem rather radical to the field artillery [man] of long experience who has always thought of the battery commander as we often see him in field exercises of an advance guard action, sitting on a hill firing his battery at first one target and then another."<sup>179</sup>

<sup>176</sup>Burns. "The Light Artillery Battalion," 351-53.

<sup>177</sup>Lloyd M. Hanna, "The Lance of Aben Habuz," *FAJ* 3 (May-June 1940): 236-37

<sup>178</sup>Keyser, FDC Correspondence, 2.

<sup>179</sup>Brewer to McNair, FDC Correspondence, 7.

Roadblocks to implementation extended beyond issues between those in the old school and new school artillery. Institutional social beliefs about those who composed the ranks within the Army also manifested itself in the operation of the FDC – the long running conflict between officers and enlisted men. The artillery leadership's belief in the officer's superiority in computational skills was reflected by insistence that officers man the FDC. However, the artillery's expansion prior to World War II made this impossible. Writing in 1941, a battalion staff officer of the 2<sup>nd</sup> Battalion, 160<sup>th</sup> Field Artillery remarked that after "many of the battalions officers were absent on detached service, at schools, and so on, so the point of assigning officers computers was 'out.' The only solution was to employ enlisted men in this capacity. It was with considerable trepidation that we commenced training, but our fears proved groundless."<sup>180</sup> The FDC had simplified training and reduced the number of gunnery experts just as Brewer predicted nearly a decade earlier. Through training, and a realization of the competence of enlisted men, the artillery officers made the practice of manning the battalion FDCs with enlisted men. Not until the publication of the Field Artillery's Tables of Organization dated 1 April 1942 did enlisted men officially become computers at the battalion level.<sup>181</sup>

Those in charge of the artillery also began to see the merits in the battalion FDC. The Chief of Artillery General Upton Birnie pronounced in a lecture to the Army War

<sup>180</sup>Walter D. Atkins, "The New Fire-Direction Technique," *FAJ* 12 (December 1941): 985.

<sup>181</sup>FDC Correspondence, 4.

College in 1935 that:

Our present regulations are working away from the intricate technique of preparation of fire, and emphasis is being placed more and more upon simplicity. A great deal of emphasis is being laid upon the rapid assignment of targets and upon means and methods of concentration upon them of the fire of a number artillery units; increased efficiency of communications is aiding materially in this respect. I consider these trends in Field Artillery training to indicate a healthy state of affairs.<sup>182</sup>

Despite Birnie's positive remarks about the FDC, the acceptance and implementation of the FDC among field units was not pressed forward. Senior artillery commanders failed to follow Field Artillery School publications or learn about the FDC.<sup>183</sup> It would not be until the issue of the wartime manuals that the official establishment and methods of the FDC would go beyond borders of the Fort Sill reservation.<sup>184</sup>

<sup>182</sup>Birnie. "Developments in the Organization, Armament and Equipment of the Field Artillery," AWCL. 13 September 1935, G-3 Course No. 6, 1935-1936, MHI, 11. Major General Upton Birnie (1877-1957) served as Chief of Field Artillery from 1934 until 1938. Graduating from USMA in 1900 and commissioned an Artillery Corps second lieutenant, Birnie served in Cuba, the Philippine Islands, and on the Mexican Border. During World War I, he served on the General Staff at General Headquarters AEF participating in the Battle of Chemin des Dames (French) 1917 and the St. Mihiel and Meuse-Argonne offensives. "Major General Upton Birnie, Jr.," FAJ 24 (May-June 1934): 201.

<sup>183</sup>J. Lawton Collins to George C. Marshall, 31 October 1938, *Marshall Papers*, Reel 9, 161-65. Collins wrote Marshall about the new developments at the Field Artillery School in fire direction. Marshall replied that he was interested and told Collins to "Drop me a note and give me some idea of what you are talking about, unless it is purely technical."

<sup>184</sup>In his biannual reports (1931-1933) to the Chief of Field Artillery, the Field Artillery School Commandant, Brigadier General William M. Cruikshank, praised Brewer's and Ward's advances in their new adjustment methods with base points, no map firing, and air-ground procedures. Absent in all the status reports to the Chief of Field Artillery was specific discussion and description of the organization that used these new and improved firing techniques. Cruikshank's omissions must be seen as his tactic to avoid public confrontation over the traditional roles of the battery and battalion commanders in fire direction. In his June 1933 report, the commandant noted that the improved techniques in fire direction had led to "systemized and simplified" staff work, but Cruikshank gave no further details on the staffs organization. Field Artillery School Commandant to Chief of Field Artillery, Memorandum, Subject: Progress Report on Development Work, 8 June 1933, File #319.1/J-8. Field Artillery School Commandant to Chief of Field Artillery, Memorandum, Subject: Progress Report on Development Work, 16 December 1931, File #319.1/J-5; Field Artillery School Commandant to Chief of Field Artillery, Memorandum, Subject: Progress Report on Development Work, 13 June 1932, File #319.1/J-6; Field Artillery School

By the late 1930's, the school battalions at Fort Sill concentrated on advanced artillery procedures, communications, tactics, and gunnery. Davis recalled that the training was "superior;" and that Fort Sill had demonstrated that it could fire four or five battalions on the same target.<sup>185</sup> The Field Artillery School taught FDC procedures to all members of the U.S. Field Artillery. Instruction in gunnery for the 1936-1937 Reserve Officers Artillery Course included 117 hours of instruction. Completing their correspondence work, reserve officers would then attend a course at Fort Sill to finish their training. A critical component in the school's student gunnery problems, published in the Extension Courses, was for a student to fire battalion level missions. Using the extension problems as a starting point, reserve officers would create a battalion overlay for an infantry plan of attack. With this overlay, students would develop a firing chart and explain their selected concentration targets. A prominent feature of the firing solutions was that instructors required the students to use the base point to calculate the artillery battalion's concentration after they had already used the registration of the adjusting battery.<sup>186</sup> The school thus ensured that its methods of shooting artillery through the battalion FDC was now an accepted practice among regular and reserve officer graduates.

Commandant to Chief of Field Artillery, Memorandum, Subject: Progress Report on Development Work, 12 December 1932, File #319.I/J-7, all found in Box 14. E 34, RG 177, NARA.

<sup>185</sup>John J. Davis, interview by Robert J. Fullerton, Project 86-3, transcript. Senior Officers Oral History Program, MHI, 40.

<sup>186</sup>Guide for Instruction, Field Artillery Troop School of Instruction for Reserve Officers (Thomason Bill), Gunnery, 1936-1937, File 210.1/B-4/DA. Box 8, E 34, RG 177, NARA.

Although taught formally in the school since the 1934 school year, the artillery community's acceptance of the FDC in field units did not occur until late 1940 and 1941. One possible explanation is that with the artillery's rapid expansion from 1939 and onward, the power and influence of the World War I generation of field artillery officers in the expanding army declined. Promoted to higher level units and staff positions or retired, senior artillerymen were not present to undermine the new "school solution" to fire direction. Consequently, those that remained had been schooled at Fort Sill and accepted the FDC as the way to direct a field artillery battalion's fires. Thus, the first lieutenants and captains that had attended the Field Artillery Schools in the middle and late 1930's instituted the FDC when they were promoted majors and lieutenant colonels.

Another advantage of centralizing fire control was that it reduced the battalion's need for competent specialists to compute gun data. In a time of rapidly expanding units, the centralization of talent in one pool could easily improve the technical soundness and speed of calculating data for all three firing batteries as Brewer had predicted.

In October 1941, the Chief of Artillery General Robert M. Danford went to Fort Sill, observed division artillery FDC in action, and gave his official approval for the FDC's basic organization and procedures.<sup>187</sup> By 1942, through field exercises and practical wartime experience, the American artillery settled on the manning and duties of those personnel in the FDC at the battalion command post (CP). The S-3, usually a

<sup>187</sup>In October 1941, Major Weyburn D. Brown consolidated the various Gunnery School Notes into the department's textbook: *Firing Book 161*. The War Department used Weyburn's text as the basis of FM 6-40, *Firing*, published in February 1942. Gjelsteen, FDC Correspondence, 5; "Lessons from the Maneuvers." *FAJ* 31 (December 1941): 916; Frank G. Ratliff, "The Field Artillery Battalion Fire-Direction Center – Its Past, Present, and Future," *FAJ* 40 (May-June 1950): 116.

captain, directed the unit's planning and operations, and served as the officer in charge of the FDC. The FDC also included the horizontal-control operator (HCO), the vertical-control officer (VCO), and a battery computer for each of the three gun batteries. The HCO prepared the firing chart with all three batteries, announced to each battery computer their unit's deflection to the designated target. Working on a chart exactly set up as the HCO, the VCO determined the site, the elevation that guns needed to raise or lower their tubes to account for the target's range and altitude. The VCO also accounted for terrain features (ridges) that could prevent the round from traveling to its intended target. Each battery computer received instructions from the S-3 on when to shoot, how many, and what type of rounds the guns would fire to destroy a target.<sup>188</sup>

With centralized fire direction and common base points, a division or corps headquarters FDC could easily coordinate multi-battalion fire missions.<sup>189</sup> The effect upon the enemy was devastating. One of most effective fire missions to originate from

<sup>188</sup>The Gunnery Department started using the terms HCO, VCO, and computer by 1940. In World War II, advances in aerial photography and interpretation also enabled an artillery corps headquarters, through the method of a radial line plot, to provide any battalion that called to receive the true trigonometric coordinates of any identifiable terrain feature, map or photo. United States Field Artillery Association, *Field Artillery Guide* (Washington: United States Field Artillery Association, 1942), 323-29; U.S. Field Artillery School, 1934 *Tactical Employment of Field Artillery*, 96; Keyser, FDC Correspondence, 2; Field Artillery Report, 1 April 1944, Headquarters, Army Ground Forces, AWC, Washington, D.C., Donovan Research Library (hereafter DRL), U.S. Army Infantry School, Fort Benning, Ga., 1-2 (hereafter AGF Artillery Report).

<sup>189</sup>Even after extensive combat experience in World War II, artillery commanders retained the FDC at the battalion headquarters with forward observers using grid coordinates to locate targets. To ensure fire direction survivability in case things got "hot" (an enemy attack), units also established alternate FDCs at the firing batteries and the battalion Command Posts (CPs). In fact, if the tactical situation permitted it, such as each firing battery supporting a different infantry unit, a battalion would decentralize fire direction down to the battery level. This occurred as early as the North African Campaign (1942-1943), and by 1944, all American batteries in the Italian campaign kept firing charts. William C. Westmoreland, "Combat Conclusions of a Medium Battalion in Africa," *FAJ* 33 (September 1943): 649; AGF Artillery Report, DRL, 1.

the creation of the battalion FDC was the Time on Target. Artillerymen knew that once they started the elongated process to adjust each of their firing batteries, enemy infantry sought cover immediately to avoid the subsequent battalion fire for effect. With the element of surprise gone, the artillery's effectiveness diminished dramatically. Success for defeating the target quickly lay in shortening the firing time. The battalion FDC provided this surprise to an extent with the massing of fires. However, to make surprise complete, the Time on Target (TOT) would have a unit, whether a battery or multiple battalions (four or five), have their rounds impact upon the target at the same time – greatly reducing the enemy's opportunity to seek cover. By calculating the time of the flight of the round from the gun to the target, battery computers could easily fire their battery's guns at the designated time and have their rounds impact simultaneously on the target. Naturally, this mission required that units to keep the same exact time. A field artillery battalion commander with the 5<sup>th</sup> U.S. Army in Italy 1944 explained the success of the TOT and why the Germans called it "automatic artillery":

We had a lot of massing of fires in our last two weeks in the lines. We had seven battalions, all 155 M-1 howitzers. We want to get coordinates and description of the target from Army as a part of the photo interpretation. It is important to get the nature of the target as it is a guide in determining how much ammunition to use. We are sold on the TOT procedures; we allow for time of flight so that all come down together. We synchronize watches and all battalions S-3's wear split second watches.<sup>190</sup>

<sup>190</sup>AGF Artillery Report, DRL, 2. John J. Davis, Senior Officers Oral History Program, MHI, 40.

Improved radio communications developed during the war also enhanced the field artillery to concentrate its fires for corps level missions.<sup>191</sup> In February 1944, Lieutenant General Jacob L. Devers, then the Deputy Commander-in-Chief (Allied Force Headquarters), asserted that the Field Artillery School's "methods of using artillery fire in large concentrations which are directly responsible for the magnificent success of the field artillery in this Theater. Their fire is accurate and can be massed on a second's notice with great ease and simplicity."<sup>192</sup> General J. Lawton Collins, VII Corps Commander in Europe, admired the German 88-mm gun, but believed their artillery was not as well organized. They did not have the Americans' "tremendous advantage" of massed fires. He recalled that "At one time, I massed twenty-two battalions on one target."<sup>193</sup>

After a few months, combat forced the Field Artillery to implement modifications and systematic improvements that perfected the decade-long work of the Gunnery Department. Within the pages of the artillery's last wartime FM 6-40 (*Field Artillery Gunnery*) was perhaps the most fitting recognition of the American field artillery's

<sup>191</sup>For all advantages radio offered, it was susceptible to enemy interception of message traffic and could reveal a sender's location through radio directional finding equipment. When possible, American artillery units, in the ETO and PTO, reverted to wire communications to secure constant contact between the FDC and the firing batteries. Standard practice was for divisional artillery battalions to install two wire lines between units and establish lateral lines between batteries. With wire and radio, all parties in the gunnery team (battalion FDC, firing batteries, and forward observers) had two means of communication to the OPs. AGF Artillery Report, DRL, 6-8.

<sup>192</sup>Devers, FDC Correspondence, 2. Ratliff, "The Field Artillery Battalion Fire-Direction Center," 117.

<sup>193</sup>J. Lawton Collins, "Conversations with General J. Lawton Collins," No. 5, transcribed by Major Gary Wade, 17 May 1983 (Fort Leavenworth, Kans.: Combat Studies Institute, U.S. Army Command and General Staff College, 1983), 4.

centralized fire direction. In Part Six of the field manual, "Fire Direction; Massing Fires," defined fire direction as: "the tactical and technical employment of fire power of one or more artillery units to bring fire to bear at the proper place at the proper time in the appropriated volume. Effective fire direction depends upon proper organization for combat, reconnaissance, survey, communication, liaison, observation, and intelligence."<sup>194</sup> No longer were the battalion commander's tactical tasks and the battery commander's separated – efficiency and volume demanded a centralized nerve center to compute and coordinate a battalion's fires.

Various reasons explain the delayed acceptance of the battalion FDC: senior officer misgivings, organizational fear of the untried, and ignorance. Perhaps the primary reason that the American artillery community accepted and used the battalion FDC was because nobody, even reluctant Chiefs of Artillery and their fellow traditionalists, could deny that it worked. The battalion FDC eliminated the battery commander as the middleman in the fire direction equation. Carlos Brewer, Orlando Ward, and the progression of gunnery instructors that followed, replicated and then improved an R.F.A. battery commander's idea of artillery forward observation post. Fraser-Tytler's artillery duck blind on the Western Front evolved into an American FDC, an organizational revolution that efficiently directed mass artillery fires and proved decisive in World War II.

<sup>194</sup>U.S. War Department, FM 6-40, *1945 Field Artillery Gunnery Manual*, 318.

## CHAPTER IV

### THE FORWARD OBSERVER: THE AEF LEGACY

*The most important lesson from the experience in France is the absolute necessity of closest coordination and harmony in the work of staffs and the various arms engaged and, especially of a mutual sympathetic understanding between infantry and artillery of the needs, powers and limitations of each other.*

*The Hero Board  
27 March 1919<sup>195</sup>*

The last significant combat experience that the American infantry had with the field artillery before World War I was the Spanish-American War (1898). In this short-lived conventional fight, the American infantry equated effective fire support with placing the cannon within or immediately behind its skirmish line – the tactics of the Civil War. With the long-range machine guns and rifles developed at the turn of the 20<sup>th</sup> century, the frontline became a precarious position for artillerymen, and they soon sought cover behind hills. Without a target in direct view, artillery gun crews now relied on their battery commander, at a forward observation post, to adjust their fires, a technique known as indirect fire. But a new tactical problem now emerged: how could the artillery commander effectively adjust fire to support advancing infantry from his stationary observation post?

The guidance for artillery in pre-World War I American regulations was that the artillery battalion commander established a command observation post with at least two

<sup>195</sup>*Hero Board*, 20.

of three battery commanders setting up their observation posts nearby for ease of command and control. Ideally, the commander chose his observation station on an elevated point (tree, ladder, building, or tower) so that he could see targets in his assigned sector, and if possible, adjacent sectors of the battlefield.<sup>196</sup> During firing operations, the battery commander followed the fire orders of his commander, but remained the primary director for his four battery guns. Underscoring the battery commander's tactical independence, the 1916 *Field Artillery Service Regulations* emphasized: "The right of the battery commander on his own responsibility to change target to meet sudden changes in the situation, when communication has been interrupted or in the belief that the major [battalion commander] can not be early enough informed, should not be abridged."<sup>197</sup> Almost forgotten in this arrangement of battalion and battery commander observation posts was the new tactical challenge of using indirect fire: timely and accurate artillery to support frontline infantry.

Pre-World War I American artillery fire support tactics were simplistic. Before the attack, the infantry and artillery commander were to meet and decide which targets, verified and suspected, needing "service" during the infantry advance. After this consultation, the artillery commander would issue his plan directing where his battery commanders should position their artillery batteries, the location of the observation posts, and the battery positions. At the divisional level, the brigade artillery commander

<sup>196</sup> 1916 *Field Artillery Drill and Service Regulations*, 3:75-76.

<sup>197</sup> Ibid., 3:163.

would assign reinforcing artillery to destroy enemy artillery and augment these artillery units in direct support of the infantry. Divisional artillery units would use "rapid and intense concentration of fire" on their targets, and once the advance reached the danger zone of the supporting artillery fire, the infantry commander would give a prearranged signal, "a conspicuous and suitable flag," that would cause the artillery commander to order his guns to increase their range beyond the objective.<sup>198</sup> Once the infantry captured the objective, the artillery units were to rush their guns forward to reinforce the infantry defense and provide fires to defeat any enemy counterattack. For defensive operations, the artillery commander conducted reconnaissance of enemy positions and probable avenues of attack, strengthened their defensive positions, and built-up their ammunition supplies. Once the enemy attack commenced, "every gun must at once, even without particular orders, resume the struggle and engage the enemy's Infantry only, heedless of the artillery fire."<sup>199</sup> Offense or defense, artillery support tactics for the infantry closely matched those of the Civil War.<sup>200</sup>

Not completely oblivious to the new demands of indirect fire, American regulations specified that an "agent" or "scout" be sent to the infantry regimental headquarters to accompany the attack and "see that the instructions of the commander of

<sup>198</sup>Ibid., 4:100-01. Whether used in the offense or defense, a concentration was a general and inclusive term. Successive concentrations, known as "accompanying fire," neutralized the enemy at known or suspected positions along the infantry axis of advance.

<sup>199</sup>Ibid., 4:99-103.

<sup>200</sup>A. B. Warfield, "Notes on Field Artillery," 5 March 1917, in U.S. War Department, *Notes on Infantry, Cavalry, and Field Artillery* (Washington: GPO, 1917), 65.

the troops are promptly sent back to the artillery."<sup>201</sup> Relying upon runners or wire communications created an invariable delay between the request and execution of a fire mission. Regulations recognized that artillery scouts and reconnaissance officers "may be employed" before a battle to establish communication with the infantry and that it "may frequently be necessary for the Infantry to furnish additional means of communication. Especially this is necessary during the last moments of an assault, when previously concerted signals for the cessation or shifting of Field Artillery fire must, as a rule be given from the Infantry firing line."<sup>202</sup> With little practical experience gained from combined training with the infantry, field artillerymen had little idea of the complexity of synchronizing their fires with an infantry attack. Finally, and perhaps the greatest short coming, American artillery fire support procedures, shaped by the small-scale battles of the Philippine War, were inadequate for the mass modern warfare of World War I.

Seeking an immediate solution, the AEF adopted the French liaison officer (LNO) organization.<sup>203</sup> The artillery AEF liaison team consisted of an officer, usually a lieutenant, a senior NCO to command the section in his absence, two or three two-man

<sup>201</sup> John E. McMahon, "The Field Artillery of the United States Army," *FAJ* 2 (January-March 1912): 103. 1916 *Field Artillery Drill and Service Regulations*, 4:9. See Chapter III, "Eliminating the Middleman: The Fire Direction Center" for more discussion on American efforts to use indirect fires.

<sup>202</sup> 1916 *Field Artillery Drill and Service Regulations*, 4:28-29.

<sup>203</sup> Liaison for the Field Artillery divided into two classes: liaison with other arms, primarily the infantry, or liaison with other artillery organizations. U.S. War Department, *Notes on Liaison In Modern Warfare* (Washington: GPO, April 1917), 5-13; Instruction Memorandum No. 6-L, Subject: Liaison in Field Artillery Central Officers Training School, in *Instruction Memoranda and Schedules* (Camp Zachary Taylor, Ky.: Field Artillery Central Officers Training School. 1918), MSL.

forward observation teams to select targets, liaison agents (runners) to link the artillery and different infantry command posts, telephone operators, and visual signalers (flags, projectors, flares, and rockets). The liaison officer remained at the supported infantry command post and was the link between the relaying requests to his artillery battalion. Copying the French, the AEF regulations charged the liaison officer "to secure for the infantry effective artillery support when necessary."<sup>204</sup>

Securing effective artillery support was easier said than done. After examining its artillery liaison effort in June 1918, the 1<sup>st</sup> Infantry Division Artillery Headquarters concluded: "There is no satisfactory means of communication between the Infantry front line and the Infantry Battalion Command Post [the artillery liaison officer's duty location] by which the Artillery can be promptly advised of the needs of the Infantry in contact with the enemy."<sup>205</sup> Resolved to improve their infantry-artillery liaison system, AEF divisions continuously refined their procedures and guidance. In early August 1918, the 1<sup>st</sup> Division Chief of Staff, Colonel Campbell King, issued revised instructions for "Liaison in semi-open warfare – in offensive or defensive actions."<sup>206</sup> Realizing that infantry-artillery coordination was paramount for success in "semi-open warfare," the division now required that the artillery place liaison officers with all attacking infantry

<sup>204</sup>U. S. War Department, *Manual for the Battery Commander Field Artillery 75-MM*, trans. AWC (Washington: GPO. 1917), 66. 79/6 *Field Artillery Drill and Service Regulations*, 4:31-37, 57-58.

<sup>205</sup>Command Posts (CP) were also known in the AEF as Posts of Command (PC). 1<sup>st</sup> F. A. Brigade Headquarters, Memorandum #199, 13 June 1918, Subject: Deficiencies in Liaison, FDWR, vol. 9.

<sup>206</sup>Headquarters 1<sup>st</sup> Infantry Division, AEF, Memorandum G-3 755, Subject: Liaison in semi-open warfare – in offensive or defensive actions," 2 August 1918, File #UB 273.U41, DRL.

battalions and charged artillery battalions to establish, maintain, and operate all the communications systems of their forward liaison officers.

After several months of combat experience, the 2<sup>nd</sup> Infantry Division also issued a refined "Plan of Liaison" in order that infantry commanders "may know what to expect from the artillery, and what they should do in order to secure the maximum of artillery support during operations."<sup>207</sup> A "how to" guide for the liaison officer, the memorandum outlined his duties which required him to know the location and capabilities of his own unit as well as those of the unit to which he was attached to, keep the infantry commander informed of the artillery situation, and to thoroughly understand barrage plans, to coordinate signals to control fires from the frontlines, and to maintain constant communication. Echoing the exhortations of AEF guidance for close and complete liaison with the infantry, the 1<sup>st</sup> Infantry Division's "Liaison in Semi-Open warfare" and 2<sup>nd</sup> Infantry Division's "Plan of Liaison" were products of an organization continually searching to create better fire support procedures between the infantry and the artillery.

American artillery battalions executed various types of missions to support the infantry in World War I.<sup>208</sup> Divisional 75-mm artillery battalions worked directly with

<sup>207</sup> Headquarters, 2<sup>nd</sup> Infantry Division (Regular), AEF, Memorandum, 29 September 1918, General Staff. Langres Army Center of Artillery Studies, 1918-1919, Folder 25, Box 4813, E 371, RG 120, NARA. Included in the "Liaison Plan" were comprehensive communication schematics between the artillery and infantry headquarters. Published before the Meuse-Argonne campaign (October-November 1918), the plan outlined "several alternative lines of telephonic communications" to ensure that in the event of a cut line between primary stations, that a request for fire reached the LNO's unit or an adjacent unit through infantry or artillery links.

<sup>208</sup>In World War I, the AEF artillery divided itself into divisional, corps, and army artillery units. A divisional artillery brigade, the division's organic artillery, had two 75-mm gun regiments, one 155-mm

an assigned infantry regiment within the division. The 1<sup>st</sup> Infantry Division's "Ramieres Raid" on 11 March 1918 reflected the divisional artillery support of a basic, small-scale, infantry mission. Before the doughboys went "over the top" into No Man's Land between friendly and enemy frontlines, the artillery "prepared" the battlefield using forty firing batteries from its own artillery units and attached American and French general support units. Seventy-five millimeter gun batteries provided a standing barrage, a continuous wall of artillery fire, which cut off the enemy soldiers from receiving support while the American infantry made a limited foray into enemy lines and captured prisoners for intelligence purposes. Before and during the raid, the attached artillery batteries and battalions fired at known and suspected enemy artillery and reserve units to prevent the enemy from reinforcing its infantry. Artillery fires, direct and general support, for the raid were preplanned with all their gun sections firing solutions and coordinated with the infantry commander on his attack time line or upon a designated signal (signal flares) fired by an artillery representative advancing with the infantry raiding party. The artillery LNO, attached to the infantry regimental headquarters, watched for the prearranged signal and then relayed the fire mission requests via telephone to his artillery regimental headquarters, who would then pass the requests for

howitzer regiment, and one trench mortar battery. For example, 1<sup>st</sup> Field Artillery Brigade supported the 1<sup>st</sup> Infantry Division. Corps Artillery units, equipped with 155-mm (6 or 4.7 inch) howitzer and gun regiments, focused their fires on destroying enemy artillery units – the counter battery mission – and augmented the fires of divisional artillery fires – reinforcing fires. 240-mm trench mortar batteries were also a part of corps artillery. Army artillery regiments and batteries attacked the enemy supply depots, rail lines, ammunition dumps, and corps and army command posts. Coast Artillery officers and men manned the army artillery units using a wide variety of heavy and naval artillery: 5 and 6 inch seacoast guns; 6 and 8 inch guns; and 9.2-inch and 240-mm howitzers. *USA WW, 1:122-29, 167, 169, 312-13.*

fire to the battalions until it reached a battery's guns. Not a complicated mission, the Ramieres Raid reflected the long chain of organizations and communications required to fire basic artillery support in World War I.<sup>209</sup>

For supporting a large-scale attack, the most famous World War I artillery mission was the rolling barrage. Using many divisional and corps artillery battalions, a rolling barrage resembled a curtain of artillery fire that jumped methodically forward across No Man's Land at a pre-determined rate and distance. Gun crews raised their gun barrels to a specified elevation and fired a round – all done to a timeline. Advancing infantry closely followed the curtain of artillery fire, a *defacto* shield, to capture trenches or attack enemy strong points. Once the barrage passed a trench or strongpoint, a race began to see who gained control of the ground first, the advancing attacker across a churned up battlefield or the defender emerging from his underground shelter – the winner determined who owned the trench or strong point. Planning, coordinating, and executing a rolling barrage was a large investment in time and resources. For example, the 1<sup>st</sup> Division Artillery's Operations Order for the Meuse-Argonne Offensive, 1-12 October 1918 required coordinating the fires of over eighteen artillery battalions

<sup>209</sup>1<sup>st</sup> F.A. Brigade, Memorandum, 12 March 1918, Report Upon Operations of 1<sup>st</sup> F.A. Brigade During Raids, Executed March 11, FDWR, vol. 14. Signal rocket communications were elaborate to compensate for the lack of an efficient system to call for fire directly to the guns. For example, in the 1<sup>st</sup> Infantry Division, a front line infantry unit used the following signals to call for fires: Demand for barrage, 3 white star rockets; We wish to progress, lengthen the fire, 1 white star rocket; Friendly artillery is firing too short, 6 white star rockets; Request preparation for preparation for the attack, red fire; and We are here, green fire. The divisions also had pyrotechnics for gas attacks, hostile tank attacks, and postponing an attack. Headquarters 1<sup>st</sup> Infantry Division, AEF, Memorandum G-3 755, Instruction No. 9, Subject: Liaison between infantry and aeroplanes. File #UB 273.U41, DRL.

shooting 35,000 rounds across the division's four-kilometer front for an advance that extended six kilometers into enemy territory.<sup>210</sup>

Whether an impressive rolling barrage for a large-scale attack or a standing barrage for a company raid, the World War I fire support solution replaced the pre-war tactics of individual firing batteries with battalions using preplanned firepower. Once the senior artillery commander initiated these preplanned fires, he had few options to alter the plan except to rely upon signals and pyrotechnics to start, slow, increase, or stop planned artillery fires. Artillery barrages were blankets of fire on the battlefield and did not allow an artillery liaison officer, or an infantry commander, to fire on a specific target that presented a threat to the infantry. If the attacking infantry were able to advance behind the rolling barrage, at one point the infantry doughboys would reach the range limits of their artillery support that required the field artillery units to move forward. Moving artillery forward across a churned-up battlefield with its roads clogged with casualties passing to the rear and the infantry reinforcements moving forward was an extreme challenge. Despite these impediments, if an artillery commander moved his guns forward, the most significant obstacle remained: regaining communication with the artillery liaison officer. Often attacks stalled once the infantry advanced beyond their

<sup>210</sup>1<sup>st</sup> Division's four-kilometer front was divided into four lanes, which extended approximately six kilometers in-depth toward the first, second, and third divisional objectives. An infantry regiment was responsible for covering the thousand-meter front within each lane, with a 75-mm field artillery regiment directly supporting it, while reinforcing artillery fired at enemy batteries and strong points throughout the zone of attack. 1<sup>st</sup> Division Artillery. Attack Orders, 2 October 1918, and Artillery Plan, 11 September 1918, *FDWR*, vol. 9.

planned artillery fires or lost the liaison connection between the frontline and their supporting artillery.<sup>211</sup>

The problem of responsive fire support was more than a cut telephone wire between the LNO and his artillery battalion. Often the LNO did not know the needs of his infantry unit nor could he effectively direct the fires of his battalion or call for the assistance of adjacent artillery units in his sector. To solve this problem, the AEF conferred the title and responsibility of "Fire Director" upon the infantry battalion or regimental commander. The AEF command reasoned that the infantry commander knew best how to compliment his operation with artillery fires. In essence, the infantry commander superceded the artillery LNO and became his own fire support officer, thus reducing the artillery LNO to the status of a telephone operator who relayed the infantry commander's calls for fire. In practice, this put the direction of artillery fire in the hands

<sup>211</sup>In its examination of the infantry-artillery liaison team, *Infantry in Battle*, painted the infantry vision of the hectic and inefficient process of passing a fire mission from the frontlines to the artillery firing unit: "Although it will seldom be true, let us assume that all officers are provided with adequate maps. Let us further assume that some of the enemy can actually be seen. Subordinate leaders must now transmit this information to the rear, together with the locations of their own units. Just how accurately will these platoon leaders be able to locate this hostile resistance on the map? How precisely will they indicate the positions of their own troops? Remember, this will not be done in the academic quiet of the map-problem room, but in the confusion and stress of battle ... The message goes back by runner and eventually reaches the battalion commander. This officer still has to formulate his request and, through his liaison officer, transmit it to the artillery. Even if we assume that this message is clear and accurate and contains all that the artilleryman must know, there are still other factors to be considered. The message may be long and involved. The artillery has to receive it, may have to compute data, and then has to get on the target. Even if everything is accomplished with 100% efficiency and good luck, how long will it all take? In exercises we do these things in a few minutes; in war they often take hours. The artillery may lack ground observation. The infantry's request may be incomplete or inaccurate. Communications may break down. These and a thousand and one similar obstacles may arise that must be overcome before the artillery can come to the aid of its partner." George C. Marshall, ed. *Infantry in Battle*, 2<sup>nd</sup> ed. (Washington: The Infantry Journal, 1939), 251. Conrad H. Lanza, "The Artillery Support of the Infantry in the AEF," *FAJ* 26 (January-February 1936): 70-72; Robert McCleave, "Infantry – Its Role, Capabilities, Limitations and Relation to Other Arms," *IJ* 17 (November 1920): 443-44; Grotelueschen, *Doctrine Under Trial*, 92-93.

of officers who neither appreciated its limitations nor were able to make use of its capabilities.<sup>212</sup>

Exacerbating the fire support problem was the artillery community itself. Organizationally, the artillery communication system did not extend directly between a firing battery and a frontline unit, but to the artillery regimental headquarters. This often prevented the LNO from making timely adjustments and calls for fires for infantry units in direct contact with the enemy. Creating even a higher level of inefficiency was the habit of field artillery commanders to assign inexperienced lieutenants as LNOs and keep the best officers for himself. This practice, according to an AEF infantry officer, convinced a number of infantry officers that "the artillery either could not or did not want to help them."<sup>213</sup> To prevent artillery battalion commanders from putting substandard officers with the infantry, the 2<sup>nd</sup> Infantry Division "Plan of Liaison" admonished their artillery commanders to "remember that thru no one factor can better be secured during an attack than thru good liaison with the Infantry, hence, pick a Liaison Officer for his ability and not because he can best be spared from an

<sup>212</sup>Field Artillery Lieutenant George P. Hays, in his May 1921 *Infantry Journal* article, cited two major problems with the infantry commander as his unit's primary fire director. First, if the infantry commander did not understand the artillery's capabilities and limits, how could he then effectively employ it? Secondly, how could infantry commander, commanding his units in contact, devote his attention to controlling artillery fires even if he was an indirect fire expert? According to Hays', the best solution for solving the artillery-infantry support corundum was to assign permanently experienced artillery officers to infantry regimental or front-line battalion headquarters. These officers would "be charged with the direction of all fire or changes in fire, as the infantry they represent require, and to render reports direct to the division or group artillery commander." Hays, "Fire Direction of Artillery Supporting Infantry," 508-10. *Manual for the Battery Commander*, 51.

<sup>213</sup>David Loring, "Instruction in Field Artillery Tactics for Officers of Infantry," *FAJ* 15 (November-December 1925): 591.

organization.<sup>214</sup> *Infantry in Battle*, the Infantry School's collection World War I battle vignettes, hoped that "as a result of the lessons of the World War," that the artillery would send a liaison officer "after careful selection and actual training with infantry units" and not choose an officer "for his uselessness to the artillery, as seems to have been done in some cases."<sup>215</sup> Unreliable communication systems and incompetent liaison officers when combined with the AEF policy of making infantry commanders the fire controllers, produced a field artillery organization unable to fulfill its own 1916 regulatory charge to "assist other arms, especially the Infantry, in the field of battle."<sup>216</sup>

After World War I ended, senior AEF officers convened investigative boards to "learn the lessons" of combat and apply them to their organizations. Without exception, these board reports and the officers' comments within them reflected the dire need for

<sup>214</sup> Headquarters, 2<sup>nd</sup> Infantry Division (Regular), AEF. Memorandum. 29 September 1918, General Staff, Langres Army Center of Artillery Studies, 1918-1919, Folder 25. Box 4813, E 371, RG 120, NARA.

<sup>215</sup> Marshall, *Infantry in Battle*, 252, 276. In World War II, artillery battalion commanders eschewed the AEF habit of assigning weak, unneeded artillery officers to the infantry, and selected worthy officers. This changed occurred with the vastly improved ability of an observer to mass multiple battalions with a request to a battalion FDC. To do this vital task, it required a competent officer. The 1944 *Field Artillery Observation* manual pronounced that the observer was now one of the most powerful man on the battlefield and concluded that: "the best qualified officer available should be detailed as forward observers." U.S. War Department, FM 6-135, *Forward Observation* (Washington: GPO, 10 August 1944), 14. *Field Artillery Journal* reprinted the manual in three parts starting in the September 1944 edition.

<sup>216</sup> 1916 *Field Artillery Drill and Service Regulations*, 1:18. Revealing the constant communication support problems, the 2<sup>nd</sup> Infantry Division Artillery command reminded its liaison officers "in the event of their not being able to reach their own unit for quick support in an emergency, they are authorized to call direct on the nearest unit to them, repeating this practice until support is secured. They should realize their primary duty is not necessarily to secure support from their own unit and that alone, but that in the event of their not being able to reach their own unit – or the support of their own unit not being sufficient, it is their duty to request support of other available artillery units, either thru their Battalion or Regimental Commanders or else by direct call to the nearest unit... Their duty is to furnish artillery support, no matter how they get it in an emergency." Headquarters. 2<sup>nd</sup> Infantry Division (Regular), AEF, Memorandum. 29 September 1918, General Staff, Langres Army Center of Artillery Studies, 1918-1919, Folder 25, Box 4813, E 371, RG 120, NARA. Hays, "Fire Direction," 509-10.

closer coordination between the infantry and the artillery. The most influential board to review American artillery operations was the board of artillery officers under the leadership of Brigadier Andrew Hero, called the Hero Board. Appointed by the AEF's Chief of Artillery in December 1918, board members studied the "experience gained by the Artillery of the AEF," sent questionnaires to senior field artillery commanders, and submitted their own recommendations. All respondents and board members agreed on one issue, the "absolute necessity of the closest coordination and harmony in the work of staffs and the various arms engaged and, especially of a mutual sympathetic understanding between infantry and artillery of the needs, powers and limitations of each other."<sup>217</sup> Respondents and the board members deemed that the AEF system of liaison between the infantry and the artillery as generally "satisfactory" with two exceptions: insufficient personnel and poor communication equipment. To ensure a solid relationship, the board recommended that both branches exchange officers for months at a time, and frequently conduct combined training.<sup>218</sup>

The Hero Board respondents, with few exceptions, demanded that artillery control its own fires and not the infantry commander as had been the practice in the AEF.

<sup>217</sup> *Hero Board*, 1, 20, 688. Many officers who responded to the Hero Board's questionnaire believed that the infantry-artillery liaison problems stemmed from breaks in communication equipment between liaison officers and firing batteries supporting infantry operations. While proffered solutions included lightweight and reliable radios and additional wire teams, a few officers such as Colonel Schofield Andrews looked beyond equipment and personnel issues. Andrews believed "close liaison" was a procedural, not an equipment problem. Continuous and responsive fire support required a clear delineation of who had authority to call for fires on enemy targets in support of infantry operations. Andrew's solution became a major point in the recommendations of both the Hero and Superior Board. See Chapter II, "After the Smoke Clears," for additional discussion on the Hero Board.

<sup>218</sup> *Hero Board*, 16, 27.

In concert with other tactical issues involving indirect fires, the artillery community held that only it knew how to employ their organization in combat. Brigadier General Dwight E. Aultman, 2<sup>nd</sup> Army Artillery Commander, AEF, captured the essence of most senior artillery officers' when he stated, "I am not in favor of placing artillery under the command of subordinate infantry commanders. They as a rule, have an extremely limited knowledge of the employment of artillery and, in addition to this fact they are so absorbed with the fighting of their own commands that they cannot possibly give attention to the intelligent fighting of the artillery." For effective support, Aultman insisted that the divisional artillery commander must supervise and direct all his artillery fires through "an efficient liaison system with the infantry."<sup>219</sup> For these senior AEF officers, their war experience taught them that efficient artillery support could be assured only by an artillery commander controlling the fires with the support of competent liaison officers, additional liaison team members, and better communications equipment. The notion of altering the liaison and fire direction system to improve the infantry-artillery close support was absent.

Despite the difficulties to establish a functional infantry-artillery team, AEF artillerymen and infantrymen respected each other and realized the necessity to work closely together. A 2<sup>nd</sup> Infantry Division field artillery battalion commander, Colonel Joseph R. Davis, shortly after the war remembered that: "Our men [2<sup>nd</sup> Infantry artillerymen] could not conceive of an objective which our infantry would not be able to

<sup>219</sup>Ibid., 740.

take in brilliant style, our men and officers had the utmost confidence in not only the offensive but also in the defensive powers of their infantry. They were certain that their infantry could never take a backward step ... Their whole attention could [sic] be centered on delivering promptly and accurately the fire which the infantry might want.<sup>220</sup> Infantry Lieutenant Colonel Paul B. Malone believed the war had "brought the Infantry and the Field Artillery into such a close cooperation that, broadly speaking, the two arms have merged into a single fighting unit compelling mutual acceptance of certain methods of combat, in order that the team may function on the battlefield with the maximum efficiency."<sup>221</sup> Though Malone may have overstated the level of cooperation, senior officers of both branches knew that success on the battlefield equated to frequent combined training to maintain appreciation of each other. Repeating a well-known aphorism among veteran infantrymen, *Infantry in Battle* warned, "Unless the infantry considers the artillery in all its actions, it is headed straight for trouble."<sup>222</sup> Jointly expressing the need for cooperation did not translate into inter-branch harmony. As the two branches moved further away from their battle experience, differences in opinion, tactics, and techniques became acute over what constituted effective close fire support.

<sup>220</sup>Joseph R. Davis, "Artillery in Recent Operations," 16 May 1919, Extracts from Lectures Delivered to the Students. Army Center of Artillery Studies, AEF, on the Employment of Field Artillery in Open Warfare, Training Course No. 12, Box 12, E 304, RG 165, NARA.

<sup>221</sup>Paul B. Malone, "Infantry-Artillery," *FAJ* 10 (January-February 1920): 1. Lieutenant Colonel Paul B. Malone served with the AEF in World War I as the Chief of Training Section and commanded the 23<sup>rd</sup> Infantry Regiment, 2<sup>nd</sup> Infantry Division and the 10<sup>th</sup> Infantry Brigade, 5<sup>th</sup> Infantry Division.

<sup>222</sup>*Infantry in Battle*, 252.

Postwar debate on close fire support among infantry and artillery officer often centered upon the ownership and implementation of the accompanying gun.<sup>223</sup> In World War I, the AEF headquarters envisioned using a 75-mm gun and artillery crew as an accompanying weapon to provide frontline infantry the knockout firepower to silence enemy strong points. To make this artillery support immediately available, an infantry commander received a 75-mm battalion from the division artillery brigade. Now under his control, the infantry commander designated two of the battalion's batteries as infantry batteries and divided the third battery into separate sections – accompanying guns. Positioning himself in close contact with the infantry brigade commander, the artillery battalion commander assumed the role as the immediate commander of the infantry batteries. Infantry batteries destroyed enemy strong points of resistance, provided defense against local counter attacks, and interdicted the immediate enemy reserves, while the accompanying guns, distributed one or two per line infantry battalion, attacked enemy machine guns, tanks, and strong points. Commanded by their battery commander or one of his lieutenants, the accompanying gun crew moved its 75-mm gun to a covered location, unlimbered it, moved it forward by hand into a protected firing position as close

<sup>223</sup>Another contentious infantry-artillery issue was the anti-tank mission and its discussion filled the pages of the *Field Artillery Journal* and *Infantry Journal* throughout the 1920's and 1930's. As early as 1924, the Field Artillery made the anti-tank mission a part of its doctrine by including guidance in its revised and updated capstone tactical manual: *Tactical Employment of Field Artillery*. The 1924 manual proffered that "defense against tanks is conducted, in general, as is the defense against any other attacking element." In January 1941, the War Department still had not published a training guide for the tactical employment of the 75-mm Anti-Tank battery within the divisional artillery. U.S. War Department, TR 430-105,1924 *Tactical Employment of Field Artillery*, 73. Headquarters, 9<sup>th</sup> Division, TC No. 1, Title: Tactical Employment 75mm Anti-tank Battery Divisional Artillery (Triangular), 16 January 1941, Carlos Brewer Papers, MHI.

as possible to the target and engaged the target with rapid fire. Once crew accomplished the mission, they withdrew the gun and prepared it for transport for the next advance.<sup>224</sup>

Of the sixty-one recorded instances of the AEF First Army using accompanying guns, only three were successful.

These discouraging statistics mirrored the experience of all AEF units. With such a poor combat record, the accompanying gun left a sour taste in many field artillerymen's mouths and created a general opinion among artillery officers that this mission would be best left to the infantry. In its May 1919 report, the Caliber Board, the AEF's artillery authoritative materiel review board, observed that: "In connection with the support of the division infantry by the division artillery the war has intensified the old question of accompanying guns for infantry. A solution of this question by the assignment of batteries of field artillery has been tried but the general opinion is that the field artillery gun is not satisfactory for this purpose; it is too vulnerable a target in motion; the ammunition supply is difficult; it is not sufficiently mobile because it cannot be man-handled; and from the division artillery standpoint the loss of the control of these batteries breaks down the power of the division artillery."<sup>225</sup> For many senior artillery officers, the primary mission of its organization was to support

<sup>224</sup>An infantry battery, detached from a divisional field artillery battalion, consisted of four 75-mm guns. Generally, one battery supported one infantry regiment. Accompanying guns were individual guns that supported smaller infantry units used to destroy machine guns, tanks, pillboxes, and other strong points impeding the infantry's advance. The use of an "infantry battery" was not a World War I novelty. The 1916 American Field Artillery regulations included the use of accompanying guns in supporting the infantry attack. U.S. War Department, *Combat Instructions*, 11-16; 1916 *Field Artillery Drill and Service Regulations*, 4:101.

<sup>225</sup>Westervelt Board. 5 May 1919, Box 3, E 23, RG 120, NARA. A. J. Dougherty, "Accompanying Gun." *IJ* 17 (November 1920): 487.

the infantry fight with indirect fires, not to piecemeal its guns under the guidance of an infantry commander to shoot individual targets.

This majority opinion did not mean that the accompanying gun did not have its ardent supporters among prominent field artillery officers. In a June 1919 *Infantry Journal* article, Colonel Edmund L. Gruber argued that "many" artillerymen turned over the accompanying gun to the Infantry because of their "failure to obtain the desired results with it and to the losses that the field artillery has suffered in its employment."<sup>226</sup> Writing in 1921, Colonel Clarence Deems, agreed with Guber's assessment and cited a major reason for the accompanying gun's failure was a lack of crew training to be effective in combat: "we [Field Artillery officers] must accept the accompanying gun as a battle expectation, train for its skilled use, teach our younger officers to glory in being assigned to such a command, and incidentally thus train them to be material for battery commanders of initiative, familiar with the needs of our infantry and imbued with the necessity for true aggressiveness in handling of their commands in battle."<sup>227</sup> Whether Gruber, Deems, and other accompanying gun proponents, were unaware of its dismal combat record or they truly believed in its merits, postwar artillery school texts and regulations clearly pointed to fact that the accompanying gun was an unwanted mission for the artillery.

<sup>226</sup>EdmundL. Gruber, "Employment of Field Artillery with Infantry," *IJ* 15 (June 1919): 972.

<sup>227</sup>Clarence Deems, "Some Features of the Accompanying Gun," *FAJ* 11 (July-August 1921): 355. Deems would once more surface the issue in the November-December 1923 *Field Artillery Journal*. Deems. "Some Observation on Accompanying Artillery," *FAJ* 23 (November-December 1923): 498-505.

Major Lesley J. McNair, AEF veteran and a leading Field Artillery intellectual, believed that artillerymen should be able to effectively use accompanying guns in battle, but held the view that infantry commanders should use them sparingly. Soon after the war, McNair became a member of the Field Artillery Sub-Section at the Command and General Staff College and wrote tactical guidance for the accompanying gun that established the official artillery position on the accompanying gun well into the late 1930's. His article for the *Field Artillery Journal* in 1921 was followed by a chapter for the Leavenworth school text, *Tactics and Technique Artillery* (1922), and then by the regulatory paragraphs in the field artillery's Training Regulation 430-105, *Tactical Employment* (1924). In all three documents, McNair explained the purpose of the gun and how it was to be attached to infantry units attacking against a defensive sector or an attack zone that extended beyond the range of their normal supporting artillery. No matter how powerful the artillery supporting fires, McNair conceded that the attacking infantry would still encounter enemy automatic weapon positions that would halt their advance, and in these instances, the infantry would require the field artillery to provide accompanying guns. But for McNair, the accompanying gun was the last option for close support. The Leavenworth text warned: "The use of accompanying artillery is justified only when a probable failure of the supporting artillery to furnish prompt and effective support in one phase of the action is foreseen. Unless such failure is foreseen with reasonable certainty, accompanying artillery is not used. It follows, therefore, that

supporting artillery is the rule; accompanying artillery the exception."<sup>228</sup> Not to excuse the field artillery entirely from its image as the infantryman's best friend, McNair stressed that accompanying artillery "should not be spared, however, at the expense of infantry casualties."<sup>229</sup> Nonetheless, McNair emphasized repeatedly that the use of the accompanying artillery was a special condition and an "emergency weapon" when the infantry could not attack it with its own weapons. Doctrinally, the field artillery leadership viewed the attachment of its guns to the infantry as a temporary bridge to cross the close fire support gap until the direct support artillery regained the ability to provide timely supporting fires.

*Tactical Employment of Field Artillery* (1924) was the doctrinal keystone for artillery training and combat operations and solidified the postwar artillery vision on how it supported the infantry in combat. The LNO and his team remained the primary organization for linking the infantry-artillery team together.<sup>230</sup> Advising that artillery commanders should carefully select liaison officers with "great initiative, command sense and tact," the regulation pointed out that the burden of successful liaison rested largely upon liaison officer "to see that the artillery meets the demands of the infantry

<sup>228</sup>U.S. War Department, TR 430-105, *Field Artillery*, 67-68. McNair, "Infantry Batteries and Accompanying Guns," *FAJ* 11 (March-April 1921): 123-35; General Service Schools, *1922 Tactics and Technique*, 1:202-15. Accompanying batteries doctrinally supported infantry regiments. Battalion commanders assigned single guns, the accompanying gun, attached to infantry assault battalions.

<sup>229</sup>McNair, "Infantry Batteries and Accompanying Guns," 131.

<sup>230</sup>Each direct support artillery battalion provided one lieutenant with the artillery regiment assigning two officers, usually captains, to each. If the situation warranted it, an artillery battalion commander would create another LNO team for an additional infantry regiment.

with the least possible delay.<sup>231</sup> Postwar training regulations and school texts mirrored those of the AEF and stipulated that the LNO should know the capabilities of his artillery, understand the infantry plan of operation and zone of operations and maintain constant communications. Beyond his obligation to conduct an emergency fire mission or request planned barrages for the infantry, the LNO was the artillery representative in the infantry command post. Postwar artillery guidance also emphasized that effective infantry-artillery liaison was a responsibility of the infantry commander. *Field Artillery School Notes*, an update of tactics and techniques published each school year, echoed the AEF liaison policies and explained that it was a primary duty of infantry commanders in the offensive to provide clear and comprehensive orders to give "each subordinate a good mental picture of what is expected of him, and a complete understanding of what the higher its is endeavoring to accomplish ... be careful to let his neighbor and supporting elements, (particularly artillery), know what he has done and proposed to do."<sup>232</sup>

*Tactical Employment* (1924) retained AEF fire support procedures with few changes. Consequently, the frontline infantry commander still relied upon the artillery battalion and battery commanders in observation posts located hundreds of yards behind

<sup>231</sup>U.S. War Department, TR 430-105, 1924 *Tactical Employment of Field Artillery*, 109-10. The new regulation reaffirmed that the primary purpose of the Field Artillery was "to assist the other branches, especially the infantry, upon the field of battle." With the substitution "branches" for "arms," this was the same purpose statement found in the 1916 *Field Artillery Drill and Service Regulations*. *Tactical Employment* superceded Part X, Volume IV, "Artillery in the Field." 1916 *Field Artillery Drill and Service Regulations*, 1:13. See Chapter II, "After the Smoke Clears," for more on the Chief of Field Artillery Office effort to revise postwar regulations.

<sup>232</sup>U.S. Field Artillery School, *Field Artillery School Notes* (Fort Sill, Okla.: Field Artillery School, 28 September 1928), Book I, Chapter XXIX, Part A. 15.

him to control and adjust his requests for fires. Disregarding the realities of trench warfare, *Tactical Employment* pointed out that best tactical situation to support an infantry attack was to have an artillery battalion commander, from his command OP, adjust fires by direct observation. Ensuring a close and cooperative working relationship between the infantry and the artillery, the manual advised:

The ideal arrangement would be to have every C.P. [command post] an O.P., but the exposed situation of an O.P. usually renders it unsuitable for use as a C.P. The desirability of having artillery commanders in close personal contact with the commanders of the infantry units they are supporting will also interfere with this arrangement. In the case of smaller units—batteries and battalions – C.P.'s and O.P's can sometimes be placed so close together as to be practically identical. The commanders of such units will usually occupy the O.P for the purposes of conduct and direction of fire. The importance of obtaining direct observation in such cases, instead of depending on the reports of observers,<sup>233</sup>

Undoubtedly, the commander's OP was a practical solution in peacetime for the artillery to conduct predetermined firing plans for infantry operations, but it still failed to provide the prompt response needed when the frontline infantry commander called for fire support on an unplanned target (commonly referred to as a "target of opportunity") Without a direct link between the requesting infantry commander and artillery unit, *Tactical Employment* warned: "It should be explained to the infantry that any call for fire (except normal barrages) must usually be transmitted by telephone to artillery regimental or battalion headquarters and thence to the batteries. This added to the time necessary for the computation of data may cause 10 to 15 minutes before fire can be

<sup>233</sup>U.S. War Department, TR 430-105, 1924 *Tactical Employment of Field Artillery*, 77.

delivered.<sup>234</sup> Even with this optimistic response time, the postwar infantry commander for much of the interwar period saw little change in artillery fire support procedures.

Without any substantial proof that the artillery could provide responsive fires in World War I or dramatic changes in postwar tactics, combined with their wariness of depending on the field artillery to provide them accompanying guns, the infantry, throughout the 1920's and 1930's, chose a close support solution that guaranteed them continuous and responsive support: an organic howitzer company. Imbedded within the infantry regiment organization, the howitzer company remained the tactical solution to provide frontline commanders with responsive support to knock out enemy strong points that delayed their advance. The Infantry Board continually sought to improve its weapons, and in 1927, the War Department approved a new 75-mm mortar (M-1) and 37-mm gun (M-1). Soon after the approval in early 1928, the Infantry Board then experimented with a war-strength howitzer company to tests its tactical effectiveness using these new weapons. Divided into platoons, each howitzer platoon, with mortars and 37-mm guns, operated under the command of the infantry battalion commander with

<sup>234</sup>U.S. War Department, TR 430-105, *1924 Tactical Employment of Field Artillery*, 110-11. G. H. Franke, "Liaison with and Fire Support of the Front Line Infantry," FAJ 15 (September-October 1925): 429-33; Howard W. Turner, "The Attack of Infantry Formations," FAJ 15 (September-October 1925): 437-41; R. C. Batson, "The Accompanying Gun," FAJ 16 (May-June 1926): 309. Standard data in the request for fire included: Exact target location, by terrain feature or coordinates, target description, whether target is visible for the LNO, cease firing time, and the type of fire (neutralization, smoke, destruction). Using the methods outlined in 1920's regulations and under ideal conditions, liaison teams required 19 minutes per message to receive fire from supporting artillery units during field exercises at Fort Sill.

the primary focus of their gun and mortar fires to destroy enemy machine guns – the primary focus of the field artillery accompanying in guns.<sup>235</sup>

Artillerymen, however, remained firmly wedded to the idea of "pre-arranged" fires to support the infantry along their axis of attack, whether it was a rolling barrage or a successive series of concentrations. Such fire support doctrine held to the idea that planned fires, schedule of fires, enabled the direct support artillery to provide quick and effective mass fires without the time consuming process of adjusting fire on. Preplanned fires found favor among artillery officers because they believed that it was easier to change an existing schedule than create one during the chaos of battle. A schedule of fires was a series of targets fired to a specified timeline or upon a signal from the supported troops. To create this timeline and targets, the senior artillery commander developed an "artillery plan" based upon the senior commander's scheme of maneuver or plan of action. Within the artillery plan, the artillery battalion commander provided instruction for reconnaissance of observation and his unit positioning areas, selection and occupation of those positions, establishment of observation posts, installation of command and communications systems, organization of the ammunition supply plan, and culminated in the planning of supporting fires. Generally, the divisional artillery brigade aligned its regiments and battalions behind the appropriate divisional units and their corresponding sector known as the zone of action. In addition to a zone of action, the artillery plan designated each artillery firing unit a contingent zones, sectors of the

<sup>235</sup>U.S. War Department. TR 420-150, Combat Principles – Howitzer Company Platoon (Washington: GPO, 29 May 1923); Andrew D. Bruce. "Adjusting 37-mm. Gun and Mortar Fire," *IJ* 31 (October 1927):

units to its left and right, to ensure that the division artillery as a whole could mass on one target. Within each infantry unit's attack sector, the artillery zone of action, the infantry commander identified specific or suspected targets that he desired destroyed or neutralized.<sup>236</sup>

To execute the artillery schedule of fires, the artillery battalion either fired it at the prearranged time or waited for pyrotechnic signals from frontline troops. Pre-arranged fires, as had been the AEF doctrine, sought to paralyze and disorganize the enemy until the infantry attacked. Yet these planned fires failed to solve the infantry's problem of the destroying the enemy machine gun not silenced in the planned fires – the target of opportunity. Infantry officers, throughout the interwar period, realized that a "rigid schedule of fires is seldom the most efficient because an attack just does not progress as planned."<sup>237</sup> Without the artillery able to destroy a target of opportunity in a timely manner, the infantry had one more reason to place its faith in the powers of the accompanying gun.

Field artillery officers knew that the AEF close fire support system outlined in *Tactical Employment* (1924) was inadequate and needed revamping. The need to

377-81; John K. Rice, "The New Infantry Accompanying Weapons," *IJ* 32 (April 1928): 376-83.

<sup>236</sup>The Field Artillery School defined a concentration as "a volume of fire placed upon a limited area, within a limited time. Destructive fire rendered a target useless, while neutralization fire prevented the enemy from employing his troops or weapons, but was not a permanent condition. I.J.S. Army Infantry School, 'Tactical Employment of Field Artillery,' Mimeograph No. 1-186, *Instructional Matter*, 1937-1938, 7 vols. (Fort Benning, Ga.: The Infantry School, 1938): 4:3, DRL. I.J.S. Field Artillery School, *Tactical Employment of Field Artillery*, Book 224, 1938 ed. (Fort Sill, Okla.: The Field Artillery School, 1938), 90-91.

<sup>237</sup>R. H. Case, "Artillery Support in Attack," *IJ* 42 (May-June 1935): 247.

improve became especially acute in light of the postwar era's rapid advances in mechanization. The Field Artillery School experimented with improving artillery liaison communications in the late 1920's, but the dramatic improvement would occur in how the artillery organized its gunnery team. In 1929, after reading the World War I diary of a British battery commander's success in shooting artillery from an observation post within his own infantry frontline, the Gunnery Department instructors initiated experiments with a new fire control system that centralized fire control at the battalion headquarters and enabled one observer to fire an entire battalion at one target. Under the leadership of Majors Carlos Brewer and Orlando Ward, the Gunnery Department developed a functioning battalion FDC that could mass the fire of all three batteries' artillery fires upon a designated target by 1932.<sup>238</sup>

Ward envisioned the battalion FDC as an organization designed to ensure that the infantry commander received timely and accurate fires for planned and unplanned targets. Summarizing the Gunnery Department's new observing procedures, Ward issued Field Artillery School Note Number G-47, "Gunnery Liaison Methods" which explained that the advent of the SCR-161 short wave radio allowed the liaison officer, using abbreviated communication aerial methods, to direct effective fire on any target within ten minutes. Ward's guidance marked a distinct change in the artillery support: the liaison officer, or his sergeant, was now "with forward elements of the Infantry"

<sup>238</sup>See Chapter III, "Eliminating the Middleman: The Fire Direction Center," for complete discussion of the creation and development of the battalion *FDC*. "Light Artillery in Support of Infantry," *IJ* 27 (August 1925): 156; Elmer Yeager, "Supporting Artillery," *IJ* 19 (September 1921): 307-11; Field Artillery School Commandant to Chief of Field Artillery, Memorandum, Subject: Report of Progress in Development Work, 12 June 1928, File #319.1/1-1, Box 14, E 34, RG 177, NARA.

calling for fire. The Gunnery Department had introduced within the Field Artillery School the idea that liaison personnel, equipped with a radio could go forward with the infantry commander, send a request to the FDC for fire, and receive accurate artillery fire within minutes.<sup>239</sup>

A remarkable achievement, the battalion FDC remained relatively unknown outside artillery circles. Many infantry officers believed that nothing had improved to provide timely artillery fires since World War I. When the artillery and the infantry held joint exercises, the artillery battalion typically failed to maintain contact with the supported infantry during advances. A 1930 student paper remarked after examining the results of recent combined field exercises: "The deficiency lies in the difficulty surrounding the laying of the initially required liaison lines, and further, in the impotency of the artillery with present equipment in extending these lines as the attack goes forward."<sup>240</sup> Frustration with the artillery's inability to support through its liaison teams during an combined infantry-artillery exercise at Infantry School at Fort Benning, Georgia, caused one dissatisfied infantry instructor in 1934 to complain that the only

<sup>239</sup>Ward, "Gunnery Liaison Methods," 631-35; Dunn, FDC Correspondence, MSL, 4. Without Chief of Field Artillery's official sanction for his new system of calling for fire. Ward warned that that his methods were only to be practiced at the Field Artillery School and should be considered as experimental and unorthodox until published in a field manual or other regulations.

<sup>240</sup>Major L. E. Jones to the Assistant Commandant, AWC, Subject: Infantry-Artillery Liaison in Combat, 5 April 1930. MHI, 9.

satisfactory solution was "bringing the guns into the frontline and firing point-blank."<sup>241</sup>

For this infantry officer, and many of his peers of the era, the solution for responsive artillery fire was to bring the guns along side them in battle.

While the infantry community continually sought to improve the tactics and techniques for its accompany gun, artillery support diminished in 1930's. No one artillery officer illustrated his branch's animus to the accompanying gun than Brigadier General Upton Birnie, Chief of Field Artillery (1934-1938). On 20 September 1934, Birnie remarked to the Army War College class that the Army had considered early proposals about providing the cavalry and infantry an accompanying gun for close support, but that a "conclusive" solution had not been reached on who would man the weapon in battle. He opposed assigning the divisional direct support guns for this mission and reasoned that to provide effective close fire support that a gun crew must stay in position and could not if it was "jumping and moving all the time."<sup>242</sup> When a student asked Birnie whether the accompanying gun or the newly introduced 81-mm mortar should relieve the field artillery from the close support role for the infantry, Birnie proffered the Field Artillery party line:

I would say this – there is a task, a mission of the employment of fire that has to be performed that that weapon has in purpose to accomplish. Now either the infantry or the artillery had to perform that mission. If the artillery is called to perform that mission and it is looked upon as their responsibility, then it is my view that those weapons should be in the

<sup>241</sup> Augustus M. Gurney to B. H. Perry, letter, 26 June 1934, File #322.991/B-Gurney, August M., Box 23, E 34, RG 177, NARA.

<sup>242</sup> Birnie, "Notes of Discussion Following Lecture," AWCL, 20 September 1934, G-3 Course, No. 5, 1934-1935. MHI, 2.

hands of and operated by the artillery. If on the other hand, the infantry want that weapon to use it to perform those missions and can satisfactorily do so, relieving the artillery of the responsibility of fire missions in connection with the localized situation of combat, then, of course, the infantry should have it. In other words, I think this: that the mission which the weapon is designed to perform is one that is without the category of the divisional artillery.<sup>243</sup>

Throughout his tenure as the Chief of Field Artillery, Birnie remained steadfast to the idea that the divisional artillery was the infantry's primary option for close support. Acknowledging that the infantry was "justified" to want a close support weapon, he believed that the infantry desire for such a weapon occurred "because of the difficulties incident to getting a prompt response on calls for artillery fire."<sup>244</sup> Though Birnie did not completely embrace the idea of the battalion FDC, he did assert that new fire direction procedures developed at the Field Artillery School, combined with improvements in radio technology, would eliminate the need for artillerymen to man close support weapons for the infantry.

Before the creation of the FDC, the Field Artillery School had vested tactical fire direction, observation, and liaison instruction in the Tactics Department. Technical fire direction – the computation of firing solutions for guns – resided in the Gunnery Department. When the Gunnery Department began to promote and teach the FDC procedures to students, it not only introduced an improved method to mass artillery fires,

<sup>243</sup>Ibid., 9. No matter who, infantry or artillery, had the "clear-cut" responsibility for the close support mission, Bimie declared it made little sense for the infantry and the field artillery to "have the same type of weapon for the same mission."

<sup>244</sup>Birnie, "Notes of Discussion Following Lecture," AWCL, 20 September 1934, G-3 Course, No. 5, 1934-1935, MHI, 2.

it also directly challenged the Tactics Departments in its ownership of observation tactics and techniques. To bridge this institutional and doctrinal disconnection, the school commandant in 1933 assigned gunnery and tactics instructors to work together on a joint project "to stimulate development of fire direction and merge gunnery with tactics so far as firing was concerned."<sup>245</sup> Whether this cooperative effort aided in publishing the school's 1934-1935 edition of *Tactical Employment of Field Artillery* is dubious, but the school text did reveal that a direct support battalion could now answer calls for fire from aerial observers, forward observers, and the liaison team "*to concentrate the mass of the fire on the decisive objectives at the critical times.*"<sup>246</sup>

In his 1935 and 1936 Army War College lectures, Chief of Field Artillery Birnie announced that recent artillery technical developments were greatly improving the ability of the division artillery to support the infantry. Birnie reminded the students that in addition to the planned fires required by the infantry, there still existed the necessity to destroy unplanned targets hindering the frontline infantry advance, such as machine guns. To meet the challenge of calling fires on such targets of opportunity, the Chief explained that the "much improved system of battalion fire direction [the FDC]" allowed a forward observer "under reasonably average conditions and communication bring down effective fire" on unplanned targets that impeded the frontline infantry advance in

<sup>245</sup> McNair, FDC Correspondence, MSL, 2.

<sup>246</sup> U.S. Field Artillery School, 1934 *Tactical Employment of Field Artillery*, 8. In 1934, the liaison team for the light artillery regiment consisted of the liaison officer, one scout sergeant, two scouts, and an orderly. Authorized two liaison teams, each light artillery battalion liaison team had a liaison officer, one scout sergeant, one scout corporal, one radio sergeant, two radio operators, one pack animal driver with pack animal and combination radio-wire pack, and one orderly.

several minutes.<sup>247</sup> The advantage of this new system, according to Birnie, was that "the person who sees the target adjusts the fire on it, using the adjustment a liaison or forward observer who has located the target and called for fire on it."<sup>248</sup> With a new call for fire system, the Field Artillery had eliminated the reliance upon a battery commander from his distant observation post to identify and bring fire upon the target for frontline infantry.

As the FDC gain credibility and acceptance within the artillery community, the Field Artillery School and its officer representatives at other army schools began to publicize the new procedures as a solution for the close support problem.<sup>249</sup> In its 1935 *Digest of Field Artillery Developments*, the Field Artillery School explained that with improved radios and centralization of battalion fires under a FDC, it was now possible for a "closer linking during action of the supported and supporting units."<sup>250</sup> The

<sup>247</sup>Birnie, "Field Artillery Developments," AWCL, 8 October 1936, G-3 Course No. 7, 1936-1937, MHI. 4. Birnie, "Developments in Organization, Armament, and Equipment of the Field Artillery," AWCL, 13 September 1935, G-3 Course No. 6, 1935-1936, MHI, 11; Chief of Artillery Annual Report 1939, MHI, 17; Instruction Memorandum, Departments of Gunnery, and Tactics and Communication, Field Artillery School, Fire Direction, 1934-1935, Box 104, E 34, RG 177, NARA; I.S. War Department, FM 6-40, 1939 *Firing*. See Chapter III, "Eliminating the Middleman: The Fire Direction Center." Ironically, the problem of realizing the tactical benefits of the FDC also existed within the Field Artillery community itself. Guidance for establishing and operating a FDC only existed in school texts and Gunnery Instruction Memoranda. The Chief of Field Artillery Office did not publish new regulations which included FDC guidance until the issue of FM 6-40, *Firing*, in October 1939.

<sup>248</sup>Birnie, "Field Artillery Developments," AWCL, 8 October 1936, G-3 Course No. 7, 1936-1937, MHI, 4-5. Birnie attributed this advancement to the use of the SCR Set 194 Radio, standard issue radio for the Field Artillery. The radio had a range of four-miles.

<sup>249</sup>George D. Wahl, "The Direct Support of Infantry in an Attack," *FAJ* 24 (September-October 1934): 437; Wahl, "The Division Howitzers and the Corps Artillery in Support of an Attack," *FAJ* 25 (March-April 1935): 121-23.

<sup>250</sup>U.S. Field Artillery School, *Digest of Field Artillery Developments* (Fort Sill, Okla.: Printing Plant, 1935), 3.

following year's edition of *Digest* announced a solution to the "unsatisfactory" infantry-artillery liaison in World War I. The Field Artillery now had "better equipment, and improved technique in communication and gunnery have increased the value of the liaison officer's services in the fire-direction system of the light artillery battalion."<sup>251</sup> The new procedures now added one significant duty for the artillery LNO with a frontline infantry battalion, he would also now act as a forward observer. The Field Artillery School further promoted the idea of the LNO as the forward observer when it advised in its 1938 edition of *Tactical Employment of Field Artillery*: "In certain situations, especially when the infantry is advancing in a partly deployed formation, it may be more effective for liaison officers to accompany front-line infantry company commanders."<sup>252</sup> The Field Artillery School, with support from the Chiefs of Field Artillery, had changed the traditional organizational framework of observation and shifted its doctrine closer to placing the artillery forward observer with frontline infantry.<sup>253</sup>

In his last visit as Chief of Field Artillery to the Army War College, Birnie again encountered students perplexed by whose responsibility it was to man close support weapons. When a student asked whether the Infantry's 81-mm mortar was the solution

<sup>251</sup>U.S. Field Artillery School, *Digest of Field Artillery Developments* (Fort Sill, Okla.: Printing Plant, 1936). 24.

<sup>252</sup>U.S. Field Artillery School, 1938 *Tactical Employment of Field Artillery*, 72.

<sup>253</sup>General Service Schools, 1936 *Tactical Employment of Field Artillery*, 42-46. The merits of the improved fire support because of the FDC and the portable radio can also be found in the 1936 edition of the Command and General Staff School's *Tactical Employment of Field Artillery*.

for the "very gloomy picture" of effective artillery support, Birnie answered that there indeed had been a legacy of inadequate fire support, but he maintained that his branch would provide better support for the infantry in the future because it "had made great strides in that by the development of a far better fire-direction system."<sup>254</sup> Replying to a followed-up question from a student wondering: "if anything had been done to indicate the solution of that problem of close effective artillery support of the rather badly used front line doughboy?"<sup>255</sup> Birnie repeated his earlier stance about improved fire direction techniques, but replied that "in the majority of cases" that there would be a need of "some sort of accompanying artillery or weapons manned either by the infantry or artillery."<sup>256</sup> For Birnie, the need for heavier direct firepower would have to be an infantry responsibility, but indirect fire support would remain the purview of the field artillery.

The new Chief of Field Artillery (1938-1942), Major General Robert M. Danford, took a firm stand on the close support and accompanying gun issues when he confronted Army War College students in the fall of 1937:

There are some who advocate that the infantry must have within the regiment suitable cannon to overcome unforeseen resistance which may appear during the action on the immediate front of assault battalions rather than to rely upon the artillery to answer calls for fire upon such targets. I for one, am not yet ready to subscribe to this belief. The artillery in the past few years has made definite progress in its methods of

<sup>254</sup>Birnie, "Notes of Discussion Following Lecture." AWCL, 14 October 1937, G-3 Course No. 13. 1937-1938, MHI, 14-15.

<sup>255</sup>Ibid.. 15.

<sup>256</sup>Ibid., 16.

fire direction and its means of signal communication. With greater confidence than ever before, the artillery can now render the infantry the support it will need ... With these developments, I am confident that in our next war the artillery and the infantry will be more closely integrated unit in combat than they have ever been before.<sup>257</sup>

With new fire direction procedures and portable radios, coupled with the infantry's 81-mm mortars, Danford asserted that the need for the accompanying gun would be virtually eliminated and decreed "true accompanying artillery is the artillery that accompanies the infantry in fire, placing same effectively when and where needed."<sup>258</sup> As if to underscore Danford's position, the 1940 edition of *Tactics and Techniques* reduced accompanying artillery guidance to one paragraph and warned in the italicized last sentence: "*The use of accompanying artillery is rarely justified if taken from the direct-support artillery.*"<sup>259</sup> With only one source for accompanying guns, the direct support battalion, the field artillery created a situation where it avoided putting its guns in a mission that it did not believe in and remained committed to the idea it could support the infantry with its new system of the forward observer and centralized fire direction. The opportunities for the field artillery to demonstrate the enhanced capabilities of the artillery observer rarely occurred. Despite the proclamations of the two Chiefs of Field Artillery announcing a remarkable improvement in reducing the time between a request for fire and the actual

<sup>257</sup>Robert M. Danford, "Developments in Organization, and Employment of Field Artillery," AWLC, 28 September 1938, G-3, Course No. 9. MHI, 14.

<sup>258</sup>Ibid., 15.

<sup>259</sup>U.S. War Department, FM 6-20, *1940 Tactics and Techniques*, 73.

destruction of a planned or target of opportunity, it meant little to the average infantry officer.

Another probable cause for the disconnection between the artillery and infantry was that each school concentrated on producing a competent artillery or infantry officer at the expense of not providing comprehensive instruction on combined arms operations.

General J. Lawton Collins, VII Corps Commander in World War II, remarked that the basic service schools (e.g. infantry and artillery) in the interwar period were fine technical schools that concentrated on their own techniques and tactics, but they lacked instructional hours devoted to other arms (weapons, techniques, and doctrine). Although a graduate, Collins believed that the Field Artillery School at Fort Sill, Oklahoma training reservation itself created the poor interaction between the artillery support for the infantry: "It [the Field Artillery School] didn't believe in moving the observers up into the front line; it had them stuck on hilltops." That was due to the type of country at Sill. You could sit on a hilltop and see for miles.<sup>260</sup> Collins argued that the school created technically competent artillerymen, but poor fire supporters because the artillery school failed to teach that forward observers needed to be permanently forward with the advancing infantry unit.

In fall of 1939, the Army War College saddled its students with an assignment that asked "whether or not the War Department should clarify the line of demarcation

<sup>260</sup>"Conversations with General J. Lawton Collins," 4.

between the roles of the infantry and field artillery with respect to supporting fires.<sup>261</sup>

Twenty years of discussion, updating tactics, and schooling apparently had not brought

the two sides any closer than they had been in the trenches of World War I. A new development arose that same school year at the Infantry School. During the artillery fire support demonstration, infantry student officers learned that in addition to the artillery liaison officer at their battalion headquarters, they could also expect support from battery observers at forward observation posts. Moreover, students were told that these battery observers, if there was not a suitable position to see the battlefield to support the

infantry, could also "function with front-line infantry units, operating mobile

observation posts."<sup>262</sup> Just before the U.S. Army entered World War II, the Field

Artillery had begun to institute the idea of using its battery observation teams as forward

observation teams. Combat would accelerate the field artillery leadership to refine and

institute this "mobile" observation post even further.

<sup>261</sup>H. I. Modes to the Assistant Commandant, AWC, Subject: Infantry and Field Artillery Supporting Fires, 14 October 1939, MHI, 1.

<sup>262</sup>U.S. Army Infantry School, "Field Artillery in Support of Infantry," Mimeo No. 1-204, *Instructional Matter*, 1939-40, 7 vols., DRL, 3:3.

## CHAPTER V

### THE FORWARD OBSERVER: IN COMBAT

*Well trained forward observers with judgment remain the backbone of our organization.*

*Lieutenant Colonel John Embry  
Field Artillery  
November 1944<sup>263</sup>*

Theoretical debate over the tactics and techniques on the infantry-artillery team ceased with the American entry into World War II in December 1941. When combat forced the two branches together in World War II, the Field Artillery made one critical adjustment to its liaison and observation teams, and decisively surmounted the World War I problems: assigning its observers directly to each infantry company. By putting the forward observer with all frontline companies, the Field Artillery forever changed its relationship with the infantry and cavalry and ushered in a new era of fire support which could not have been imagined in World War I.

At the very beginning of the war, the Field Artillery was slow to assign its officers and men directly to the infantry units. Forward observing tactics for the infantry generally still relied upon a system of fixed observation posts near infantry units with zones of observation that corresponded with the infantry zone of action. After a few weeks of combat operations, the Army leadership saw the necessity to attach their artillery observation teams directly with frontline infantry companies. Instead of an

<sup>263</sup>John Embry, "Tips from Overseas – III." *FAJ* 34 (November 1944): 767.

infantry commander relaying his request for fire through the liaison officer at the infantry battalion command post, the forward observer attached to an infantry company, with his radio or telephone, called directly to the battery or battalion FDC to request his fire mission.<sup>264</sup>

Using the AEF hierachal fire control system that passed through artillery command posts to a firing battery, an observer could wait as long as fifteen minutes for his first adjustment round on a target of opportunity, while an artillery forward observer in World War II, calling directly to a artillery battalion FDC, could complete the adjustment and the fire effect phase on a target of opportunity in under eight minutes.

With timely close support fires achievable, commanders immediately saw the merits of attaching forward observer teams to each of their maneuver companies. Providing the nine forward observer teams to support an infantry regiment, in addition to manning his battalion and battery observation posts, a direct support artillery battalion commander soon discovered that observation placed a severe stress on his battalion's manpower. At the outbreak of World War II, the War Department authorized each direct support battalion two liaison teams, but did not provide the authorization slots for the additional twenty-seven soldiers to man these forward observer teams. Eventually, in the latter half of 1944, the War Department authorized three forward observer teams per battalion, but this increase still did not meet the demand of providing each infantry or tank company its

<sup>264</sup>W. H. Bartlett, "Organization of Observation," *FAJ* 32 (January 1942): 2-9; U.S. War Department, FM 7-20, *Rifle Battalion* (Washington: GPO, 28 September 1942), 12; U.S. War Department, FM 7-20, *Infantry Battalion* (Washington: GPO, 1 October 1944), 15. A forward observer was not a member of the unit he supported. Wartime manuals made it clear that the observer was the property of the artillery and not the infantry.

own assigned forward observer. Some direct support missions required as many as twelve forward observer teams for some operations. Commanders scrambled constantly to find enough officers, and in many cases NCO's, to lead forward observer teams. Nonetheless, most artillery battalion commanders did find the men and ensured that the infantry received artillery close support.<sup>265</sup>

Early in the Tunisian Campaign in North Africa, artillery officers realized the advantages of attaching their forward observer teams to the infantry. Lieutenant Edwin V. Westrate, a forward observer in that campaign, remembered that after his unit experienced some initial tactical setbacks, the infantry and artillery units now had the experience to be successful in the next battle: "It was no pushover but we knew what we were doing and how to do it and we know we weren't going to be stopped this time. The infantry and artillery were clicking like a machine and the air forces were working with the ground forces better than at any time. In our own small forward observation world, we finally were trying out the system of having the FO assigned to one doughboy outfit instead of to a zone and that worked better than anything we had used before."<sup>266</sup> As the Americans had discovered in North Africa, the need to put the forward observer upfront

<sup>265</sup>U.S. War Department, FM 6-135. *Forward Observation*, 1-14; Palmer, Senior Officers Oral History Program, MHI, 19; U.S. War Department, Technical Manual 6-605, *Field Artillery Individual and Unit Training Standards* (Washington: GPO, 1 February 1945), 68-69; Reports of the General Board, United States Forces European Theater, 1945 (hereafter General Board), Study No. 59, *Report on Study of the Organization and Equipment of Field Artillery Units*, 4, 12-13, CMH; General Board, Study No. 64, *Study of Field Artillery Gunnery*, 2-3. In August 1944, the War Department released FM 6-135, *Forward Observation*. In this pamphlet, observation techniques were divided into two distinct types: observation (OP operations) and forward observer. The manual consolidated the adjustment methods found in interwar and wartime artillery manuals.

<sup>266</sup>Edwin V. Westrate, *Forward Observer* (Philadelphia: The Blakiston Company, 1944), 141.

with the infantry was also paramount for success in the Pacific Theater operations.

Senior artilleryman Colonel Christiancy Pickett observed: "In the good old days we felt than an OP had to be adjacent to the gun position; then the idea occurred to some bold thinker that a better place of an OP might be up where one could see the target area. Being a conservative, I resisted this: at Fort Sill one can see everything from the hill near the guns and that's where we used to do all our firing. Then the Japs challenged us to fight them in the jungle. I'm opposed to this, but I'm afraid we will have to become resigned to it."<sup>267</sup> Questioned why the division commanders started to place artillery observers in frontlines with the infantry, General J. Lawton Collins, a World War II division and corps commander, responded that having the FO assigned with each maneuver company was "something developed out of logic."<sup>268</sup> Combat jarred the traditional liaison and observation system from its perch to join the frontline infantry and marked the beginning of the modern fire support team.

The duties and organizational structure of the artillery liaison team outlined in interwar guidance remained unchanged during World War II. Whether sent to an infantry or artillery command post, the liaison officer remained the artillery battalion commander's primary conduit for information on the location of friendly units, the movements of patrols, and enemy actions. Conversely, the liaison officer needed to keep the supported commander aware on the artillery situation. Wartime manuals explained

<sup>267</sup>Christiancy Pickett, "Up Front Down Under," *FAJ* 34 (February 1944): 90. Pickett served as a staff officer in the Chief of Field Artillery Office under Snow in the 1920's.

<sup>268</sup>"Conversations with General J. Lawton Collins," 4.

that the liaison officer duties were "to advise and assist the commander of the supported or reinforced unit in obtaining the desired supporting or reinforcing fires, and to keep his artillery commander informed of the plans, operations, and disposition of the supported or reinforced unit."<sup>269</sup> Captain Ralph M. Fuller, a liaison officer in the Pacific Theater, confirmed this coordination mantra in his September 1944 *Field Artillery Journal*:

"During his tour of duty the LnO should further harmonious cooperation between his own HQ and the one to which he was sent. Keep informed of the situation of his own unit and make that information available to the commander and staff of the unit to which sent. Most important is to keep his own battalion up too date on anything that the infantry may do or enemy that it may meet. If he fails to do this, he has failed in his mission."<sup>270</sup> With the institution of numerous forward observation teams assigned to frontline companies, the artillery liaison officer at the infantry battalion headquarters was now coordinating, monitoring, and controlling the forward observer teams. If needed, the liaison officer was also expected, and frequently did, adjust and call for fire in support of battalion operations and emergencies. Throughout World War II, *Field Artillery Journal* articles stressed that the liaison officer needed to be a "good shot"

<sup>269</sup>U.S. War Department, FM 6-20, *Field Artillery Tactical Employment* (Washington: GPO, 5 February 1944), 24. A useful tool to ensure that the infantry and artillery were literally on the same page was the "common index." Before the operation, the infantry regimental commander and the direct support artillery commander assigned reference numbers to prominent terrain features in the regimental zone of advance. More refined and detailed in World War II, the common index was an out growth of artillery liaison officer's maps and charts used in World War I. Discussion of the liaison officer needing to know the location of his unit's base point and check concentrations was emphasized after the introduction of the FDC. U.S. War Department, FM 6-101, *Field Artillery Tactics and Technique, Battalion and Battery Motorized* (Washington: GPO, 28 June 1944), 73-77; U.S. Field Artillery School, *1938 Tactical Employment*, 52-53.

<sup>270</sup>Ralph M. Fuller, "Liaison in the Jungle," *FAJ* 34 (September 1944): 599.

without forgetting his primary duty to keep both infantry and artillery commanders informed. Artillery commanders also sent liaison officers to division and corps artillery headquarters to ensure that fire plans, observation plans, artillery position management, and unit moves were continuously well coordinated.<sup>271</sup>

In a hypothetical World War II situation, the artillery battalion commander and the infantry regimental commander formulated a general support plan for the location, time, duration, and priority of artillery fires that best supported infantry attack. The considerations in the plan included suspected enemy locations, regimental objectives and intermediate objectives, the boundaries of the regimental zone of action, the contemplated maneuver of the supported unit, supporting fires of other arms (i.e. tanks, anti-tank (AT) guns, infantry howitzers, and tank destroyers), reinforcing artillery fires, and battlefield conditions. Once the two commanders agreed upon the general artillery support plan, the artillery commander sent his artillery liaison officers to all the infantry battalions his unit would support. The artillery liaison team at an infantry headquarters consisted of the officer, usually a captain, his NCO, and radio and telephone operators. At the infantry battalion command post, the liaison officer and the infantry battalion commander conducted a joint reconnaissance of the area of operations to help in their formulation of the close support plan – a refined version of the general support plan for each attacking infantry battalion. This firing planning process occurred simultaneously at all unit levels (company, battalion, and regiment) within the division, including corps

<sup>271</sup>Fuller, "Liaison in the Jungle," 599; Eugene R. Smyth, "Fighting the Nips – With 105's," *FAJ* 35 (September 1945): 532; Eli G. Gifford. "Woe is the L.O.," *FAJ* 35 (February 1945): 79.

units. Upon the completion of all fire plans, the artillery liaison officers sent their plans to their higher headquarters to eliminate the duplication of targets, request additional fires from other sources, and refine the timeline of fire plans with the maneuver advances. With plans approved, artillery gun units began the process of computing data for all targets, resupplying ammunition, sending forward observer teams to the maneuver companies, and if warranted, registering their guns. With units in position ready to fire at the designated times, it was now up to the forward observer to initiate the artillery fire plan.<sup>272</sup>

Wartime doctrine specified that the primary mission of the forward observer was "to observe and adjust artillery fire on those hostile elements which interfere with the mission of the unit with which he is working."<sup>273</sup> Artillery battalion commanders assigned lieutenants, usually a firing battery reconnaissance officer, as the forward observer team leader. The goal was to have one forward observation team with each maneuver company. The lieutenant's team, also chosen from the firing battery, consisted of himself, a noncommissioned officer, and a communications specialist. Riding in a jeep, the team carried their equipment that included a radio set with a remote control unit, wire reels, telephones, telescopes and binoculars, and their personal weapons. After receiving guidance and locations of his battalion's base and check points (known registration points to easily adjust fire) from the battalion operations officer (S-3), the

<sup>272</sup>General Board, Study No. 61, *Report on Study of Field Artillery Operations*, 107-108.

<sup>273</sup>U.S. War Department, FM 7-20, *Infantry Battalion 1944*, 15.

lieutenant linked-up with the artillery liaison officer at the maneuver battalion. At this coordination meeting, the forward observer became apprised of the tactical situation, the scheme of maneuver, recorded infantry check points, and the employment plans of the infantry's heavy weapons such as machine guns and mortars. After this meeting, the team linked-up with the infantry company commander to coordinate targets or areas that would likely need prompt artillery fires and to confirm infantry positions, and then established its observation post, whether it be a high piece of terrain, building, church steeple, to look over the area of operations of his supported unit. After consolidating his targets, the observer would transmit or give their fire plans to the infantry commander, liaison officer, and the battalion FDC. If the tactical conditions permitted it, the team would fire on an identifiable land feature if they did not know or could not identify their battalion's base point (a common registration point).<sup>274</sup> A forward observer lieutenant, fighting in the Tunisia campaign, explained his preparation:

We parked our jeep near the primary OP then made a complete check of our equipment to be sure we had everything we need, especially rations and water. My final duty before going up was to check with Rick [the liaison officer]. I did this as soon as he came back from the conference with the battalion at which the complete attack plans were explained. Rick and I squatted on the ground under a blanket with a flashlight and went over the maps. From Rick I had to learn the exact time of the H hour, the exact map location of the line of departure, of our base point, of each battery of the battalion's fire direction center, of all the command

<sup>274</sup>The base point was a known point/target on the ground, and more importantly, on a map that the observer and the battalion FDC could both identify. Once the observer registered a gun on the base point, he could then call a fire mission on targets in relation to the base point. For example, a target could now be 300 yards right and 200 yards short in relation to the base point. See Chapter III, "Eliminating the Middleman: The Fire Direction Center"; Richard M. Hardison, *Caissons Across Europe* (Austin: Eakin Press, 1990), 102-4. 126-27; "Bottlenecks," *FAJ* 32 (November 1942): 885; Gjelsteen, "Massing Fires of Division and Corps Artillery," 426-29; U.S. War Department, FM 7-20, *Infantry Battalion 1944*, 15.

posts – that of our battalion commander, the infantry battalion commanders of the infantry battalion observation posts, since our liaison officers would be there, also the location of the reinforcing artillery, the mediums and the leading infantry elements. I had to learn from him the complete plan of communications for the battalion, where our battery wire head would be so we could hook up to it without losing time, how much ammunition we had and what kind, the code to be used the next day, what the infantry rocket signals would be if any were needed the complete plan of attack, the succession of objectives and the time each was supposed to be reached.<sup>275</sup>

In battle, the observer remained in close proximity to the commander or established a communication link from his observation position to respond to the infantry commander's requests for fire. Assigned to support the infantry, the forward observer did not necessarily move directly with the infantry commander, but moved to points where he could best accomplish his mission. Both the infantry commander and his observer were responsible for keeping each other informed of their location.<sup>276</sup>

During World War II, artillery units established two types of observation posts: the forward observation post by the forward observer team, and the battalion or battery observation post. Unit observations posts used soldiers derived from officers, NCOs, and soldiers assigned to the battalion and battery headquarters. Naturally, the observer found a location in which he could observe the zone of action or defensive sector of his supported unit while maintaining contact and communications. The forward observer team generated the majority of fire missions for the direct support units. At the battalion

<sup>275</sup>Westrate, *Forward Observer*, 41-42.

<sup>276</sup>Hardison, *Caissons Across Europe*, 102; Two-Thirtieth Field Artillery Battalion, *On the Way: A Historical Narrative of the Two-Thirtieth Field Artillery Battalion, Thirtieth Infantry Division* (Poessneck I. Thuer., Germany: Fr. Gerald Verlag, 1945), 95-99; U.S. War Department, FM 6-135, *Forward Observation*, 15; U.S. War Department, FM 7-20, *Infantry Battalion 1944*, 15.

and battery observation post, the three-man team chose a post farther away from the front lines that provided a wider and deeper view of the battlefield. Observers at the battalion or battery observation posts conducted registrations, surveyed fires, and gathered intelligence. The higher headquarters FDC, whether it was a battalion, division artillery, or corps FDC checked these missions with the direct support battalions to prevent fratricide on friendly units. To facilitate coordination between the reinforcing and the direct support artillery battalions, the reinforcing battalion sent a liaison officer with team to the command post of the direct support battalion. As with the direct support battalion manpower problem of finding the men to compose its forward observation teams, the reinforcing battalions and general support battalions faced the challenge of finding soldiers to man their observation posts. Authorized only one observer team per battalion, a commander often had the responsibility to cover a wide front with four to six teams and had to take key personnel from his firing batteries to meet this mission requirement. Manning the observation posts and the forward observation teams exacted a high cost in manpower, but the division artillery commander now had three sources to observe the enemy and call upon for fire: aerial observers, observation posts, and forward observers.<sup>277</sup>

<sup>277</sup>At the corps level, the commander had a fourth artillery source for finding targets with his observation battalion. Using sound and flash ranging equipment, the U.S. Army's twenty-five field artillery observation (Target Acquisition) battalions in World War II conducted operations in both the European and Pacific theaters. These units were an outgrowth of World War I attempts to locate enemy artillery by monitoring the flash and sound of enemy artillery. Observation battalions were only adequate during the static phases of the battles when they had an opportunity to array their microphones and sensors across front lines. During the waning months of the war, some units conducted experiments using ground radars to locate enemy mortar and artillery fire. See Arthur R. Hercz, *Development of the Field Artillery Observation (Target Acquisition) Battalions* (Fort Sill, Okla.: U.S. Army Field Artillery School, Target Acquisition Department, 1972) and General Board, Study No. 62, *Report on Study of the Field Artillery*

With three observation sources watching the battlefield, the Field Artillery now had a reliable network to provide accurate situation reports to unit command posts. All training literature and field manuals concerning the forward observer emphasized the point that the secondary mission of the observer was to be the "front line representative for obtaining information of the enemy."<sup>278</sup> Standard operating procedures required that after each mission, the observer report to the FDC the effects of the artillery fire on the target(s). For example, "destruction of three tanks," "neutralization of mortars," or "explosions on an enemy supply dump." With knowledge of where their forward observers were and the reports from unit observation posts, a commander could track the battle, anticipate future fire missions, and plan unit moves to support the infantry commander. In fact, it was the battalion S-2, the intelligence officer, who created the "plan of observation" to ensure that all areas of the battlefield had artillery observers and that their efforts were not needlessly duplicated. Artillery intelligence officers realized when their observers reported the essential elements of an intelligence message (Who, What, Where, When, and How) that even small observations "tied together quite often make a big picture"—a composite intelligence picture.<sup>279</sup> By receiving intelligence reports from higher and from his unit air and ground observers, a battalion S-2 could analyze the battlefield and determine suspected enemy positions and intentions. At the

*Observation Battalion.* W. V. Ledley, "Medium Artillery Liaison," *FAJ* 34 (January 1944): 24; General Board, Study No. 59, *Report on Study of the Organization and Equipment of Field Artillery Units*, 5.

<sup>278</sup>U.S. War Department, FM 6-135, *Forward Observation*, 1.

<sup>279</sup>Neil D. Cox, "Observation," *FAJ* 33 (September 1943): 648.

conclusion of a fire mission or at specified times throughout the day, the S-2 reported effects on targets to his higher headquarters. With suspected and known enemy locations, the division and corps headquarters requested aerial photographs to verify enemy locations to become future targets.<sup>280</sup>

Mirroring the artillery liaison and forward observer system of an infantry division, the armor division artillery units also assigned a liaison officer with each battalion command post and attached a forward observer party, riding in their own M-4 Sherman tank, to each tank company. Commanders assigned lieutenants and soldiers from the battalion staff or chose teams formed from the three firing batteries. For example, in July 1944, the 3<sup>rd</sup> Armor Division organized Combat Command C into three task forces to support 1<sup>st</sup> Infantry Division attacks designed to cut off German forces in Normandy. Each task force consisted of one infantry and one tank company, supported by three firing batteries from the 391<sup>st</sup> Armored Field Artillery Battalion. To direct the close fire support, a forward observer lieutenant, mounted in a tank, was attached to each task force. In addition to the forward observers, battalions also established forward observer stations to register the guns and destroy targets of opportunity such as enemy positions, batteries, and staging areas. As with the infantry observer seeking anonymity by looking like an infantryman, the armored field artillery observers also sought to have

<sup>280</sup>Westmoreland, "Combat Conclusions of a Medium Battalion in Africa," 649; Cox, "Observation," 648; Percy W. Thompson, "Direct-Support Battalion S-2 in Action," *FAJ* 33 (December 1943): 883; John C. Guenther, "Artillery in the Bougainville Campaign," *FAJ* 35 (June 1945): 331; James J. A. Kelker, "Division Artillery Intelligence," *FAJ* 35 (August 1945): 456-57; U.S. War Department, FM 6-130, *Field Artillery Intelligence* (Washington: GPO, 30 June 1945), 1, 7-8, 20-21.

their tanks appear like those they supported to avoid undue attention as a high priority target. Observers would use their tank guns only in self-defense.<sup>281</sup>

Armor-artillery operations entailed modifications to forward observation tactics and techniques. The primary challenge was that the forward observer needed to know his commander's scheme of maneuver, destroy targets of opportunity, adjust proactive barrages just beyond his unit's limit of advance, and anticipate future moves all at an accelerated battle tempo. An armored battalion on the move did not have time to lay wire to its observers and relied exclusively on radios. A mounted observer, with his head sticking out of the tank had to look beyond the direct fire range of the tank, stay on the windward side of the battle area to prevent dust and smoke from obscuring his view, and adjust fire from a moving, loud, and conspicuous observation post. Another

<sup>281</sup>Each firing battery supported one battalion task force and allowed for independent operations, but the battalion FDC could still control all three batteries fires to mass the battalion on one target if needed. This task organization reflects the flexibility that the field artillery now had with its FDC and forward observers in frontline units. Combat Command Teams are akin to the modern U.S. Army's Brigade Combat Team (BCT) organizations. In a BCT, a maneuver brigade commander organizes his unit to best accomplish his mission. For example, a three-battalion task force could consist of two mechanized infantry battalions and one armor battalion, or the commander could mix the composition of each battalion by moving a company of armor or mechanized infantry to a different battalion. In an infantry task force, a common organization is three mechanized infantry companies and a tank company. The American World War II forward observer team mirrored today's fire support team: lieutenants worked as company level fire supporters, while captains worked as the task force (battalion) headquarters liaison officer (the maneuver battalion fire support officer). The U.S. Army in World War II did not establish an organic fire support organization as in today's Direct Support Field Artillery Battalion. A modern field artillery battalion has a Fire Support Element (FSE) consisting of a maneuver brigade fire support officer, with each maneuver battalion and its respective maneuver companies assigned Fire Support Officers (FSO) with the complimentary sergeants and fire support specialists forming observation teams at each level. At the brigade level, the American artillery still establishes observation posts with brigade Combat Observation Lasing Teams (COLT teams) that overlook critical engagement areas. Using a laser, the team can locate targets for the artillery and designate targets for precision-guided munitions (PGMs). O. W. Martin, "Armored Artillery at Sened Station," FAJ 33 (August 1943): 572; Paul H. Bowdle, *Combat History of 391st Armored Field Artillery Battalion* (Neu-Isenburg, Frankfurt am Main, Germany: Derndruck, 1945?), 59, 63, 112; U.S. War Department, FM 6-135, *Forward Observation*, 27; John Box, telephone conversation with author, 16 January 2002. During World War II, Box was a first lieutenant in the 47<sup>th</sup> Armored Field Artillery Battalion, 5<sup>th</sup> Armor Division.

mounted challenge for the observer was monitoring radio traffic: every tank had a radio that made every tank commander a potential artillery observer. In addition to the monitoring and deciphering the chatter of his tank company requests, the observer also had to listen to the infantry company net, request fires from battalion FDC, and, if needed, talk with the three firing batteries. Mounted in a Sherman tank, the observer was afforded a higher degree of protection than his counterpart assigned to the infantry, but it did not exempt him from sharing the same hazards as his fellow tankers: superior German tanks, high-powered anti-tank guns, and landmines. Effective observation often required him to climb down from his tank and directly talk to the infantry to find out the locations of enemy tanks and anti-tank guns. All these factors increased his chances of being wounded or killed. As with the artillery observer with regular infantry, the armored forward observer had a substantially higher casualty rate than his lieutenant peers directing battery and battalion firing operations. Calling for fires mounted or dismounted, the armored forward observer provided effective close supporting fires that allowed American armor units to advance across Europe to victory.<sup>282</sup>

<sup>282</sup>An observer had a better chance of hearing the battlefield, seeing the enemy, and taking more advantageous and concealed positions to see targets rather than drawing enemy fire while mounted in the tank. Necessity being the mother of invention, observers also used a spare tank periscope to see out of trenches and foxholes. The M-7, "Priest," 105-mm howitzer, mounted on a M-4 Sherman tank chassis, equipped the direct support battalions of an armor division. An armored artillery firing battery had six guns instead of four of the infantry division to provide more "punch" for the fight. Richard D. Bush, "Forward Observation in Africa," *FAJ* 33 (October 1943): 771; James J. Gibbons, "Armored Artillery Support," *FAJ* 34 (July 1944): 454; Sydney S. Combs, "Observation is Support of Armor," *FAJ* 34 (August 1944): 573; I. B. Washburn, "Armored FA Across France," *FAJ* 35 (April 1945): 203-04; Bowdle, *Combat History of the 391*, 51, 53-54, 59, 126-27; U.S. War Department, Historical Documents (hereafter WDHD), Headquarters 68<sup>th</sup> Armored Field Artillery Battalion, Subject: Unit History, 3 November 1944, Item 2396, Reel 2197, 1, 3, 5, USMA; General Board, Study No. 59, *Organization and Equipment of Field Artillery Units*, 45-46.

In North Africa and Europe, the Field Artillery battalions fought closely along the lines of the doctrine and tactics taught at Fort Sill. Commanders repeatedly stated that the performance of their units in battle had proven the soundness of the curriculum at the Field Artillery School. Improvements upon the school methods marked the progress of the artillery as it gained experience in working with tanks and close support aircraft.

After the war, the General Board recommended, "no changes be made in published field artillery doctrine concerning tactical employment."<sup>283</sup> All artillery battalion commanders desired only one significant change – the allocation of more liaison teams and the authorization for officers and men to man forward observers teams to attach with each maneuver company.<sup>284</sup>

Extensive radio and wire systems connected all members of the artillery: observers, liaison officers, FDCs, firing batteries, and headquarter elements. Artillery units used the radio communications in three ways: in fast moving situations in which it was the only link between elements, slow moving situations when it was combined with a wire network to provide redundancy, and in static situations where it served as reserve in the event wire communications failed. During numerous instances in the pursuits across France and Germany, artillery battalions pulled their guns off the road, occupied hasty positions, and fired missions in answer to an observer's radioed request. The common radio link between the battalion FDC, liaison officer, and forward observers

<sup>283</sup>General Board, Study No. 61, *Study of Field Artillery Operations*, 108.

<sup>284</sup>Hardison, *Caissons Across Europe*, 153-55; Headquarters 68<sup>th</sup> Armored Field Artillery Battalion, Subject: Unit History, 3 November 1944, Item 2396, Reel 2197, 7, WDHD.

was a FM radio set, SCR-609. During the war, observation teams often parked their vehicle in a concealed location, with the radio mounted in the vehicle, and used a remote control unit. The observer, using the remote control system connected to the radio by wire, allowed him to be several miles away from his jeep and still man his observation post or position himself with his maneuver company. In the remote configuration, the team had to have one soldier remain at the vehicle and operate the radio. To eliminate the problems associated with carrying and broken wire, artillery forward observers used a "Walkie-Talkie, a hand-held AM radio set, SCR-536. Using the "Walkie-Talkie," the observer called for fire to the radio operator, also equipped with a "Walkie-Talkie," at the team's vehicle mounted FM radio, who would then in turn relay the observer's radio traffic. Although a little cumbersome because of the need to use a human relay between the observer, radio operator, and the FDC, most observers still prized the flexibility that a wire-free hand-held radio offered.<sup>285</sup>

<sup>285</sup>Gjelsteen, "Massing the Fires of Division and Corps Artillery," 428; Hardison, *Caissons Across Europe*, 102, 160; Two-Thirtieth Field Artillery Battalion, *On the Way*, 95-99; Harold R. Barker, *History of the 43<sup>d</sup> Division Artillery* (Providence: John F. Greene Co., Inc., 1961?), 79; U.S. War Department, FM 6-135, *Forward Observation*, 25-27; James R. Major, *The Memoirs of an Artillery Forward Observer 1944-1945* (Manhattan, Kan.: Sunflower University Press, 1999), 69; James H. McBroom, "Radio in Fire Direction," *FAJ* 33 (April 1943): 291; Washburn, "Armored FA across France," 205; Eugene Maurey, Jr., "Close Support at Kaltenhouse." *FAJ* 35 (April 1945): 207; Robert C. Gildart, "Artillery in the Bougainville Campaign." *FAJ* 34 (February 1944): 88; John W. Ferris, "Jungle Communication," *FAJ* 34 (March 1944): 186-87; General Board, Study No. 63, *Study of Field Artillery Communications*, 19-26; U.S. War Department, Technical Manual 6-235, *Field Artillery Radio Communication* (Washington: GPO, 18 July 1942): 5, 14-28, 37-39. AGF Artillery Report, DRL, 7-8. The SCR-609, FM radio, was portable in two separate cases, weighed 51 pounds, had a 13-feet telescopic antenna, and used dry cell batteries which provided six to eight hours of continuous operations with a range of about five miles. With a range of about 1½ to 2 miles, the SCR-536, a Walkie-Talkie, weighed six pounds, had a 44-inch whip antenna, and was powered with dry-cell batteries. Armored and airborne direct support artillery battalions normally did not maintain wire communications with their forward observers.

Despite the capabilities of the portable radio, wire remained the critical link connecting the liaison officer with the higher and adjacent headquarters and units and directing the massing of artillery fires - fire control. If possible, wire also connected the forward observer party with the liaison officer and the battalion FDC. After unit movements, wire teams immediately started connecting the battalion FDC and the firing batteries and higher headquarters together. Units, and especially forward observers from observation posts, chose wire over the radio when possible because it was not susceptible to enemy interception and enabled them to relay commands faster, thus shortening mission times. Units often laid two sets of wire between stations on different routes to enhance the probability of continuous contact. In the European theater, artillery units established a virtual telephone company to ensure communications between FDCs, observers, and headquarters. XIX Corps artillery wire teams frequently installed and maintained two to three hundred miles of wire to support combat operations. The Pacific theater posed tougher challenges for the installation of wire. With few roads on the jungle islands, wire teams were forced lay their wire along heavily traveled routes susceptible to line cuts by friendly vehicles and enemy troops. The overuse of laying wire on the same routes created situations where multiple wire sets made it difficult to decipher which line was broken. In one extreme case, two divisions fighting in Guadalcanal had laid over two hundred sets of field wire along the same main supply route.<sup>286</sup>

<sup>286</sup>Gjelsteen, "Massing the Fires of Division and Corps Artillery,"428; Hardison, *Caissons Across Europe*, 102, 160; Two-Thirtieth Field Artillery Battalion, *On the Way*, 95-99. Barker, *History of the 43<sup>d</sup> Division*

Regardless of their caliber, reinforcing and general support artillery battalions also had their own liaison officers and observation teams that they attached to various artillery headquarters and established observation posts to overlook an assigned sector for enemy targets. As with the direct support battalion forward observer teams, the reinforcing and general support observers contacted the artillery and infantry and armor commanders in their area of operations to learn the situation and coordinate fire plans and targets. In the reinforcing mission, a battalion would normally have its fires controlled by a direct support field artillery battalion to "reinforce" its fires, thus putting rounds on the designated target or targets that the direct support battalion could not fire. With a general support mission, a battalion answered calls of fire from a direct support battalion or shot missions for a field artillery brigade, division artillery, or corps artillery headquarters. Unchanged from their AEF counterparts, reinforcing and general support units, in addition to augmenting the fires of a direct support battalion, shot counter-battery (destruction of enemy artillery batteries) harassing, and interdiction fires.

Rounding out the three direct support 105-mm battalions within a division was the 155-mm battalion with the specific mission to reinforce the direct support battalion fires. Not usually associated with the direct support mission, the division reinforcing battalion, and other reinforcing and general support battalions in some tactical situations, could find themselves assigned to provide direct support fires for a maneuver element. The real benefit of these reinforcing or general support battalions was that they had internal

resources to provide liaison officers and forward parties to assume the direct support mission if needed.<sup>287</sup>

The ability of a reinforcing or general support battalion to meet the demands of different tactical situations was a hallmark of the American artillery support in World War II. For example, on 20 December 1944, the 391<sup>st</sup> Armored Field Artillery was first assigned to the 3<sup>rd</sup> Armor Division, then V Corps, and a short stint in XVIII Airborne Corps to providing reinforcing fires to the 82<sup>nd</sup> Airborne Division. When the XVIII Corps changed its main effort from the 82<sup>nd</sup> to the 30<sup>th</sup> Infantry Division, it reorganized its artillery and directed the 391<sup>st</sup> to send an LNO to the 30<sup>th</sup> Infantry Division Artillery and attach an additional LNO to the 197<sup>th</sup> Field Artillery, the artillery battalion that it would provide reinforcing fires. Four days later, the armored field artillery battalion found itself back under 3<sup>rd</sup> Armor control. With self-sufficient battalions, the Field Artillery had created organizational flexibility to build artillery firepower that was immediately responsive and had the ability to support battalion, division, corps, or army operations. This duplication of resources ensured that all artillery battalion commanders could provide their supported infantry and armor commander responsive and effective artillery support.<sup>288</sup>

<sup>287</sup>Reinforcing fires was not solely a mission for the medium artillery battalions. For example, the 391<sup>st</sup> Armored Field Artillery battalion, a 105-mm self-propelled unit, originally assigned to 3<sup>rd</sup> Armor Division fired additional "on call fires" in support of the 30<sup>th</sup> Infantry Division's attack to break out of the Normandy beachhead. Cox, "Observation," 648; Westmoreland, "Combat Conclusions of a Medium Battalion in Africa," 649-50; Frank W. Norris, "With Mediums," FAJ 35 (March 1945): 173.

<sup>288</sup>Three-Thirty Fifth, *Battle of Germany* (Reichenbach I. Vogtl., Germany: Haun und Sohn, 1945), 35, 51, 56; Bowdle, *Combat History of the 391st*, 18, 58, 113-14; Cox, "Observation," 648; Leif C. Reinersten, ed.. *After Five, Plus One: History of the 93<sup>rd</sup> Armored Field Artillery Battalion* (1945; reprint, Weinsberg,

In theory, units would rotate their forward observer teams to keep their teams from combat fatigue and to ensure that, if a team was disabled, an artillery commander could replace it during a battle. Following the AEF tradition, some battalion commanders used the same officers and selected their unit's expendable lieutenants. Other commanders had a rotating duty log in which all company grade officers, battery commanders and primary staff officers included, manned observation posts or led forward observer teams. The rotation of teams was a necessity because observation duty was an arduous task. During the brutal Huertengen Forest campaign (November-December 1944), the FO teams of the 28<sup>th</sup> Field Artillery Battalion needed to be replaced after a few days of intense combat and returned from the front exhausted and "useless for days."<sup>289</sup> After their first week in combat, the 110<sup>th</sup> Field Artillery, 29<sup>th</sup> Infantry Division, resorted to replacing their teams on a four-day schedule to prevent their forward observation teams from becoming ineffective because of the mental and physical exhaustion of battle. An armored field artillery battalion commander "found it almost mandatory" to relieve his forward observers after three or four days in the line during the advance across France.<sup>290</sup> The same was true for those FO teams in the Pacific theater. Fighting with the 77<sup>th</sup> Infantry Division on the jungle islands, the 902<sup>nd</sup> Field Artillery

Germany: Wilhelm Rock. 1998): 2-3; 4<sup>th</sup> Infantry Division Artillery, Subject: Action Against Enemy, Reports After/After Action Report, 31 March 1945, Appendix No. 1, Item 2230, Reel 2132, 16, WDHD.

<sup>289</sup>Doctrine recommended that observing teams be rotated every forty-eight hours. Twenty-Eighth Field Artillery Battalion, *Gunshot – On the Way: Twenty-Eighth Field Artillery Battalion* (n.p., 1945?), 67. Cox, "Observation," 648; Barker, *History of the 43<sup>d</sup> Division Artillery*, 80; U.S. War Department, FM 6-135, *Forward Observation*, 2.

<sup>290</sup>John P. Cooper, Jr., *The History of the 110<sup>th</sup> Field Artillery* (Baltimore: War Records Division, Maryland Historical Society, 1953), 117. Washburn, "Armored FA Across France," 204.

battalion commander made it a practice to rotate all his soldiers, including cooks and k.p.'s, as forward observers. An artillery liaison officer in the Pacific observed that not only did rotating the keep the teams "fresh" for battle, rotating personnel greatly increased the artillery skills of the battalion officers and soldiers alike and made "each one aware from first-hand experience what our doughboys have to go through. All personnel upon returning from the front have vowed to put forth every bit of effort because they realized more fully that an artilleryman's existence is strictly to assist the doughboy in every possible way."<sup>291</sup>

The challenge for the forward observer team, as the 1944 artillery observation field manual explained, was to "select observation posts from which they can see the movement of the supported unit. Such posts should not be so far forward that the forward observer and his party will be neutralized and pinned to the ground by hostile fire. If the forward observer enters the firefight he will not be able to carry out his primary mission. However he must not be so far back that contact with supported unit is lost."<sup>292</sup> Artillery battalion history accounts confirm the dangers calling for artillery fires with the infantry. In battle, an infantry soldier could seek cover in the low ground, but the forward observer had to put himself on positions that overlooked the battlefield – known by friend and foe to be likely locations for an artillery observer. During the Normandy Campaign, half of all the officers of the 110<sup>th</sup> Field Artillery were killed or

<sup>291</sup>Smyth, "Fighting the Nips," 533.

<sup>292</sup>U.S. War Department, FM 6-135, *Forward Observation*, 3. Major, *Memoirs of an Artillery Forward Observer*, 69. 147.

wounded serving as forward observers. In one day's battle, 7 March 1945, the 399<sup>th</sup> Armored Field Artillery Battalion had all of its forward observers critically wounded or killed in action while fighting in Rhineberg, Germany. Accompanying a jungle patrol searching for the Japanese, a four-man liaison team, recognized as one of the 43<sup>rd</sup> Division Artillery's most aggressive, was listed missing in action after fighting the enemy. Recognized as the individual who called the firepower of artillery, the forward observer was a key target for the enemy. Little wonder the observer field manual advised: "Don't look like a forward observer. Look like an infantry soldier."<sup>293</sup> A veteran of the 47<sup>th</sup> Armored Field Artillery, 5<sup>th</sup> Armored Division, expressed relief fifty years later: "I never had to serve as an FO for which I am most grateful; but, I had many friends who did draw that assignment and who did not survive."<sup>294</sup> Being the point man for the artillery carried a very high price.

In combat, forward observers readily won the praise for their ability to direct and mass their unit's fires to destroy the enemy. Before entering combat for the first time, one FO remarked that the relations between the artillery and infantry had been poor, but after the first battle "the doughboys found out how valuable the artillery can be to them

<sup>293</sup>U.S. War Department, FM 6-135, *Forward Observation*, 27. Cooper, *History of the 110<sup>th</sup> Field Artillery*, 117; Hardison, *Caissons Across Europe*, 120-21; Barker, *History of the 43<sup>d</sup> Division Artillery*, 90-91; Alfred A. Alvarez, "7<sup>th</sup> FA on D-Day at Omaha Beach: First to Fire," *FAJ* 7 (November-December 2001): 41; Two-Thirtieth Field Artillery Battalion, *On the Way*, 95-99; Ninety-Fourth Armored Field Artillery Battalion, *History of the Ninety-Fourth Armored Field Artillery Battalion* (n.p., n.d., 1945?), 17, 27,34; John E. Lynch, *History in Action: 118<sup>th</sup> Field Artillery. 3<sup>rd</sup> Infantry Division, 1942-1945*(1945; reprint, n.p.: Florida "Gator" Chapter, 1993). 38, 50-51; Three-Forty Fifth Field Artillery Battalion, *345<sup>th</sup> Field Artillery Battalion. 90<sup>th</sup> Infantry Division* (Munich: F. Bruckmann KG.. 1945), 36; Ernest M. Chamberlain, ed., *951<sup>st</sup> Field Artillery Battalion* (Giessen, Germany: Wilhelm Schmitz, 1945), 23-25.

<sup>294</sup>John Box, letter to author, 28 December 2001.

and after that, they were pretty much for us. We still weren't exactly palsy walsy, but the only doughboys who still looked at us out of the comers of their eyes were those who hadn't been through the mill.<sup>295</sup> Infantrymen of the 115<sup>th</sup> Infantry Regiment, 29<sup>th</sup> Infantry Division were so impressed by the valor and gallantry of their forward observer, Lieutenant John J. Polarine, killed while calling for fire during a combat patrol, that they conducted a raid for the specific purpose of recovering his body. While serving as a forward observer for the 1<sup>st</sup> Battalion, 358<sup>th</sup> Infantry Regiment, 90th Infantry, in the Lorraine Campaign, Lieutenant James R. Major earned praise from his infantry for directing accurate artillery fire that destroyed a German armor column that threatened the unit. After the battle, infantrymen remarked, "that lieutenant sure can shoot" and submitted his name for the Silver Star.<sup>296</sup> Second Lieutenant Clarence A. Sillman, assigned to an assault team of the 33<sup>rd</sup> Armored Regiment, received recognition for his work of adjusting a field artillery battalion's fire on enemy infantry and tanks within fifty yards of his own position. GIs, returning from the front passing a firing battery that had just supported their defense, climbed up on the self-propelled howitzers, and shook hands with the cannoneers. In combat, the power of the forward observer to call in timely and accurate fires gained the highest respect from infantrymen.<sup>297</sup>

European combat often involved the capture of small towns that dotted the roads across Europe. The 1<sup>st</sup> Battalion, 315<sup>th</sup> Infantry, 79<sup>th</sup> Infantry Division's capture of the

<sup>295</sup>Westrate, *Forward Observer*, 81-82.

<sup>296</sup>Major, *Memoirs of an Artillery Forward Observer*, 77.

<sup>297</sup>Cooper, *History of the 110<sup>th</sup> Field Artillery*, 114; Smyth, "Fighting the Nips," 532.

small Alsatian town of Kaltenhouse in December 1944 illustrated artillery close support at its best in an infantry attack on a town. A company of German infantry, supported with self-propelled guns, mortars, and artillery, defended Kaltenhouse. Drawing on both the close scrutiny of aerial photos and his experience with the enemy tactics of defending other towns, the artillery liaison officer, Captain Eugene Maurey, developed a flexible plan that targeted twenty possible enemy strong points with a variety of artillery effects: time, smoke, delayed fuzes, and concentrations. He also selected concentrations on the town's approaches to break up counterattacks. All targets would be on-call to ensure that he could alter the sequence of fires and shoot them when needed. Upon H-Hour when the infantry left the line of departure (LD), Maurey called for a smoke mission which screened the infantry as it approached the town, and then requested time fire – rounds exploding above the ground – on the forward edge of town to force the enemy to seek cover. Along with the time fire, Maurey requested fuze-delay fires – rounds burrowing into the ground then exploding to create holes – on the main intersection to immobilize enemy reinforcements. Upon the infantrymen's entry into the smoke screen, Maurey lifted the smoke and shifted heavy concentration fires on the flanks and roads of the village to prevent the enemy from escaping. While the direct support fires lifted and shifted, reinforcing fires from a 155-mm battalion fire targets put high explosives and smoke concentrations on potential enemy direct fire weapon locations from influencing the infantry mop-up of the village. For the attack, the infantry also had five medium tanks and four tank destroyers to assist in the mop up, and upon their movement, the artillery fired a smoke screen to conceal the armor movement from potential enemy anti-

tank gun fire. The 1<sup>st</sup> Battalion, 315<sup>th</sup> Infantry incurred only four light casualties in the capture of Kaltenhouse. After the mission, Maurey deemed that the, "The infantry-artillery team clicked!"<sup>298</sup>

The capture of Kaltenhouse represented a small-scale version of combined arms operations in Europe. The standard procedures used with the infantry, artillery, and armor in coordination with each other was a variation of the standard tactic of the American divisions fighting across Europe. Over a three-day period in late November 1944, the 117<sup>th</sup> Regiment, 30<sup>th</sup> Infantry Division attacked a succession of six German villages north of Aachen towards the Ruhr Valley. The regimental artillery liaison officer, Major R. W. Millican, in coordination with the artillery battalion liaison officers, placed one forward observer with the lead assault companies of the 2<sup>nd</sup> and 3<sup>rd</sup> infantry battalions. For artillery support, the liaison officer had the direct support fires of 118<sup>th</sup> Field Artillery Battalion (105-mm), supporting fires of the 70<sup>th</sup> Field Artillery Battalion (105-mm), and the additional fires of the 4.2-inch mortars, and an infantry cannon company. After consulting the infantry headquarters, Millican devised an artillery fire plan that included eighteen targets (concentrations and area targets) that hit known and suspected enemy positions and defensive fires for each objective after the infantry had captured them. He took his plan to the division artillery headquarters to request fires on targets his internal firing units could not support, and the 30<sup>th</sup> Infantry Division artillery headquarters asked XIX Corps Artillery Headquarters to support the attack. Still short

<sup>298</sup>Maurey, "Close Support at Kaltenhouse," 205-7.

artillery for some targets, Millican assigned these to the cannon companies and mortars. On the day of the attack, observers from static observation posts marked targets with red smoke to direct air strikes on two key objectives. During the three-day advance, battalions lifted and shifted fired in concert with infantry and armor movement. At the end of each day, the liaison officers and forward observers adjusted their fire plans, observer locations, and refined registration points with the firing units. When a company became pinned down by enemy fire, the forward observer called to the FDC and soon had all thirty-six 105-mm howitzers concentrating their fires on the enemy. During the capture of the one village, Warden, the attack had the "test of perfection" according to Millican: "DivArty neutralized the centers of Langweiler, Lurken, Kinzweiler, and St. Joris for 30 minutes. Our 105s covered Warden. Then infantry and tanks came fast, the tank machine guns spraying the near side of town. As the friendly troops approached our fire, "A" FO [forward observer from A Battery] would move it by saying, Move Cannon Co 200 yards deeper" or "Move 70<sup>th</sup> FA 200 yards northeast." As our troops entered Warden he fired both the 70<sup>th</sup> and 118<sup>th</sup> FA Bns on Boche beyond the town attempting to escape."<sup>299</sup> At the end of three days, the 117<sup>th</sup> Regiment had taken its assigned objectives, all through the combined support of infantry, armor, and artillery. Undoubtedly, a critical component of the success was a direct result of a well-executed artillery plan drawn up by the artillery liaison officers and executed by the forward observers.

<sup>299</sup>R. W. Millican and John Lynch, "Direct Support," *FAJ* 35 (April 1945): 199-201. 4<sup>th</sup> Division Artillery, Subject: Action Against Enemy, Reports After/After Action Report, 12 May 1945, Appendix No. 3,

American artillery employment in the Pacific Theater of Operations (PTO) encountered challenges not present in the European Theater. Nonetheless, senior Field Artillery officers in the Pacific stressed that the "established principles are sound, as to both employment and techniques of artillery fire."<sup>300</sup> Assessing the employment of artillery in the New Georgia Campaign, Brigadier Harold R. Barker, 43<sup>rd</sup> Infantry Division Artillery Commander, observed that "it was simply a case of using common sense and applying the basic principles to fit amphibious and jungle warfare."<sup>301</sup> The first challenge in amphibious warfare was to get soldiers, weapons, and supplies on shore. In the PTO, each landing site had its own obstacles to surmount: coral reefs, changing tides, rough surf, high swells, uncharted sandbars, and few serviceable piers. Beyond these obstacles, the artillerymen learned the fine art of loading and unloading various amphibious vehicles to get supplies, ammunition, and their guns on land using a wide assortment of amphibious vehicles, landing boats, and landing ships: DUKWs, AMTRACKs, LCTs, LSTs, and LSMs. After the infantry had secured the beachhead or island, the artillery sent bulldozers first ashore to create new road networks and clearings, then the artillery units disembarked to move their guns inland and establish firing positions. With the guns ready to fire, the liaison officer and forward observers began their job of supporting the infantry operations that spanned in scale from a platoon

Narrative Report. I April 1945, Item 2230, Reel 2132, 1, WDHD.

<sup>300</sup>Howard F. Haines, "Division Artillery in the Battle of New Georgia," *FAJ* 33 (November 1943): 846.

<sup>301</sup>Harold R. Barker, "Artillery Operations of the New Georgia Campaign," *FAJ* 34 (August 1944): 530.

patrol in the dense jungle to a division amphibious assault against a heavily defended island.<sup>302</sup>

The jungle and mountainous terrain of the Pacific island campaigns dictated modification and adoption to new tactics and techniques to defeat the Japanese. To penetrate the jungle canopy and thick vegetation, artillery battalions would use high angle fire – raising the gun tube over forty-five degrees to fire a round. In contrast to low angle fire, a round shot at high angle has a steeper angle of fall, almost perpendicular to the ground, which allowed the round to explode directly over the target or, with a time delayed fuze, to penetrate deeper into the ground and explode. High angle fire also allowed the artillery to "search" for the enemy targets in ravines or on sharp reverse slopes of hills and allowed a firing battery to occupy a smaller clearing because it did not have to worry about its rounds clearing the a high tree line in front of the gun. More effective in thick vegetation than low angle fire, high angle fire had disadvantages. Not stressed or taught thoroughly at the Field Artillery School, field artillery battalions had to learn the peculiarities of high angle fire in combat and its three major tactical deficiencies. First, it increased mission times because the gun crew needed to load the round at a low angle elevation, raise the tube, fire the round, and then lower the tube again to reload it. Secondly, a high angle fire mission reduced the accuracy of the round because it doubled the time of flight and introduced more probable errors in ballistics. With a greater chance of error, high angle fire missions prevented the forward observer

<sup>302</sup>O. M. Doerflinger and Parker M. Holt, "Amphibious 105s," *FAJ* 34 (January 1944): 57-58; Bernard S. Waterman, "Webfoot Artillery," *FAJ* 35 (July 1945): 387-90; Smyth, "Fighting the Nips," 529-30.

from adjusting on targets closer than 400 yards to friendly lines. Finally, high angle fire reduced a gun's range dramatically, and limited the infantry from conducting operations deeper into enemy territory and close to its frontlines.<sup>303</sup>

Being a forward observer on a small unit patrol in the jungle was an arduous assignment for a lieutenant and his team. Captain Robert F. Cocklin wrote in the September 1944 *Field Artillery Journal* that a forward observer should expect that he was "going to suffer a good deal of hardship on these patrols. He is going to be constantly wet, tired and under a nervous strain."<sup>304</sup> Combat patrols varied in duration from a few hours to a week. For a company patrol, a forward observer team could require up to six men to conduct the mission and carry spare radios and batteries. Sometimes, the artillery would provide the infantry company an additional team for support.<sup>305</sup>

Adding another level of difficulty for artillery observers in the Pacific was the thick jungle vegetation. Greatly reducing visibility, it was common for an observer team

<sup>303</sup>John F. Casey, "An Artillery Forward Observer on Guadalcanal," *FAJ* 33 (August 1943): 563-67; Gildart, "Artillery in the Bougainville Campaign," 89; Abbott H. Burns, "Principles of Observed High-Angle Fire," *FAJ* 34 (January 1944): 39; Fuller, "Liaison in the Jungle," 599. A high angle firing solution is the opposite of a low angle solution and exaggerates ballistic flight characteristics. In a low angle fire mission, the higher a gun crew raised the tube, the farther the round would go down range. At one point in raising the gun tube, exceeding 45 degrees or 800 mils, the round would start to move closer to the gun itself – high-angle fire. Another oddity of high angle fire is large amount of drift of the round. A rifled gun barrel (uniform right-hand twist) imparts spin on the round for flight stability and causes the round to move to the right when fired. To compensate for this drift, the crew aims their weapon slightly to the left of the target. The longer the range, the more to more round drift, and the more the crew must aim the weapon to the left to hit the target.

<sup>304</sup>Robert F. Cocklin, "Patrol Party," *FAJ* 34 (September 1944): 597.

<sup>305</sup>Barker, *History of the 43<sup>d</sup> Division Artillery*, 80, 90-91; Fuller, "Liaison in the Jungle," 597-99; Haines, "Division Artillery in the Battle of New Georgia," 847; Cocklin, "Bougainville – 1944," 34 *FAJ* (July 1944): 451-52; Cocklin, "Patrol Party," 596-97; Smyth, "Fighting the Nips," 531-33.

on the frontline to find itself fighting and repelling attacks along with their infantry. Consequently, artillery battalions conducted their own basic infantry patrol training for their teams to better prepare them. Thick vegetation also prevented the easy identification of unit boundaries and the frontline. Forward observers worked closely with each other, the infantry company commanders and platoon leaders, and the adjoining units when shooting missions and adjusting protective fire lines in front of their positions. Clearing fire missions demanded close coordination, and at times delayed mission requests, but was necessary to prevent fratricide.<sup>306</sup>

Often the thick terrain prevented effective observation from the ground and observation from trees only revealed more treetops.<sup>307</sup> The thick vegetation made it difficult for the infantry soldier to see even twenty-five yards in front of his position, and nearly impossible for the forward observer to see the impact of rounds on the jungle floor. To compensate for their inability to see, observers would mark the target with smoke rounds for aerial observers or fire a round that exploded well above the jungle

<sup>306</sup> Americal Division Artillery, Annex 7, Report of Operations, 31 May 1944; Item 1347, Reel 120, WDHD; Haines, "Division Artillery in the Battle of New Georgia," 846-47; Cocklin, "Bougainville - 1944," 451-52; Cocklin, "Patrol Party," 596-97; Smyth, "Fighting the Nips," 532-34; Fuller, "Liaison in the Jungle," 597-99; Barker, *History of the 43<sup>d</sup> Division Artillery*, 80, 90-91. Maintaining communications with higher headquarters was a difficult task in the Pacific Theater. The wet damp climate hampered the effectiveness of radios, not to mention maintenance of radios that used "dry-cell" batteries to operate. Wire between units was frequently strung overhead to avoid the wheeled and tracked vehicles from cutting wires. When wire was laid between islands, the tide action often cut wires on sharp coral reefs.

<sup>307</sup> The Japanese used trees as effective perches for their snipers. After having their men picked off by the Japanese snipers, the 43<sup>d</sup> Division Artillery resorted to a "fight fire with fire" solution. The Division Artillery commander, Harold R. Barker, explained: 'The most practical cure found for this menace was the command "Fire Mission All Battalions ... Fuze Quick Three Volleys." The fire order equated to all the division's forty-eight howitzers firing three rounds aimed at treetop level with their rounds exploding on contact. Barker commented, "After the first week of this type of treatment the Japs moved from the trees into the ground." Barker, *History of the 43<sup>d</sup> Division Artillery*, 63, 79.

floor to use as a reference point. Infantry commanders sometimes used the artillery to locate themselves on the map. After shooting the first round, the observer then "walked" the rounds towards his position until he "sensed" the estimated distance of the sound of the exploding round was two to three hundred yards from his location. The battalion FDC then plotted the location of the round on the map according to the calculated firing solution and reported the map coordinates to the observer. Using this plotted location, the observer then estimated his unit's position and used the point as a targeting reference point for future fire missions. Adjusting artillery fire by sound in the jungle was difficult. Shells exploding in trees, in the rain, soft earth, during the day and night all caused the sound to travel in different ways. One senior artillery officer stated that the sound of a explosion in the jungle "was often puzzling and unreliable, especially in heavily wooded, hilly terrain which can bounce the sound around or dampen it out."<sup>308</sup> Consequently, an observer had to be deliberate in his adjustments, and when possible, he enlisted the help of another observer to increase accuracy. With two observers, sound adjustment was inherently slow, but nonetheless, observers became proficient in hitting their targets.

<sup>308</sup>Pickett, "Up Front Down Under," 91. Haines, "Division Artillery in the Battle of New Georgia," 847; Barker, "Artillery Operations of the New Georgia Campaign," 534; Charles E. Brady, "Artillery Support of Foot Cavalry," *FAJ* 34 (August 1944): 537; 221<sup>st</sup> Field Artillery Battalion, Report of Operations, 3 January – 29 April 1944, Item 1348, Reel 120, 2, WDHD. Firing data computed to a target location is known as the "should hit" location. The actual location, if observable is known as the "did hit" location. Frequently, the observers used the aerial observer to locate a friendly unit or assess the effectiveness of artillery fire. American forward observers used sound adjustment in all theaters in the war. The 110<sup>th</sup> Field Artillery, 29<sup>th</sup> Infantry Division, used sound adjustment mission with appreciable success in the Normandy Campaign in the summer of 1944.

Island hopping and jungle fighting infantrymen valued their artillery forward observers. Finding their defensive positions under heavy Japanese mortar fire, unsure of their exact location, and their casualties mounting, a company from the 172<sup>nd</sup> Infantry Regiment found itself in a precarious situation. Unfazed by the chaos around him, Captain Robert S. Pine, 103<sup>rd</sup> Field Artillery Battalion, the artillery liaison officer, called down a concentration on a point about a hundred yards away, and adjusted then the artillery fire so close that "dirt was thrown on us in our foxholes." Pine's adjustment silenced the enemy mortars for most of the night. After his final adjustment, the 103<sup>rd</sup> Battalion FDC assigned the target as "Concentration 110." Afterwards, "Concentration 110" became a byword with the 172<sup>nd</sup> Regiment infantrymen, and upon getting into a "tight situation," they would demand "Give us Concentration 110." Pine had met the challenge of his battalion motto: "Play the Game," but more importantly, he had established within the infantryman's mind that his artillery could and did provide immediate and accurate close support.<sup>309</sup> Barker, the 43<sup>d</sup> Division Artillery commander, observed that during the New Georgia Campaign as the infantryman's confidence in and appreciation of the artillery increased as the artilleryman's appreciation of the challenges faced by the infantry "resulted in the formation of a 'Mutual Admiration Society' that paid dividends during the entire campaign."<sup>310</sup>

<sup>309</sup>Barker, *History of the 43<sup>d</sup> Division Artillery*, 68.

<sup>310</sup>Ibid., 108. Barker became 43<sup>d</sup> Division Artillery commander shortly after Operation Flintlock.

With few exceptions, U.S. Army amphibious assaults in the PTO began with massive air and naval bombardments. Although an impressive display of firepower, most of the enemy did survive these barrages and was often able to mount effective resistance to the assaulting American infantry. Once the naval and air support left, the field artillery remained to support the infantry in its efforts to reduce the Japanese strong defensive networks of interlaced bunkers, trenches, mines, and gun emplacements. The 8<sup>th</sup> Army operations during the Leyte-Samar operation in the Philippines, 26 December 1944 to 8 May 1945, illustrated the use of infantry-artillery tactics to reduce the enemy pockets of resistance while avoiding high casualty rates. In "mopping up" the last Japanese pockets of resistance in late February 1945, the 8<sup>th</sup> Army Command noted a "most noteworthy occurrence of the day" when it fired thirty-eight battalion concentrations on enemy machine gun positions and assembly areas. A critical lesson learned in this campaign, and no doubt learned much earlier in the New Guinea jungles, was the necessity to conduct aggressive and continuous combat patrols to keep the offensive initiative, eliminate the chance of a surprise counterattack, and render bypassed enemy units combat ineffective. For these patrols, the command noted that the "use of forward observers with patrols in order to coordinate artillery fire in support of missions assigned, proved very effective." During these operations, the forward observers only called for fire on known targets with "short, dense, concentrations." The command

"believed that the number of Japanese killed by our artillery fire greatly exceeded that destroyed by infantry action."<sup>311</sup>

The 7<sup>th</sup> Infantry Division's capture of the Kwajalein Atoll in the Marshall Islands in February 1944 was a highly successful amphibious operation and represents a good example of the fruition of Army amphibious warfare tactics.<sup>312</sup> After studying the lessons learned from the Marine attack on Tarawa, the division embarked to the Marshall Islands thoroughly trained and with a detailed battle plan. The 7<sup>th</sup> so valued the power of artillery close support in their operations that the leadership made special efforts to foster the infantry-artillery team. During the four-month training period before the Kwajalein operation, division headquarters directed that each infantry NCO receive instruction in infantry-artillery coordination and call for fire procedures. In the training exercises, the division leadership required that all infantry NCOs call artillery fire in support of platoon or company attacks and shoot artillery fire within two hundred yards of their front lines. The division commander's philosophy was to teach the "men to close up and take advantage of their artillery concentrations."<sup>313</sup>

<sup>311</sup>8<sup>th</sup> U.S. Army, *Report of the Commanding General Eighth U.S. Army on the Leyte-Samar Operation (Including Clearance of the Visayan Passages) 26 December 1944 – 8 May 1945* (67<sup>th</sup> Engineer Topographical Company, 1945), 14, 17, Pentagon Library, Washington D.C.

<sup>312</sup>The 7<sup>th</sup> conducted operations on twenty-seven islands within the Kwajalein Atoll of which twelve were occupied by the Japanese. Infantry-artillery operations on those islands mirrored those used on the main island of Kwajalein.

<sup>313</sup>Headquarters Seventh Infantry Division Artillery, Report of the 7<sup>th</sup> Division Participation in FLINTLOCK Operation, 8 February 1944, 2. Enclosure "A," Narrative of Events, 13 February 1944, 6-8; FLINTLOCK OPERATION – SOUTHERN FORCE ARTILLERY, 22 February 1944, 3, all found in Item 1340, Reel 116, WDHD. The division artillery underwent intensive training for the Kwajalein amphibious operations. The four 105-mm battalions trained with DUKWs for their landing transportation and as prime mover for the guns. Training included having three drivers for each DUKW, loading and unloading the

Before the attack on the main island of Kwajalein, division artillery reconnaissance parties, along with infantry support, established position areas for five artillery battalions on a small offshore island.<sup>314</sup> Once the guns got ashore, aerial observers conducted a registration on a division checkpoint on Kwajalein and the battalions fired harassing fires throughout the night. With the land-based artillery support registered and ready, the pre-landing barrage began at 0615, 1 February. The artillery preparation was a massive firepower display that represented a well-coordinated fire plan between the Army and the Navy. In addition to the division's five artillery battalions, the division's four 105-mm battalions and an attached 155-mm battalion, the Navy supported the effort with three battleships, four cruisers, eight destroyers, carrier based fighters and bombers, and land-based bombers.<sup>315</sup> For the main assault, the two

DUKW loading the DUKW in the stern of an LST, and a dress rehearsal landing on a strange beach. The attached 155-mm howitzer battalion, 145<sup>th</sup> Field Artillery, trained with LCMs, Landing Craft Material, to quickly disembark to get their guns ashore with M-5 tractors.

<sup>314</sup>Pickett, "Up Front Down Under," 92; Barker, "Artillery Operations of the New Georgia Campaign," 532-34; Bernard S. Waterman, "The Battle of Okinawa: An Artillery Angle," *FAJ* 35 (September 1945): 523. If available, artillery commanders in the Pacific Theater often used the adjacent small islands to position their artillery batteries. Once cleared of the enemy by the infantry, the isolated islands offered many advantages: did not require extensive road construction, simplified ammunition resupply from ship to shore avoiding long muddy jeep trails, and reduced landline communication problems associated with vehicular traffic and troop movements breaking landlines. The most important advantage was security. On a small island, a battery or battalion simplified its perimeter defense requirements with the use of small patrols and anti-tank gun units. With these security elements, the unit could mount an effective defense and conduct twenty-four hour operations in support of operations on the mainland without the interference of snipers and raiding parties. If forced to occupy on the main island, units reduced their operational footprint to lessen the security requirements of guarding a large position area. Instead of emplacing the battery's four guns in widely dispersed "W" or diamond formation to protect them from enemy counter fire, units positioned their guns in a straight line and parked the prime movers (trucks or tractors) close to the guns. Infantry divisions in the Pacific Theater simply did not have the luxury of assigning infantry units to protect artillery units.

<sup>315</sup>Barker, "Artillery Operations of the New Georgia Campaign," 531; Archibald V. Arnold, "Kwajalein Atoll – An Interim Report," *FAJ* 34 (September 1944): 595-96; Edmund G. Love, *The Hourglass: A History of the 7<sup>th</sup> Infantry Division in World War II* (Washington: Infantry Journal Press, 1950), 105-108;

infantry regiments each had a command artillery liaison team and each infantry battalions had an artillery liaison officer "boated for landing with the infantry battalion commander" and two FO parties per battalion. Additionally, each artillery battalion sent a liaison officer to the division artillery command post to ensure that all units had situational awareness to coordinate and control fires. In battle, the field artillery proved true to its training. Artillerymen on boats, on the beach, and in tanks, established observation posts to survey and call for fire on targets spotted across the entire island. Wire and radio teams established redundant communications links between infantry, armor, and artillery units to include laying communication cable between the islands. Accurate artillery preceded infantry assaults with FOs adjusting "nightly normal barrages," parallel to their infantry lines and "quickly neutralized" local enemy counterattacks trying to infiltrate friendly lines. The division commander, Major General Charles H. Corlett, remarked, "no appreciable counter-attacks were effected by the enemy because the artillery forward observer with each battalion could bring a

Headquarters Seventh Infantry Division, Enclosure "A," Narrative of Events, 13 February 1944, Item 1340, Reel 116, 1-6, WDHD. Major General Charles H. Corlett commanded the division from April 1943 until the end of the Kwajalein operation (February 1944). Major General Archibald V. Arnold, the Division Artillery Commander and writer of the journal article, commanded the 7<sup>th</sup> Infantry Division from February 1944 to September 1945. To maintain surprise and reduce the chances of neutralization by enemy artillery or aircraft, the division only registered one gun per battalion. One gun registration permitted a FDC to build observed firing charts for a corps, divisions, and battalions and still achieve accurate massing of all the guns. The firepower expended on the beach was not unlike the barrages of World War I. After ninety minutes of plastering the entire island of Kwajalein, the bombardment shifted and focused on the landing beaches until 0830. The artillery was lifted for a scheduled air strike that included: nine land-based heavy bombers, eighteen dive bombers, and fifteen torpedo bombers followed by strafing runs by Navy fighters. After the air strike, the artillery firing resumed at 0900 with the first waves of the assault battalions reaching shore at 0930. Even with this incredible expenditure of firepower, large numbers of Japanese did survive to put up a tenacious fight. The 7<sup>th</sup> Division commander did not declare Kwajalein Island secure until 4 February 1944.

concentration down at any point he desired day or night.<sup>316</sup> The excellent use of artillery by the 7<sup>th</sup> Infantry was not a coincident, but a calculated decision by the division commander to ensure his infantry units had overwhelming and timely artillery support to capture the Kwajalein Atoll. In his after-action report, the division artillery commander, and new incoming division commander after the battle, Archibald V. Arnold, concluded that "[L]iaison with the Infantry was superior."<sup>317</sup> The artillery forward observer had proven himself indispensable in the conduct of small and large-scale combat operations in the Pacific.

Artillery field manuals released during the war refined the Field Artillery School tactics and techniques with the lessons learned in combat. Released in February 1944, the revised Field Manual 6-20, *Field Artillery Tactical Employment*, confirmed that the efficiency of artillery fires to support the infantry depended "upon adequate control, close liaison with supported troops, and efficient communications and observation."<sup>318</sup> Upon H-hour, corps artillery units, as had their AEF predecessors, still targeted enemy communications, neutralized artillery, stymied enemy movement on the battlefield, and lifted and shifted their fires to destroy targets spotted by aerial observers and forward

<sup>316</sup> Headquarters Seventh Infantry Division Artillery, Report of the 7<sup>th</sup> Division Participation in FLINTLOCK Operation, 8 February 1944, Item 1340, Reel 116, 1-4, WDHD.

<sup>317</sup> Headquarters Seventh Infantry Division Artillery, Report of the 7<sup>th</sup> Division Participation in FLINTLOCK Operation, 8 February 1944, 1-2. FLINTLOCK OPERATION – SOUTHERN FORCE ARTILLERY, 22 February 1944, both found in Item 1340, Reel 116, 14, WDHD. The *Field Artillery Journal* published numerous articles concerning the 7<sup>th</sup> Infantry's Division's successful operations on Kwajalein Atoll in the Marshall Islands. Thomas Dransfield, "Selling Artillery Support to the Infantry," *FAJ* 34 (June 1944): 385.

<sup>318</sup> U.S. War Department, FM 6-20, 1944 *Field Artillery Tactical Employment*. 1.

observation posts. The dramatic change for the Field Artillery in World War II was the divisional direct support artillery. Undoubtedly, the fire planning coordination between the artillery liaison officer and the infantry battalion commander was a boon for close support, but it was the forward observer moving with each maneuver company that allowed the Field Artillery to solve the World War I problem of unresponsive support. Connected with a reliable communication system to the FDC and located with the frontline unit, the forward observer was able to support the infantry with timely and accurate close support fires. The artillery tactic of massive preparatory fires followed by concentrations along the infantry axis of attack now worked because the infantry now had a field artillery representative with them, the forward observer. The forward observer could change and redirect fires at a moment's notice to support his unit and enabled the division artillery to fulfill the mission statement found in the wartime edition of *Field Artillery Tactics and Technique*: "to furnish close and continuous fire support by neutralizing or destroying those targets which threaten the success of the supported infantry."<sup>319</sup>

Throughout the interwar period, infantry and artillery officers mutually agreed that the close support procedures in World War I were inadequate and improvements necessary. Glaring deficiencies in the artillery liaison system aside, both branches accepted the slightly improved close support solution that was merely an step up of an

<sup>319</sup>U.S. War Department, FM 6-100, *Field Artillery Tactics and Technique of Division Artillery and Higher Artillery Echelons* (Washington: GPO, 24 May 1944), 1. Barker, *43<sup>d</sup> Division Artillery*, 80; Haines, "Division Artillery in the Battle of New Georgia," 849; General Board, Study No. 61, *Report on Study of Field Artillery Operations*, 107-108.

AEF organization until the Field Artillery School began implementing the battalion FDC. Believing that the Field Artillery liaison team's technique had not substantially changed since the war, the Infantry remained tied to the immediate postwar solution for continuous close fire support and adopted the infantry version of the accompanying gun – the howitzer company. Deeming the accompanying gun as robbing the division artillery commander of fire power and viewing inadequate artillery fires as larger problem than just supporting the infantry, the Field Artillery selected a different approach, a technical answer – an observer directly connected to the battalion FDC using improved techniques and technology. By itself, the FDC was an artillery organizational improvement that enabled the massing of fires and improved fire mission accuracy and timeliness, but fell short in completely solving the close support problem. With the observer and liaison officer, the artillery connection with the infantry commander, remaining at the same locations of their AEF counterparts, reliable close support remained unachievable. Only upon its entry into combat, did the infantry demand that the artillery permanently put forward observers *with* frontline troops rather than the interwar regulatory guidance of just in "certain situations."<sup>320</sup> The simple decision of moving the battery observer from his hilltop overlooking the battle to integrating him within frontline companies marked the beginning of the modern artillery fire support team and enabled the American army to capitalize on the capabilities of the FDC. Directing timely, accurate, and massive artillery fires for the infantry, the forward

<sup>320</sup>U.S. Field Artillery School, 1938 *Tactical Employment of Field Artillery*, 56.

observer was a major reason for the triumph of the American artillery, thus the U.S. Army in World War II.

## CHAPTER VI

### THE FLYING OP: FROM KITTYHAWK TO POST FIELD

*Mission of the Air Service. – The mission of the Air Service is to assist the groundforces to gain strategical and tactical success by destroying enemy aviation, attacking enemy groundforces and other enemy objectives on land or sea, and in conjunction with other agencies to protect groundforces from hostile aerial observation. In addition it furnishes aerial observation for information and for artillery fire, and also provides messenger service and transportation for special personnel.*

*Fundamental Principles for the Employment of the Air Service*  
26 January 1926<sup>321</sup>

Within the first decade of its introduction, the American Field Artillery community agreed that the airplane could serve as a flying "OP."<sup>322</sup> Using airplanes as elevated observation posts to call for and adjust artillery fires was not a new idea for the American field artillery of the 1920's and 1930's. Beginning with balloon observers in the American Civil War, the U.S. Army also used aerial observers for reconnaissance and artillery observation in the Spanish-American War, the Mexican Border Punitive Expedition, and World War I.<sup>323</sup> After 1912 the Signal Corps and Field Artillery

<sup>321</sup>U.S. War Department, TR 440-15, *Air Service, Fundamental Principles for the Employment of the Air Service* (Washington: GPO, 26 January 1926), 1.

<sup>322</sup>OP stands for an observation post. For the majority of the interwar period, the Field Artillery classified the OP as a point to conduct and observe artillery firing into two types: aerial and terrestrial. A terrestrial point could be near the firing battery or near the target. School texts noted, "It may be merely a point on top of a hill occupied by a single observer equipped with field glasses, or it may be a solidly constructed shelter occupied by several observers, protected from shell fire, containing numerous observing instruments and plotting boards, and with a complete communication system connecting it with the unit or units which it serves." General Service Schools, 1927 *Tactics and Technique of Field Artillery*, 140-41. Robert M. Danford to Eugene A. Salet, 28 April 1967, Robert M. Danford Papers, MHI.

<sup>323</sup>Jack Coggins, *Arms and Equipment of the Civil War* (Garden City, N. Y.: Doubleday and Company, 1962), 109-10; David F. Trask, *The War with Spain in 1898* (New York: Macmillan Publishing Co., Inc.,

experimented with airplane artillery observers until American entry into World War I. During the war, it was the AEF's aerial observation experience that led to a tumultuous Air Corps and Field Artillery feud over who should own and train aerial observers.

From the earliest years of manned flight, field artillerymen embraced aerial observation despite its problems with the emerging technologies of aviation and radio. Field Artillery leaders campaigned ardently to have their own airplanes and observers – a campaign that would last more than twenty years. The addition of pilots and airplanes directly assigned to an artillery battalion for aerial artillery observation is a different story than that of the adoption of the FDC or the campaign to replace the horse. In its interwar attempt to improve its tactical efficiency, the Field Artillery fought against another Army branch for the ownership of the observation pilots and airplanes.

The U.S. Army's purchase of a Wright Brothers' airplane in the summer of 1909 marked the beginning of Army aviation.<sup>324</sup> Falling under the leadership of the Signal Corps, the establishment of an aviation section prompted American military theorists to contemplate how the airplane would revolutionize warfare. Despite a few aviation enthusiasts who theorized about bombers and pursuit airplanes, the 1910 and 1914 *Army*

1981), 239-40; Frank E. Vandiver. *Black Jack: The Life and Times of John J. Pershing*, 2 vols. (College Station: Texas A&M University Press, 1977), 2:622-24; Maurer Maurer, ed.. *The U.S. Air Service in World War I, Final Report of the Chief of Air Service, AEF. A Tactical History of the Air Service, AEF*, 4 vols. (Washington: GPO, 1978), 1:137-42.

<sup>324</sup>Rebecca R. Raines, *Getting the Message Through: A Branch History of the U.S. Army Signal Corps* (Washington: GPO, 1996), 131.

*Field Service Regulations* relegated this emerging technology to service as reconnaissance platforms to find and track the enemy.<sup>325</sup>

Army officers believed the airplane was superior to balloons and dirigibles for artillery spotting. Indeed, with the emergence of another technological infant, the radio, the Signal Corps combined its two nascent technologies for unit maneuvers in Connecticut in August 1912. Emboldened with the success of its radio-equipped airplanes, the Signal Corps began testing its pilots to locate and adjust artillery fire on targets at Fort Riley, Kansas, in November.<sup>326</sup> The Signal Corps and the Field Artillery recognized immediately the aerial observer's primary problem: communicating between the aircraft and the artillery firing unit. Using a variety of methods during the tests at Fort Riley, the Chief of the Signal Corps reported that the most successful means was using the airplane's one-way transmitter radio with artillerymen replying with panel code. With the transmitter, testers discovered that it was not necessary for the airplane to "remain in special position with reference to the battery as the aeroplanes can observe the effects of fire from front, rear, or either flank, and communicate with the battery

<sup>325</sup>F. E. Humphreys, "The Wright Flyer and its Possible Uses in War." *JUSA* 33 (March-April 1910): 144-47; Robert F. Futrell, *Ideas, Concepts, Doctrine: Basic Thinking in the United States Air Force, 1907-1960*, 2 vols. (Maxwell Air Force Base, Ala.: Air University Press, 1989), 1:16-17.

<sup>326</sup>One of the Army's first aerial artillery observers and pilots was Henry Harley "Hap" Arnold who became the General of the United States Army Air Forces in World War II. Arnold graduated from West Point with the Class of 1907 and was commissioned as an Infantry lieutenant. He transferred to the Aviation Section, Signal Corps, in 1911. In World War II, Arnold commanded an American air force of over 2,400,000 men and women and 83,000 airplanes. Henry Harley Arnold, General Officer Files, CMH.

without difficulty."<sup>327</sup> Other acceptable methods included smoke signals and dropping a colored card weighted with iron nuts for mounted messengers.<sup>328</sup>

In July 1915, the 1<sup>st</sup> Aero Squadron under command of First Lieutenant Benjamin D. Foulois moved to Fort Sill to work with the School of Fire. The squadron's arrival at the artillery training camp confirmed the Army's view that aviation was a primary platform for reconnaissance and observing fire missions. Foulois and his pilots made little progress in aerial observation for two weeks after the squadron's arrival, one section was sent to join John J. Pershing's Punitive Expedition against Mexican bandits. The remaining section was so plagued with mechanical problems that Foulois grounded his planes for six weeks until he received replacement parts. Eventually, the section completed its artillery-airplane experiments and left Fort Sill in November 1915.<sup>329</sup> The 1<sup>st</sup> Aero Squadron's departure marked the end of aerial artillery observation until the Army's entry into World War I.

Although Americans introduced the world to aviation in 1903, it was the Europeans, desiring to break the deadlock of trench lines, who advanced the methods of aerial observation. Reflecting the rapid advances belligerents made in aviation

<sup>327</sup>U.S. War Department, *Annual Report 1913*, 4 vols. (Washington: GPO, 1914), 1:781, 788. Henry H. Arnold, *Global Mission* (New York: Harper and Brothers, Publishers, 1949), 41. The Signal Corps had not yet developed a receiving set for airplanes. The Chief of the Signal Corps 1913 Report stated: "So far no successful method of receiving messages in the aeroplane itself has been devised. Fortunately, however, but little use for reception of signals is needed, the prime requisite being to send messages from the aeroplane." *1913 War Dept. Annual Report*, 1:799.

<sup>328</sup>*1913 War Dept. Annual Report*, 1:781.

<sup>329</sup>Benjamin D. Foulois, *From the Wright Brothers to the Astronauts: The Memoirs of Major General Benjamin D. Foulois* (New York: McGraw-Hill Book Company, 1968), 120-21; U.S. War Department, *Annual Report 1915*, 3 vols. (Washington: GPO, 1915), 1:744; Futrell, *Ideas, Concepts, Doctrine*, 1:19.

technology, an anonymous writer in the *Field Artillery Journal* discerned that the wartime aviation mission was divided into four tactical functions: artillery observation, reconnaissance, fighting, and bombing. Europeans had learned to use, observe, and direct an improved air-ground communication system. The writer argued that the European experience showed that each field artillery regiment should have its own organic aviation section: an ideal that would be the source of conflict between American artillermen and aviators for the next quarter century.<sup>330</sup>

Despite the rapid advances in aviation technology and tactics developed in Europe, American aerial artillery techniques and organizational structure remained almost unchanged. The Field Artillery's 1916 *Provisional Drill and Service Regulations* provided little guidance on aerial observation except to say that the battery commander could use captive balloons and mobile aircraft as auxiliary stations to assist in the adjustment of fire. Moreover, the means for effectively communicating between the observer and the battery had not improved since the 1912 Fort Riley experiments. The regulations stated that a radio transmitter worked best, and that without radios, the observer should drop messages to the ground, use a high-pitched hom at short distances, fire a Very pistol with assorted flare colors, and finally, like a skywriter, create dots, dashes, or streamers of black powder. Again, as with Army's first experience at Fort

<sup>330</sup>"Aviation and Its Employment with the Field Artillery," *FAJ* 5 (July-September 1915): 528-30.

Riley, artillery soldiers relied on signal panels to communicate with the aerial observer.<sup>331</sup>

American artillery aerial observation during World War I followed the same general pattern as other War Department programs initiated to transform its army into a modern force. The War Department issued ambitious plans that created chaos throughout 1917. By early 1918, newly established Army bureaucracies instituted marginally adequate training camps, including flying schools and artillery camps. These stateside camps produced poorly trained soldiers and units, which were then sent to France. If fortunate, these soldiers and units then received more advanced training at AEF schools. After units had completed advanced training, or in some cases retraining, the AEF General Headquarters would send them to a quiet sector on the front to "season" them for a few weeks before assignment to a primary task or mission. Throughout this process, Army leadership, especially AEF commanding General Pershing, claimed they were maintaining an American tactical and doctrinal independence from the Allied emphasis on trench warfare. However, given the realities of scant equipment, competent trainers, and few training facilities, AEF units would often adopt Allied methods completely.<sup>332</sup>

<sup>331</sup>Captive balloon communication was done through telephone wires. *1916 Field Artillery Drill and Service Regulations*, 3:77, 85.

<sup>332</sup>AEF observation units also included balloon companies. The problems of training and using balloon units as artillery OP's are similar to airplane observers. Moored to the ground and with an installed telephone, balloons provided a reliable observation system for the artillery. The AEF immediately sent the first four balloon companies that arrived in France to the Artillery Training Centers in December 1917 to work directly with artillerymen. In fact, the 1<sup>st</sup> and 2<sup>nd</sup> Balloon companies were the first organized Air Service units to operate with American troops in April 1918. At the Armistice, the AEF had thirty-five balloon companies and had, according to General Mason M. Patrick, Chief of Air Service, AEF, fired at

In July 1917, three months after Congress declared war upon Germany, the Signal Corps Chief recommended that a "School for Aerial Observers should be located at Fort Sill and work in conjunction with the School of Fire."<sup>333</sup> The opening of the observer school was not the only one to occur at Fort Sill. That same month, the War Department directed that the Field Artillery's School of Fire reopen its doors that it had closed in 1915 when the student soldiers and equipment were dispatched to the Texas-Mexico border. Artillery students arriving that July, along with the incoming School Commandant Colonel William J. Snow, found that the School of Fire had few instructors, two rounds of ammunition, no guns to fire, and no airplanes or instructors for artillery observation training. The Signal Corps and the War Department's desire for the establishment of an aerial school at Fort Sill was in response to an AEF communique to establish such training schools, but, it was not Snow's top priority. The commandant realized that aerial observation represented just one of many directives and problems that he and his handful of officers must address in order to establish an artillery school that could effectively receive, house, train, and graduate thousands of officers and soldiers for a growing mass army.<sup>334</sup>

939 artillery targets with the enemy making 98 attacks against the balloons - 48 balloons lost in combat. Harry A. Toulmin, *Air Service American Expeditionary Force, 1918* (New York: D. Van Nostrand Company, 1927), 273-75.

<sup>333</sup>Memorandum for the Chief of Staff, Subject: School for Aerial Observers, dated 7 July 1917, War College Division (hereafter WCD) 9003-12, Establishment of a School for Aerial Observers at Fort Sill, Oklahoma, War Department General Staff, 7 July 1917, File 13472, Box 142, E 304, RG 165, NARA.

<sup>334</sup>Snow, *Signposts of Experience*, 143, 158; Report, # SWC.46-1, 26 July 1917, USAWW, 1:66.

Without an established curriculum, Snow realized that the School of Fire would fail and consequently submitted a training plan to the War Department. In September, he received War Department approval for his plan, but soon left the school to command an artillery training camp at Fort Jackson, South Carolina. Briefly commanding the camp, Snow transferred to Washington, D.C., was promoted to brigadier general and became the first Chief of Field Artillery on 15 February 1918. He discovered that six months after implementing his training plan at the Field Artillery School that the Air Service and Field Artillery had still not resolved the problem of training aerial observers. The disagreement between the two branches centered on the observer's branch affiliation. To alleviate this interbranch argument and provide trained aerial observers, Snow made an agreement with the Air Service that upon graduation the officers would remain in the Field Artillery, but be attached to the Air Service. He then arranged that the Field Artillery School and Air Service jointly establish a seven-week course for artillery officers and flying cadets. Upon graduating, the cadets would receive Air Service commissions, and as previously agreed, the Field Artillery officers would retain their artillery commissions. Finally, on 25 August 1918, the first joint class entered the School for Aerial Observers and began training. The quality of this training program was questionable. Upon arriving in France, the *AEF* Air Service sent the observers to another five-week aerial observer training course. The requirement reflected the *AEF*

leadership's belief that stateside-educated students needed complete retraining.<sup>335</sup>

The Air Service efforts to train observers in France were a mirror reflection of the problems it experienced stateside. Establishing an effective aerial observers school in France was one of many issues that overwhelmed the branch as it attempted to build itself into an effective combat arm. Though French aviators trained artillerymen in artillery observation at the artillery camp at Valdahon in the fall of 1917, the AEF did not establish its own school until well into the war. In fact, the first organized and trained squadron did not fly its first combat missions for AEF units until July 1918. One culprit was the organization itself. Not until 16 January 1918 was the AEF Air Service able to send the first group of aerial observers to its own school at Tours.<sup>336</sup>

The AEF aerial observer program contemplated providing Pershing with 350 observers by 1 July 1918, and with six to seven hundred observers by 1 January 1919. By August, the expansion of the ground army required that the Air Service make urgent calls to the United States to fill hundreds more school positions. To meet the demand, the AEF Air Service expanded its aerial school from fifty observers every two months to seventy observers every ten days.<sup>337</sup> Naturally, the Air Service sought potential

<sup>335</sup>Memorandum for the Chief of Staff, Subject: Aerial observers, 6 December 1917, WCD 9003-18, Box 142, E 304, RG 165, NARA; Snow, *Signposts of Experience*, 152, 158; Sunderland, *History of the Field Artillery School*, 54, 68; Toulmin, *Air Service*, 289.

<sup>336</sup>Toulmin, *Air Service*, 273-75.

<sup>337</sup>At the end of October 1918, the Aerial Observation School at Post Field had the ability to train 315 students. Pilots trained for four weeks, while observers had a five-week course. The Air Service also conducted aerial observation training at Call Field, Wichita Falls, Texas, and Langley Field, Hampton, Virginia. U.S. War Department, *The Signal Corps and Air Service: A Study of Their Expansion in the United States, 1917-1918* (Washington: GPO, 1922), 125.

candidates from the Field Artillery, which further fueled their debate over the branch affiliation of the graduates. After month-long negotiations, the Chief of Field Artillery agreed to send a number of artillery officers to fill the school vacancies for temporary duty with the Air Service. However, in August, the Air Chief cemented these officers to the Air Service through the publication of War Department General Order 63:

Upon successful completion of their training in the Air Service Schools, aerial observers shall receive official rating as observers, and be recommissioned in the Air Service in the same grades that they held in their own branches. Observers are thus placed on footing of absolute equality with other officers of the Air Service as regards command, promotion and pay. The observer personnel now attached to the Air Service shall be given opportunity to transfer to the Air Service. In case any elect to remain in their original arms, these officers shall continue to serve with the Air Service until such time as they can be replaced by Air Service personnel, and none of them shall be returned to his arm except on application approved by the C. A. S.<sup>338</sup>

Though the two branches worked together for only a short time during the war, artillery commanding officers from regimental to army level blasted the Air Service for its inability to conduct effective aerial observation missions in combat. No doubt artillermen viewed the Air Service as the sole cause for the poor tactical relationship. The primary AEF study on artillery, the Hero Board, captured their criticism of the aviators. As Colonel Albert Cox, 113th Field Artillery commander, recalled, "aerial observation so far as our experience goes, has been a failure. On every front the regiment has been engaged, the radio sets have at all times have been employed and panels displayed for days at a time, with but slight if any attention paid by the air

<sup>338</sup>Final Report of Chief of Air Service, AEF, General Headquarters, Bulletin No. 64, 28 August 1918, *USA WW*, 17:98-99.

service.<sup>339</sup> Another regimental commander asserted, "the work of our aerial observers as far as this regiment was concerned, was practically nil. The regiment received no assistance from the aviators, nor any information that was of any value."<sup>340</sup> Second Army Artillery Commander Brigadier General Dwight E. Aultman asserted that the Air Service relegated reconnaissance planes to a secondary place and denied them escort protection. To Aultman, "Battles are won on the ground, and the Air Service performs its functions best when it provides the troops, and more especially the artillery, with the information that will enable the troops to successfully operate against the enemy."<sup>341</sup>

The Hero Board cited five faults with aerial observation, none of them attributable to the Field Artillery: "(a) Lack of control by the artillery over the observers; (b) Imperfect liaison, due to distant fields and constantly changing aviation personnel; (c) Lack of artillery training on the part of observers; (d) Lack of discipline in the Air Service, which resulted in absolute undependability for results obtained; and (e) Observation planes being relegated to secondary place and being frequently obliged to perform their functions without necessary protection of battle planes."<sup>342</sup> For the majority of artillery commanders, only one solution would solve this problem – that observers be artillerymen and that they and their aircraft be assigned permanently to a field artillery unit. They reasoned that only an artilleryman understood gunnery and,

<sup>339</sup>*Hero Board*, 664.

<sup>340</sup>Ibid., 665.

<sup>341</sup>Ibid., 662.

<sup>342</sup>Ibid., 15.

moreover, if the observer was an artilleryman, then that officer had to answer to an artillery commander and could not treat his work as a diversion. The Field Artillery community would use the Hero Board's arguments throughout the 1920's and 1930's.

From the Air Service's perspective, the reasons for failure in poor artillery adjustments with aerial observers in the war were centered on two primary communication problems: one, the use of inferior radios; and two, a "lack of mutual understanding between the air service and the artillery."<sup>343</sup> Technology solved the first problem by 1941, but the second problem remained unresolved. As shown in a 1920 Leavenworth textbook, the Air Service and Field Artillery did not appreciate each others' work nor trust each other.<sup>344</sup> The Air Service placed the responsibility for the poor communications between air and ground forces upon the ground forces. A 1928 school text asserted that "During the World War, our line troops, if trained at all in the use of Observation Air Service, were so incompletely trained that the full value of this branch of aviation was never [sic] exploited."<sup>345</sup> Though ground and air forces had progressed in their joint training since the war, the school text explained that there was "still room for great improvement. And, it behooves every Air Corps officer to use his utmost to sell Observation Aviation to the ground troops."<sup>346</sup>

<sup>343</sup>Earl L. Naiden, *Air Service* (Fort Leavenworth, Kans.: General Service Schools Press, 1920), 59.

<sup>344</sup>Ibid.. 15.

<sup>345</sup>U.S Army Air Corps Advanced Flying School, *Observation* (Kelly Field, Tex.: Air Corps Advanced Flying School, 1928), 21.

<sup>346</sup>Air Corps School, *Observation*, 21. The Air Service became the Air Corps on 2 July 1926 when Congress passed the Air Corps Act of 1926. After World War I, many Air Service Officers, most notably General William Mitchell, argued for an independent branch. Other officers, such as Chief of Staff

The artillery-air service argument did not center on the need for qualified observers, for both branches realized the need for individuals who could accurately adjust fire from an airplane, but upon ownership of the observers. If the aerial observer's mission was successfully accomplished, then the fight over whether the officer was commissioned in the Field Artillery or Air Service seemed irrelevant. However, both branches considered the observer's insignia to be vital, for each branch believed that the observer's loyalty would lie with his branch. The Air Service reasoned that only an officer officially belonging to the aviation branch would know and understand airplane and aerial observation. On the other hand, the Field Artillery community, especially its branch chief, asserted that only an artillery officer, trained in the techniques of adjusting indirect fire, could possibly provide efficient calls for fire.

In spite of the Field Artillery's plausible reasoning for its own organic air, the Air Service achieved its goal in the closing days of the war. On 30 October 1918, the War Department issued General Order 98, stating that: "All graduates of schools of aerial observation will be commissioned in the Air Service. All officers now serving as aerial observers will be recommissioned in the Air Service in their corresponding grades but

General John J. Pershing, thought that an independent air force could not win a battle by itself against a ground force. Pershing argued that the Air Service was an essential arm of the Army, just like the Infantry, Cavalry, and Artillery, and therefore it must be commanded and trained as such. After much national debate between the proponents and opponents of a unified and independent air force. Congress chose to settle the issue by following the recommendations of the Morrow Board. Established by President Calvin Coolidge, the Morrow Board convened to determine the best means for the use of air power in national defense and recommended that the Air Service legally change its name to Air Corps and have special representation on the General Staff. United States Air Force Historical Division, *The Development of Air Doctrine in the Army Air Arm, 1917-1941* (Gunter Air Force Base, Ala.: Air University, 1955), 20-29.

will be give the option of returning to their branch of the service."<sup>347</sup> From this point until the introduction of the organic field artillery airplanes in June 1942, the relationship between Field Artillery and the Air Service (later the Air Corps) would remain strained. Each branch had a separate vision of what constituted efficient aerial observer support. For the Field Artillery, the War Department decision was unsatisfactory. Artillerymen would seek to reverse the decision for they could not accept the idea that their branch was now a designated customer of an aviation branch focused on interception and bombing.

Not wasting any time to correct deficiencies identified by the Hero Board, Chief of Field Artillery Snow wrote to the Director of the War Plans Divisions on 5 March 1919 that "The fact is recognized universally and the belief is general that in the present war this element [aerial observation] was not developed to its maximum or even a reasonable efficiency."<sup>348</sup> He made three recommendations: first, aerial observers should be competent artillery officers; secondly, specific Air Service units should be organized as artillery observation sections; thirdly, Field Artillery officers should be detailed for extended tours of duty with the Air Service as observers; and finally, in peacetime, officers exchanged to the Air Service should be lieutenants. Snow also set forth his branch's policy on aerial observation training. He required that future Field Artillery officers, without regard to rank, would undergo aerial observation training as an

<sup>347</sup>U.S. War Department, General Order No. 98, *General Orders and Bulletins*, 1918 (Washington: GPO, 1919). 1.

<sup>348</sup>Memorandum for Director War Plans Division from Chief of Field Artillery, Subject: Artillery Aerial Observers, 5 March 1919, File #21 I-A-4, Box 11, E 34, RG 177. NARA.

integral part of their branch's "Conduct of Fire." Knowing the Air Service's limited school allocations and that all his artillery officers could not be selected to undergo Air Service School training as artillery observers, the branch chief stipulated that all his officers should be competent in an emergency to conduct fire from airplanes and balloons with the same skill as they directed fire from a ground observation post. Thus, Snow created a requirement to expand artillery observation training, an expansion to be filled by his School of Fire.<sup>349</sup>

The Air Service staff agreed with Snow's recommendations, but questioned the value of completing a full study of the aerial artillery observation because of the uncertainty about how congressional mandates would restructure the postwar Army. Not completely dismissing Snow's proposal, the Air Service indicated that it planned "to have one of its largest training stations at Post Field, Fort Sill, Oklahoma, where this work will be carried on and where we shall endeavor to meet the wishes of the Chief of Field Artillery to the fullest extent with respect to training his officers in the work in question."<sup>350</sup>

Snow waited six months for a study on the aerial observation problem. On 29 September 1919 the War Department appointed Air Service Colonel James Prentice to form a board at Fort Sill to examine, test, and recommend procedures to train officers to become the "Battery Commander in the air." Besides Prentice, the board consisted of

<sup>349</sup>Ibid.

<sup>350</sup>Memorandum for Director War Plans Division from Air Service Section, Subject: Training of Artillery Aerial Observers, 15 March 1919, File #211-A-2, Box 11, E 34, RG 177, NARA.

one Coast Artillery colonel, two Field Artillery lieutenant colonels, an Air Service lieutenant colonel, and a Signal Corps captain as its recorder. Board members first interviewed instructors from the School of Fire. Mirroring the Hero Board's responses, the Field Artillery officers replied that the individual observing artillery fires should be an artilleryman. Perhaps tempering their comments because Prentice was an Air Service officer, the artillery instructors stated that the Air Service should operate the aircraft (balloons and airplanes). Major Augustine McIntyre, member of the Field Artillery Board and an instructor at the School of Fire, reflected the general tone when he declared "Artillery men should be graduates of Camp Taylor School, and graduates of the school here (Fort Sill) before being sent to the Air Service for instruction. The Air Service should do instruction in airplanes, but the Artillery should do all theoretical observation training before being sent to the Air Service. This Field (Fort Sill) should be used to train the Artillery observers. It will take one-fourth the time to train observers who do not know artillery."<sup>351</sup> McIntyre's comments reflected that the artillery community realized that the possibility of having its own airplanes in the postwar army was remote. Therefore, the branch's next best option lay in the expectation that it could put its own officers in the cockpit to call artillery missions.

The board continued its work by conducting aerial observation firing problems from airplanes and balloons at various posts around the country to include Fort Bliss, Texas; Langley Field, Virginia; and the Balloon School at Arcadia, California. Echoing

<sup>351</sup>Proceedings of the Board, 29 October 1919, File #21 l-A-5, Box 11, E 34, RG 177, NARA. Camp Zachary Taylor, Kentucky, was an introductory school for newly commissioned Field Artillery lieutenants.

the Hero Board's results published a year earlier, the air observation board published its findings: "The Board finds that as a result of experience gained in the war, in battle and in active cooperation with Air Service at Field Artillery Firing Centers, the methods of liaison between Air Service and Artillery in the present system of adjusting fire are inadequate; that the system [sic] of fire adjustment now in use consumes a large amount of time under critical circumstances; and the results obtained, due to the insufficient training and experience of aerial observers in far from uniform, and that the battery commanders do not obtain maximum benefit from cooperation with the Air Service."<sup>352</sup>

The board identified obvious solutions to correcting deficiencies such as establishing and increasing efficient communications between the observer and the ground through better equipment and training. Still reflecting the Field Artillery doctrine and training regulations that the battery commander controlled his unit's fires, the board suggested that it might be advantageous to shift control of fire from the battery commander to the observer. Whether the observer controlled the fires or merely reported adjustments, the board believed that the observer had to know about artillery gunnery. It recommended that the U.S. Army establish an observer school immediately to correct the aerial observation problem and that it authorize a position with distinction – the Aerial Battery Commander (ABC). Not actually a commander of an artillery battery, the

<sup>352</sup>Findings of the Board, 3 December 1919, File #21 l-A-5. Proceedings of the Board, 29 October 1919, File #21 l-A-5, both found in Box 11. E 34, RG 177, NARA.

position reflected the board's desire to signify the importance of the aerial observer for both the Air Service and the Field Artillery.<sup>353</sup>

Throughout their final recommendations, the board stressed that the ABC could be either an Air Service officer or an artillery officer (Field or Coast). Trying to heal the rift between the Field Artillery and the Air Service, the board urged that after an officer attended his branch's school, he should then attend the other branches' school to complete his training, but "his commission should remain unchanged after qualification, except under the usual conditions of mutual transfer or detail."<sup>354</sup> Like most divisive issues settled by a joint committee, the board report was a polite compromise that only provided a superficial solution to the artillery's demand for responsive support. At no time did the board try to tackle the difficult issue of creating a system in which the Field Artillery could expect dedicated and responsive observation. For it did not matter if the observer was a well-trained artilleryman or not, it was the organization that controlled the aircraft that determined if the artillery received adequate aerial observation. Thus the board stepped around the issue of ownership of observer and plane. Each branch believed that the only acceptable solution was outright ownership of both. Despite its advocacy of the ABC position, the board, chaired by a senior Air Service officer, ensured

<sup>353</sup>Findings of the Board, 3 December 1919, File #21 l-A-5, Box 11, E 34, RG 177, NARA.

<sup>354</sup>Recommendations of the Board, 3 December 1919, File #21 l-A-5, Box 11 E 34 RG 177, NARA. The observer's branch affiliation debate remained a primary concern for the Chief of Field Artillery Office. The chief's executive officer, Colonel R. E. Lee, wrote: "It is desired that the Field Artillery Officers trained as observers remain officers of Field Artillery and that they be returned to Field Artillery duty at the completion of the Observers' Course. Their Air Service Training can be continued by requiring them to fly as observers during artillery maneuvers and in the course of regular Field Artillery Stations." 1<sup>st</sup> Indorsement, Chief of Field Artillery, File #21 l-A-5, Box 11, E 34, RG 177, NARA.

that the Air Service would still control observation aircraft and relegated the Field Artillery to the status of an unsatisfied customer.<sup>355</sup>

Solidifying their claim to exclusive jurisdiction and responsibilities even further, the Chief of Air Service, Colonel W. G. Kilner, met with the Chief of Training and Instruction of the General Staff, Colonel Dan I. Sultan, to discuss the aerial observation issue.<sup>356</sup> On 8 December 1919, Kilner's office gave the Training Branch the Air Service's proposed curriculum for Aerial Observer Course: a three-month course (438 hours) that allocated sixty-five hours to artillery liaison with the prerequisite that the student attend the Field Artillery's fifteen-week aerial gunnery course at the School of Fire. A student would receive twenty hours of theory instruction, forty-five hours of practical exercise with a minimum of ten hours flying.<sup>357</sup>

Attempting to settle the ownership of the aerial observer in their favor, the Chief of Field Artillery Office submitted its own proposal to the General Staff on 29 December 1919. Much like the aerial observer board's ABC, the artillery office suggested three ranked classes of aerial observers with the first class consisting of Air Service officers, the second class composed of Field Artillery officers, and Coast Artillery Corps officers as the third class. Each observer class would receive rank and promotion in their

<sup>355</sup>Ibid.

<sup>356</sup>Ensuring that all facets of aerial observers should remain in the Air Service, the branch also made special efforts to retain the reins of training its lighter than air units – balloon companies. Memorandum for Colonel Sultan, War Plans Division, General Staff, Subject: Air Schools for Training Lighter-than-air Personnel, 5 December 1919, File #21 l-A-6, Box 11, E 34, RG 177, NARA.

<sup>357</sup>Memorandum for Chief, Training and Instruction Branch, General Staff, 8 December 1919, File #211-A-6, Box 11, E 34, RG 177, NARA.

respective branch. After graduating from their branch school, the officer would attend the necessary aviation or artillery school to complete his training. The Chief of Field Artillery believed that "this classification as to arm of service, methods and responsibility for training, and specific assignment to duties, it is believed, will obviate all misunderstanding as to the proper field of use, duties and functions of these officers."<sup>358</sup> A noble proposal, it had little bearing upon the issue. On 9 April 1920, War Department issued Circular 143, that specified: "the Air Service is responsible for the provision of aerial observation for the Army, and is charged with the training of all aerial observers, both airplane and balloon. Officers designated for this duty will be commissioned in or detailed for duty with the Air Service. They will be trained in Air Service schools and in the schools of such other arms as may be necessary."<sup>359</sup> All was not lost for the Field Artillery, for the circular required that the Air Service Chief seek the approval of the Chief of Field Artillery for the Air Service students graduating from the School of Fire observer course before he could bestow the title of "aerial observer" upon them.<sup>360</sup>

Not satisfied with the circular's requirements, the Air Service Director, along with the Field Artillery and Coast Artillery Chiefs, formed a committee to rescind Circular 143 and replace it with one that allowed Field Artillery and Coast Artillery

<sup>358</sup>Memorandum for Colonel Dan I. Sultan, General Staff. Subject: Aerial Observers, 29 December 1919, File #21 l-A-6a. Box 11, E 34, RG 177, NARA.

<sup>359</sup>U.S. War Department, Circular No. 143, Aerial Observers, 9 April 1920, 1, USMA.

<sup>360</sup>Ibid., 2.

officers to attend Air Service schools.<sup>361</sup> Despite the inter-branch committee's recommendation, the War Department rescinded Circular 143 on 28 February 1923 without replacing it with any declaration on the status on aerial observers. Without War Department directives, the Air Service's control of the airplane allowed it to dictate its terms to the Field Artillery about aerial observation through its manuals and regulations.<sup>362</sup>

The Air Service established its own observation school at Kelly Field and Brooks Field in San Antonio, Texas, to train its air officers, while the Field Artillery resuscitated its observation school at Fort Sill.<sup>363</sup> In 1920, the Field Artillery's Gunnery Department gave only two lessons in aerial observation, but as the school overcame the postwar turmoil of reverting to a peacetime curriculum, aerial instruction and school demonstrations increased. In July 1920, General Ernest Hinds, Commandant of the School of Fire, reported that his school was using a balloon company for its work and that he was prepared to receive and train the Air Service students graduating from the Air Service Aerial Observation Course at Brooks Field. Following the exchange of students between the Air Service and Field Artillery proposed by the 1919 aerial observer board, nineteen artillery officer students took the artillery school's three month Aerial

<sup>361</sup>In June 1920, Congress made amendments to the 1920 National Defense Act that officially established the Chief of the Air Service. See U.S. War Department, Bulletin No. 25, 9 June 1920, Section 13a. U.S. War Department, *General Orders and Bulletins*, 1920.

<sup>362</sup>Wrapper Indorsement, War Department, 15 April 1920, File #211-A-9 - File #211-A-10(a), Box 11, E 34. RG 177, NARA; U.S. War Department, Circular No. 22, Section 1, 22 March 1923, USMA.

<sup>363</sup>The War Department renamed the Air Service as the Air Corps in 1926. U.S. War Department, Bulletin No. 8, Section 4, 18 August 1926, USMA; Wesley F. Craven and James L. Cate, eds.. *The Army Air Forces in World War II, Men and Planes*, 6 vols. (Chicago: University of Chicago Press, 1955), 6:616.

Observers Course and graduated in preparation for their Air Service training. Students received 103 hours of instruction in field artillery topography, map problems, and practical terrain exercises. In December 1922, the Course for Aerial Observers graduated thirty-two students, and by the 1923-1924 school year, the school, working with the Air Service flight at Post Field, graduated forty-nine students. By 1924 and throughout the interwar period, the Field Artillery School had Air Service personnel, airplanes, and balloons attached as a support unit to train student officers in the Artillery Basic, Advanced, and Aerial Observation courses.<sup>364</sup>

Aviation support for the Field Artillery School ebbed and flowed according to the continual aerial observation debate between the Air Corps and the Field Artillery. At Fort Sill, Artillery School commandants remarked that the Air Service officers and enlisted men assigned to their command were professional and provided the best aviation support possible. Yet as early as March 1919, a school commandant complained: "If the School is to do the desired amount of work in aerial observation and firing, it will be very necessary to have the balloon and flying facilities directly and completely at the disposal of the Commandant. They have always shown a willingness to co-operate with the School except where this interfered with their own schedules or with instructions for

<sup>364</sup>Before 1924, the Air Service flew its planes from Kelly Field, Texas, on temporary duty to support the school. Sunderland. *History of the Field Artillery School*. 98; Letter # 17, Hinds to Snow, 21 July 1920, Miscellaneous Correspondence. MSL; Field Artillery School Commandant, 1921 *Annual Report*, MSL. 2, 4; Field Artillery School Commandant, 1922 *Annual Report*, MSL; Field Artillery School Commandant, 1923 *Annual Report*, MSL; U.S. Field Artillery School, *Description of Courses, 1930-1931*, MSL, 4; 3<sup>rd</sup> Indorsement, War Department, Chief of the Air Corps, 4 February 1932, File #322.172-F-3; 2<sup>nd</sup> Indorsement, Chief of Air Service, 15 March 1923, File #322.172-B-1, both found in Box 22, E 34, RG 177.NARA.

their own chief, but the work in the School can not [sic] be satisfactorily carried on if its schedules must be constantly adjusted to conform to those of the flying field."<sup>365</sup>

Adding to the organizational jurisdiction problems was school support. If the Field Artillery was to train its officers, it needed planes and pilots to conduct its classes. Senior Air Corps support for the Field Artillery School was minimal throughout the interwar period. For example, during the 1922 and 1923 school years, Hinds requested that the Air Corps return the balloon company stationed at Fort Sill to full strength, since its manning reduction the previous school year had rendered training inadequate. The Chief of Field Artillery, in his 1923-1924 annual report to the Secretary of War argued that there was "insufficient air service stationed at the School to carry on the desired course of training which is considered essential."<sup>366</sup> When the War Department directed each branch to propose a Five Year Plan, the Air Corps' 1926 plan realigned and consolidated its units to streamline training and reduce costs. Not surprisingly, it chose to transfer the Field Artillery School's squadron to a San Antonio base. Explaining that the Deputy Chief of Staff agreed with their consolidation proposal, the Chief of Air Corps, Major General Mason M. Patrick, told Chief of Field Artillery Snow that such a move would still support training programs at the artillery school and VIII Corps area units (Southwestern states). The Air Corps asserted that its proposed consolidation would improve training and save money for its squadrons. Not one to take such a

<sup>365</sup>Currie to Snow, 25 June 1919, *Miscellaneous Correspondence*, MSL, 4.

<sup>366</sup>"Annual Report of the Chief of Field Artillery for 1923-24," 26. Field Artillery School Commandant, *1923 Annual Report*, MSL, 6; Field Artillery School Commandant to Chief of Field Artillery, 5 March 1923, File #322.172-B-1, Box 22, E 34. RG 177. NARA.

proposal lightly, the Chief of Field Artillery fought the move and managed to retain its aviation detachment.<sup>367</sup>

The Air Corps' campaign to consolidate its organization under its control was renewed when it submitted another unit realignment proposal to move the Fort Sill planes in the fall of 1930 as an amendment to the organization's five-year plan. Learning of the amendment, Major General Harry G. Bishop, Chief of Field Artillery, feared that it marked the beginning of the removal of the 88<sup>th</sup> Observation Squadron from Fort Sill. Building his case to have the War Department keep the air detachment, Bishop enumerated the various missions the detachment performed at the school and stated that: "this specialized training is most essential to the Field Artillery and has been of the greatest value to the Air Corps personnel itself, as at no other place can the details of the close liaison between the Field Artillery and the Air Corps, so essential to battle-field success, be worked out and practiced as at Fort Sill." Bishop concluded his plea to the War Department by proclaiming: "I can conceive of no action which would more seriously cripple the efficiency of both the Air Corps and the Field Artillery in their combined work than one which would reduce the Air Corps troops at Fort Sill.... It is, therefore, recommended that no action be taken to remove the 88<sup>th</sup> Observation Squadron from Fort Sill or to change its present status."<sup>368</sup>

<sup>367</sup>Memorandum for Chief of Field Artillery, Subject: Aerial Training at Fort Sill, 11 December 1926, File #322.172-B-2, Box 22, E 34, RG 177, NARA.

<sup>368</sup>Chief of Field Artillery, Subject: Amendment of Provisions of 5-Year Air Corps Program (Relating to Observation Units), 27 October 1930, File #322.172-B-13(d), Box 22, E 34, RG 177, NARA.

The Office of the Chief of Field Artillery took the additional measure to invite the Assistant Chief of Staff, G-3 and a representative of the Chief of Air Corps office in November 1929 to Fort Sill to investigate the school's observation training. After the visit and several conferences at the Field Artillery School, the assistant commandant convinced his Washington visitors of the necessity of the Air Corps detachment at Post Field. Solidifying the Air Corps' apparent support for the aviation school detachment, the War Department declared on 29 November 1929 that the "primary mission of this unit is cooperation with the Field Artillery School" and directed that the Air Corps assign eight airplanes to the unit by 1 April 1930.<sup>369</sup>

The War Department directive was ineffectual. In October 1930, the Field Artillery School had only two planes supporting its training, and by 1931, the Air Corps had only supplemented its detachment at Post Field by one additional plane. Though the Air Corps would send additional planes and pilots from San Antonio to support training and give demonstrations, these three planes and the accompanying personnel represented the entirety of Air Corps support at Fort Sill until the Army expansion in the late 1930's. In his 1931 annual report, Bishop warned that though progress had been made in aerial observation at the Field Artillery Schools "the present tendency to lessen this cooperation by reductions in the Air Corps personnel and materiel at the Field Artillery School, development of the Field Artillery by hampering it in its progress toward a

<sup>369</sup>5<sup>th</sup> Indorsement, Chief of Field Artillery, 3 March 1932, File #322.172-F-3. 3<sup>rd</sup> Indorsement, War Department, Chief of the Air Corps. 4 February 1932, File #322.172-F-3, both found in Box 22, E 34, RG 177, NARA.

correct solution of the difficult problem of observation and control of the fire of modern long range artillery."<sup>370</sup> In February 1932, even the Chief of Air Corps Section at the War Department admitted that its section was unable to adequately support school missions at Fort Sill. Prompted by the school's routine practice of giving each student an opportunity to fly as an observer, the Air Corps office, still protecting their branch's interests, stated that it was willing to give artillery students familiarization flights if they did not interfere with Air Corps training, conflict with the school's required course work, or exceed flying hours. The Air Corps Office directive concluded that "cooperative missions be performed by Air Corps personnel and that orientation and familiarization flights by Artillery students be curtailed."<sup>371</sup>

Preparing its reply to the Air Corps proposal to reduce familiarization flights, the Office of the Chief of Field Artillery directed the Field Artillery School Commandant, Brigadier General William Cruikshank, to detail the flights in question. Cruikshank complied, and on 24 February 1932, the school commandant explained that the orientation mission flights were first flights for artillery students at the Basic and Advanced Course.<sup>372</sup> Armed with the commandant's reply about reducing observation

<sup>370</sup>"The Annual Report of the Chief of Field Artillery – 1931," FAJ 21 (November-December 1931): 585. Adjutant General, Subject: Amendment of Provisions of 5-Year Air Corps Program relating to Observation Units, 13 October 1930, File #322.172-B-13(b); Memorandum for Chief of the Air Corps, Subject: Monthly Activity Report, 9 December 1931, File #322.172-F-3, both found in Box 22, E 34, RG 177. NARA.

<sup>371</sup>3<sup>rd</sup> Indorsement, War Department, Chief of the Air Corps, 4 February 1932, File #322.172-F-3. 5<sup>th</sup> Indorsement, War Department, Chief of Field Artillery. 3 March 1932, File #322.172-F-3, both found in Box 22, E 34, RG 177, NARA.

<sup>372</sup>Not missing an opportunity to promote his school and branch, Cruikshank replied that when a aerial demonstration required only one observer, the school instructors chose artillery officers over the air

opportunities at Fort Sill on 3 March, Lieutenant Colonel Robert M. Danford, the office executive officer, first noted that the Chief of Field Artillery had repeatedly complained that three planes were insufficient to meet the needs of the Field Artillery School effectively, and had recommended that the school have one plane designated solely for photography work and six planes equipped with radios, with the pilots and enlisted men necessary to support such a unit. Danford reminded the Air Corps office about the 29 November 1929 War Department directive that formally established squadron level support at Fort Sill: "The only important progress that has been made since 1919 in the matter of liaison of the Air Corps and Field Artillery, and the progress is not as satisfactory as it should be, has been accomplished at the Field Artillery School by the unremitting efforts of the School authorities and the loyal and efficient assistance of the Air Corps personnel stationed there from time to time – personnel limited in number and operating with limited equipment. The substitution of the three planes of Flight "E," 16<sup>th</sup> Observation Squadron, for the 88<sup>th</sup> last November, has effectively crippled a continuation of such progress."<sup>373</sup>

Not all voices within the artillery community in the early 1930's were virulent supporters of designating the observer as a Field Artillery officer. In June of 1930, Lieutenant Colonel Lesley J. McNair, Field Artillery School assistant commandant,

officers. The school commandant remarked that "There is no intention of discriminating against Air Corps observers in such cases; it is simply a question of selecting the most skillful observer available for the given occasion." 2<sup>nd</sup> Wrapper Indorsement, Field Artillery School, 24 February 1932, File #322.172-F-3, Box 22, E 34, RG 177, NARA.

<sup>273</sup>5<sup>th</sup> Indorsement, War Department, Chief of Field Artillery, 3 March 1932, File #322.172-F-3, Box 22, E 34, RG 177, NARA.

replied to a colleague about a recent artillery study that again argued that the aerial observer should be an artilleryman. McNair reasoned it would be unprofitable to "stir up" the Air Corps in the matter and believed that "we haven't looked sufficiently on the A.C. side of it."<sup>374</sup> Reasoning that the "A.C. is new, undergoing great expansion, making mistakes and errors of omission," the future Army Ground Force commander thought it was better to aid the Air Corps instead of "telling them they are no good and taking over their mission ... I believe we should push, pull and help the A.C. to proficiency as observers."<sup>375</sup> McNair's viewpoint represented a minority voice. Most artillery officers throughout the interwar period viewed their air counterparts as aloof and uncooperative. An artillery officer's comments during a visit to the Air Corps Advanced Observer School at Kelly Field, Texas, captured the general hostility of the artillery toward the aviation branch: "The A.C. (Or its personnel in the saddle here) is fundamentally more interested in preserving the sanctity of the rating "Air Observer" (that is preserving it as a haven for retired pilots) than in granting it to genuinely deserving cases ... The staff of the Observation Course includes some high type men. None of them, as far as a visitor for a few days could judge, is a student who thinks in terms of the army as a whole."<sup>376</sup>

With continued Air Corps attempts to reduce support for the Field Artillery, the Chief of Field Artillery decided to take action as only the head of a bureaucratic

<sup>374</sup>McNair to McDonald, 14 June 1930, File #211-A-15, Box 11, E 34, RG 177, NARA.

<sup>375</sup>Ibid.

<sup>376</sup>Notes on Visit to Kelly Field, n.d.. File #211-A-15, Box 11, E 34, RG 177, NARA.

organizational knows how to – by conducting a study. In August 1930, Bishop requested that the War Department send his office's questionnaire on "Conduct of Fire with Air Observation" to all corps areas and departments. The questionnaire asked each unit to list aerial missions fired since 1 January 1929, with mission data on observer names, the unit that fired, and accuracy and time. The War Department sent the letter out to the various commands on 21 August. Three corps commanders reported that they had not done any aerial observation firing, Third Corps reported only four missions fired, and the Philippine Department had fired a total of five missions. Undeterred, on 17 March 1931, Bishop wrote to his office's training section that it was his "intention to reopen the question of aerial observers for Field Artillery fire," requesting that the section prepare a draft on the subject. The Training Section responded that it was not sure exactly what the chief wanted and proposed that if this study was "to be used as a basis for undertaking a campaign for the revision of the Army Regulation which gives the job of air observation of artillery fire solely to officers of the Air Corps, then, the data is not sufficiently extensive or revealing to enable any definite deductions to be made."<sup>377</sup>

Apart from lacking data to formulate an argument for organic artillery observers, the artillery office's training section report also disclosed that the problems of aerial observation did not belong entirely to the Air Corps. Bishop's staff officer, Lieutenant Colonel D. C. McDonald, pointed out that drastic reductions in artillery ammunition

<sup>377</sup>Chief of Field Artillery, Memorandum for: Training Section, 17 March 1931, File #211-A-17(c). Office of Field Artillery, Subject: Conduct of Fire with Air Observation, 14 August 1930, File #211-A-17; U.S. War Department, Conduct of Fire with Air Observation, 21 August 1930, File #211-A-17(a); Chief of Field Artillery, Subject: Information called for in Letters AG-353.16 (8-14-30) Misc. C., 21 November 1930, File #211-A-17(b), all found in Box 11. E 34, RG 177, NARA.

training allowances limited observation training to Fort Sill and Kelly Field. McDonald reasoned: "a two battery battalion, with an annual allowance of only 400 rounds and an officer strength of from 15 to 18 officers, has not much incentive to waste any of those precious rounds in firing with air adjustment, since such firing means practically nothing new to the Field Artilleryman on the ground and is of service and practical value only to the observer in the air. If this observer, as is almost invariably the case, is an Air Corps officer, the Field Artillery sees no use of wasting its already too scanty ammunition on training him. Were the air observation the duty of a Field Artilleryman, the case would be very different."<sup>378</sup> Despite this admission that aerial observation was a joint problem between the aviators and the artillerymen, McDonald pointed out that if the Field Artillery was "entrusted with the mission of air observation of its own fire, there can be no doubt that steady progress along lines of great value to the Field Artillery would be obtained."<sup>379</sup>

Throughout the interwar period, the Air Corps made few fundamental changes in its operational and tactical doctrine and relationship with ground forces. The Air Corps organized itself along the same lines as its AEF Air Service predecessor with its air missions and forces divided into bombardment, attack, pursuit, observation, transport, and training. During these years, observation aviation developed aircraft and units to support infantry, artillery or air forces using light planes, dirigibles, and balloons.

<sup>378</sup>Draft, Memorandum for the Chief of Field Artillery, Subject: Conduct of Fire with Air Observation, 12 March 1931, File #21 l-A-17(c), Box 11, E 34, RG 177, NARA.

<sup>379</sup>Ibid.

Observation aviation separated its mission and units into two different types: short-range observation units were assigned to armies and corps to support the infantry and the artillery, long-range observation units were assigned to General Headquarters Air Force for long-range reconnaissance beyond the influence of ground forces. Air Corps regulations further defined that air operations conducted by corps and army air forces conducted visual and photographic reconnaissance, observed artillery fire, and coordinated liaison between ground forces headquarters. Doctrinally, a field force commander had three choices for employment relationships between the Ground Force and Air Force Headquarters. With the first method, the ground commander assigned a broad, general mission to the GHQ Air Force and designated major objectives. In the second method, the ground force commander assigned special missions and specific methods. If the first two methods centralized the air forces under GHQ Air Force, the field force commander had a third choice to assign special missions to the GHQ Air Force for execution under the direct control of the chief of field forces with all or a specified part of the GHQ Air Force.<sup>380</sup>

In December 1936, the War Department directed that the Chief of Field Artillery provide comments and recommendations for an ongoing study on the "organization and establishment of observation units to properly care for the needs of ground troops" with "the least practicable delay."<sup>381</sup> Attaching the results of its own 1932 study, the Office of

<sup>380</sup>U.S. War Department, TR440-15, *Air Corps Employment of the Air Forces of the Army*, 2-7.

<sup>381</sup>Adjutant General, Air Observation, 9 December 1936, File #21 I-A-19, Box 11, E 34, RG 177, NARA.

Field Artillery tasked the Field Artillery School to provide a report to the War Department. Upon receipt of the requirement, the school commandant, Colonel Augustine McIntyre, the same officer who as a 1919 Field Artillery Board member argued for the establishment of artillery officers as aerial observers, immediately appointed a board of officers to evaluate the issue.

After conducting many experiments and tests, McIntyre's board provided the home office exactly what it wanted: a report that strongly endorsed the Field Artillery's enduring argument for its own observers. The board report also revealed the era's rapidly improving technology. It recommended that autogiros should be used for light and medium artillery units, high speed planes should observe fire for heavy artillery units, all aircraft should be equipped with two-way voice radios, and that balloons should be eliminated. Reasoning that the development of the battalion FDC and the increased use of air photos demanded a "much higher standard of teamwork between air observation and ground troops," the school board proposed that aviation observation units must be organically attached to the division, "the real fighting unit of our army."<sup>382</sup> Finally, the board concluded: 'That air observers for artillery missions be artillery officers, trained as aerial observers so as to function in pilot-observer teams but who are members of the division staff to be known as 'Air-Artillery Liaison Officers.'<sup>383</sup> Pleased with the report, Birnie directed that it be used as a guide for the Field Artillery's

<sup>382</sup>Report of a Board of Officers, April 1937, File #21 I-A-19, Box 11, E 34, RG 177. NARA.

<sup>383</sup>Ibid.

reply to the Adjutant General. The Chief of Field Artillery's reply to the War Department closely matched the school's final report. The office's conclusion asserted that the Field Artillery's proposed system of training artillery officers as aerial observers with the Air Corps had proven itself satisfactory in the World War. Yet, as with previous reports and recommendations, the War Department, under the influence of the Air Corps, did not act to provide organic aerial observation.<sup>384</sup>

During the American mobilization in the late spring of 1917, the establishment of the School for Aerial Observers at Fort Sill revealed more than a willingness by the Air Service to work with the artillery. Without the expertise to train artillery observers, the Air Service sought the assistance of the School of Fire to fulfill the demand for artillery observers and training to put its own qualified observers in its cockpits. Yet, even in the very moments of the rebirth of the artillery aerial observation team from the experiments of 1915, an intra-service battle between the aviation and artillery leadership emerged, an intra-service battle that would grow as the war progressed.<sup>385</sup> After the World War, the Air Corps-Field Artillery's working relationship had existed mainly in training circulars, field service regulations, school texts and War Department directives. Each branch conducted their own studies that proved that they, and not the other branch, were best qualified to conduct aerial observation. For example, even with a shortage of artillery ammunition, the War Department directed in September 1931 that in the upcoming

<sup>384</sup>Record Sheet, Office of Chief of Field Artillery, 16 April 1937, File #211-A-19; 1<sup>st</sup> Indorsement, Chief of Field Artillery, 26 April 1937, File #211-A-19, both found in Box 11, E 34, RG 177, NARA.

<sup>385</sup>Arnold, *Global Mission*, 56.

training year "Observation of fire by Air Corps observers will be included in the training of all Field Artillery Battalions."<sup>386</sup> Though the War Department could announce, it could not overcome the reality that the Field Artillery and Air Corps would treat the training directive as secondary task. In an era of constrained resources, air-ground training with a competing branch was not a priority. Even with little Air Corps support, the Fort Sill school ensured that its students, Basic and Advanced Courses, gained actual cockpit experience to call for fire from the air, continued to teach the techniques and methods of aerial adjustment in the classroom, and experimented with radios to determine the proper table of equipment and organization so that the artillery could effectively work with aircraft.<sup>387</sup> Quite simply, the Field Artillery, ignoring the Air Corps' status as the official owner and trainer of aerial observation, created and maintained its own aerial observation program in the hope that one day it would be authorized.

<sup>386</sup><sup>rd</sup> Indorsement, Chief of the Air Corps, 4 December 1932, File #322.172-F-2, Box 11, E 34, RG 177, NARA.

<sup>387</sup>Gurney to B. H. Perry, 9 October 1933, File #322.991-C-Gurney. B. H.. Box 23, E 34. RG 177. NARA.

## CHAPTER

### THE FLYING OP: FROM POST FIELD TO BATTLEFIELD

*[We] need a relatively slow, stable plane, with short take-off and landing characteristics, capable of operating from improvised flying fields near the front. It is not necessary for this artillery observation plane to fly very high or to pass the hostile front line: it is more like an O.P. lifted high enough to overcome the handicap of defilade. It is inherent in such a development that the observers will be artillerymen, and it probably will be found eventually that the pilots will be artillerymen, much as the artillery operates its own communications and its own motor transport.*

*Major Williston B. Palmer, FA  
Field Artillery Journal  
September 1941<sup>388</sup>*

In the late 1930's, several critical factors influenced the establishment of the flying "OP" as an organic field artillery unit. Beginning with an attempt to renew the air OP debate in 1938 by a new Chief of Field Artillery, the artillery and aviation branches revived their feud over who should own and control tactical aerial observation against the backdrop of world war. Organizational disagreements ended abruptly when the United States entered World War II in 1941. With the prospect of imminent combat, the War Department settled the debate: the Field Artillery was authorized its own organic aviation. In the European and Pacific theater, the establishment of the "Grasshopper" squadrons proved a major reason for the Field Artillery's success in World War II.

The primary catalyst that prompted senior American leadership to reevaluate the Army's ground-air team was the German *Wehrmacht's* success in uniting ground and air

<sup>388</sup>Williston B. Palmer, "Field Artillery – 1941," *FAJ* 31 (September 1941): 644-45.

power in its *blitzkrieg* campaigns across Poland and France. In their examination of the American air-ground team, Chief of Staff George C. Marshall and his deputy, General Lesley J. McNair, confirmed something well-known in U.S. Army circles: the American air-ground relationship was ineffective. Yet, this problem provided the Field Artillery an opportunity. Without an effective tactical air support organization for army ground forces, the artillery leadership found itself able to counter Air Corps' protests and promote the cause for its own aircraft. Moreover, the chaos and urgency to man, train, and equip an American army allowed civilian light aircraft companies the opportunity to take part in the national mobilization effort. Together, the Field Artillery and the light airplane industry eventually convinced the War Department, and more importantly the senior army leadership, that organic aircraft for the artillery was not only feasible, but also tactically effective. In a matter of a few years, the Field Artillery would create, train, and fight with its own airplanes.

On 26 March 1938, Major General Robert M. Danford became the new Chief of Field Artillery. Following his predecessors' footsteps, Danford renewed efforts for his branch to have their own aerial observers the following July. In September, he directed that a board of officers at the Field Artillery School be formed to "study the procedure involved in the execution of air-ground fire missions, and to make certain tests."<sup>389</sup> Included in these "certain tests" was the evaluation of two types of aircraft as practical

<sup>389</sup>Extract, Subject: Final report of Board of Officers to study the air-ground procedures with regard to the suitability of the O-47-A airplane, the autogiro YG-1B, and their equipment," 1 June 1939, File #21 l-A-21, Box 11, E 34, RG 177, NARA. "Chiefs of Artillery," *FA Journal* 4 (July-August 1999): 29.

observation platforms. One was an Air Corps observation plane and the second one an aviation oddity – the autogiro. A hybrid of a monoplane and a helicopter, the autogiro resembled a common open cockpit stubby-winged monoplane; however, extending from the top of the aircraft's fuselage was a mast housing that supported a helicopter three-blade or four-blade rotor.<sup>390</sup> The Field Artillery School board completed their air-ground tests with the autogiro and an observation airplane on 1 June 1939. Not surprisingly, the board, dominated by artillery officers, reconfirmed the Field Artillery's standard argument – only artillerymen should be artillery aerial observers. Before sending the report to the Chief of Field Artillery Office, the Assistant Commandant, Colonel Leroy P. Collins, tacked on that "whichever type [aircraft] is adopted should be manned by field artillerymen as observers who are members of the battalion commander's staffs and should be made available by attaching a unit to each brigade of field artillery in the ratio of one per battalion."<sup>391</sup> Like previous recommendations forwarded to the War Department on acquisition of new and questionable technology and organizational

<sup>390</sup>Manufactured by the Kellett Company, the autogiro seemed like an ideal aerial platform for the artillery. The aircraft had extremely short take-off and landing capabilities; could be equipped with radios and telephones, carried an observer and pilot, and could be easily transported on roads. Yet, the aircraft had serious flaws. **[It vibrated violently at certain points in its take-offs and landings causing the aircraft to sometimes crash.]** Many officers considered the "giro" to be nascent technology with promise. However, as with most new technology examined by the military for use, the giro underwent numerous tests. Consequently, the autogiro remained an experimental aircraft when hostilities erupted in Europe. Seeking established technological solutions, the Army, including the Field Artillery, elected to use a proven aircraft – the civilian sport light airplane. The Field Artillery School did test the Pitcairn autogiro in April 1941, however, this improved aircraft met the same fate as the Kellett model. "New Autogiro Tested as Flying 'OP,'" FAJ 31 (June 1941): 433.

<sup>391</sup>Extract, Subject: Final report of Board of Officers to study the air-ground procedure with regard to the suitability of the O-47-A airplane, the autogiro YG-1B, and their equipment, 1 June 1939, File #21 l-A-21, Box 11, E 34, RG 177, NARA.

changes, the board report remained another folder to be filed in the cabinets at the Chief of Field Artillery Office.

Besides sending reports to the War Department demanding the creation of an artillery aerial OP, artillery officers campaigned extensively in the pages of their journal. In the March-April 1939 edition of the *Field Artillery Journal*, Lieutenant Colonel John S. Wood contended that the "present interest" directed to the activities and development of the Air Corps should also "include measures for increasing the effectiveness of observation aviation" and reasoned that modern artillery could not achieve its mission without air observation.<sup>392</sup> Citing European precedents, Wood noted that the French, after identifying the need for a dedicated aerial artillery observer twenty-five years earlier, had finally given their artillery their own airplanes with artillery officers serving as the observers. He also pointed out that one of Germany's foremost military writers had demanded that the *Wehrmacht* give the artillery its own an organic observation plane. Despite offering a conciliatory olive branch in the name of teamwork, Wood remained steadfast to the idea that aerial observers should be "selected artillery officers detailed to the Air Corps or officers of both arms who are given a thorough schooling at an Artillery-Air Corps School."<sup>393</sup>

Whether directed by the Chief of Field Artillery or not, the *Journal's* May-June 1939 issue focused on the issue of organic aerial observation. An editorial wondered

<sup>392</sup>Jonn S. Wood, "Notes and Comments," *FAJ* 29 (March-April 1939): 178.

<sup>393</sup>Ibid., 180.

why much had been done to improve "blind flying" techniques for aviators, but nothing had been done about "blind firing" in the Field Artillery.<sup>394</sup> He noted that cooperation between the Air Corps and the Field Artillery had been "cordial, sincere, and conscientious," but "we are getting nowhere; progress is not being made."<sup>395</sup> After pointing out that foreign armies had given their field artillery battalions their own aircraft, the editorial concluded that "this matter is a field artillery problem, and the Field Artillery, with such help as the Air Corps may be able to give it, must solve the problem of "blind firing" itself."<sup>396</sup>

The argument for an air OP was driven home another *Journal* article which noted that amid the avalanche of widely publicized demands and plans for aircraft for national defense: "Careful observers may have noted a statement by the Secretary of War to the effect that modernization of our field guns is needed – an indication that the War Department still believes artillery will be required in the event of war. However, unless the plans of the hundreds of millions to be spent on the Air Corps include a very definite earmarking of funds for artillery observation planes and a proper organization for their use by the artillery, the field guns might as well be left as they are. Blind artillery does

<sup>394</sup>"Blind flying" referred to instrument flying that enabled a pilot to fly his plane safely and arrive at his intended destination. "Blind firing" pointed to the Field Artillery's inability to observe targets because of the limited view of its forward observers.

<sup>395</sup>"Blind Firing," *FAJ* 29 (May-June 1939): 195.

<sup>396</sup>Ibid.

not need any particular increase of range or flexibility in its weapons. All it requires is more and more ammunition to be plastered over the landscape in unobserved fire.<sup>397</sup>

Two other articles in the journal, "The Autogiro – an Observation Post" and "We Must See with Own Eyes," continued the argument for an organic air unit for the artillery.

Editorials or articles, all pieces reveal the Field Artillery's perception that aerial observation was a secondary mission for the ever-expanding Air Corps. Consequently, the only answer for the artillerymen would be to operate and own their airplanes.<sup>398</sup>

The Third Army maneuvers of 17 to 20 August 1940 revealed the problems of the Army's observation air-ground team. For the training exercise, Third Army attached the observation squadrons to VIII and IV Corps. VIII Corps retained their squadrons at the corps headquarters level and did not parcel them out to subordinate units. To compensate for this centralized control and to increase response times to subordinate requests for liaison and artillery missions, the corps kept the crews and their planes on constant alert. Observer squadrons did only reconnaissance missions the first day and a half until the corps' three artillery regiments established their firing positions. Once the regiments began to shoot simulated fire missions, they constantly petitioned corps for air support. Despite the VIII Corps tight control over mission assignments, air observers only achieved a fifty percent effectiveness rate of observing and adjusting missions of the total artillery missions requested by ground units. The problems were many. Most

<sup>397</sup>John S. Wood, introduction to "Flying Observation Posts for Artillery," by A. Verdurand, *FAJ* 29 (March-April 1939): 197.

<sup>398</sup>Louis B. Ely. "The Autogiro – an Observation Post," *FAJ* 29 (May-June 1939): 202-14; H. W. Blakeley, "We Must See With Our Own Eyes," *FAJ* 29 (May-June 1939): 215-18.

observers were students that could not correctly identify tactical formations or the employment of enemy forces. Nevertheless, the biggest obstacle to successful reconnaissance and artillery missions was the faulty air-ground communications system. Artillery radio operators and air observers caused many missions to be delayed because they did not know the assigned radio frequencies and the specified time to establish contact with the pilot. When the artillery units did make a timely and valid radio check on the ground before the flight, more than two thirds of the missions were successful.<sup>399</sup>

In his after-action report on the maneuvers, the VIII Corps' Air Officer, Colonel George E. Lovell, recommended many "lessons learned" to improve the artillery-air observer relationship. Perhaps the most striking characteristic of his comments was that they closely followed the traditional Field Artillery arguments for the establishment of its own organic aircraft. Lovell asserted that for efficient coordination there should be a habitual relationship between observation squadron and ground unit. Moreover, he recommended that the tables of organization be amended to provide for liaison officers without disrupting pilot-observer teams and that observers should be from the ground combat arms, not the Air Corps. To improve radio communications, Lovell proposed that the VIII Corps establish an air-ground radio net between the ground subordinate headquarters and aerial observer along the same pattern as the radio net in the cavalry division. Specifically for the artillery, he advised that artillery regiments train communication officers and instruct these officers to check and supervise the ground-air

<sup>399</sup>G-2 Report, Annex No. 2; Report of the Air Officer, Annex No. 7, Report of Third Army Maneuvers August 1940, 31 August 1940, both found in Box 16, Walter Krueger, Jr. Papers, USMA.

communications of the artillery observers. Lovell only differed from the artillery's idea of organic air when he advocated that the posts of G-2 (Intelligence Section), the Chief of Corps Artillery, and the Chief of Corps Aviation, should be near each other to allow a better coordination of all air missions.<sup>400</sup> Regardless of the Army's senior leadership keeping air observer management and employment the responsibility of the Air Corps, practical experience in the field pointed to the need for decentralization.

**Not waiting for the Air Corps to provide solutions or a *Field Artillery Journal* article to influence senior leadership to settle the observation debate, a Texas National Guard officer took the initiative to solve the problem.** First Lieutenant Joseph M. Watson, a private pilot and an artillery officer, had conducted his own experiments using rented Piper Cub airplanes to learn radio-directed artillery fire procedures in the late 1930's. Convinced that he had a sound system, Watson in 1940 proposed to his artillery brigade commander that they should ask the Piper Aircraft Corporation to furnish airplanes to conduct additional experiments in the unit's upcoming exercises at Camp Beauregard, Louisiana. General Robert O. Whiteaker agreed, and Watson contacted the Piper Aircraft Corporation, which sent a sales representative, Tom Case. Case flew his plane from dirt roads and dropped messages to the ground units to adjust fires. The durability and usefulness of the Cub in the exercises impressed Whiteaker and his

<sup>400</sup>There was one exception to the aerial liaison problem, the 1<sup>st</sup> Balloon Squadron. VIII Corps on the third day of the maneuvers attached the balloon unit to the 77<sup>th</sup> Field Artillery Regiment. The after-action report noted excellent communications between the units. G-2 Report, Annex No. 2; Report of the Air Officer, Annex No. 7, Report of Third Army Maneuvers, August 1940, 31 August 1940, Krueger Papers, USMA.

officers. After the maneuvers, Watson and Case remained in contact with each other and discussed problems and solutions with using the Cub as an artillery spotter.<sup>401</sup>

The issue of organic aircraft for the artillery observation was merely a pawn in a bigger air power chess game. The primary source of the disagreement between soldiers and the aviators revolved around the employment of tactical aircraft in the close air support role. Most soldiers believed that some aircraft should be controlled by the ground commander to provide reconnaissance, protect the force from enemy air, and destroy enemy ground targets before their front line. Ground force commanders were not concerned about the operational and strategic implications of air power, they wanted immediate support for their forces. Airmen, on the other hand, envisioned the battlefield in a larger scope – the range of their aircraft. With fighters and bombers, air power proponents contended that they could defeat the enemy by first eliminating his air force, then once accomplished, destroy his lines of communications and war industries.

Aviators perceived defensive air patrols and the apportionment of aircraft to attack tactical targets for ground forces as a misuse of air power. However, the success of the German *blitzkrieg* across France in 1940 convinced Marshall and many other U.S. officers that the German rapid advance was a direct result of the *Wehrmacht's* ability to unite air and ground firepower. Consequently, Marshall ordered a series of staff studies

<sup>401</sup>Laurence B. Epstein, "Army Organic Light Aviation: The Founding Fathers," *United States Army Aviation Digest* (hereafter USAAD) 23 (June 1977): 4-5, 10-11; Richard K. Tierney, "The Army Aviation Story, Part I," *USAAD* 8 (June 1962): 15.

on close air support for ground troops to seek to resolve the issue.<sup>402</sup> On 26 September 1940, Marshall's G-3 Training Branch completed its study on the Army's air-ground doctrine. The staff defined five different types of close air support: (1) close, direct-support fire missions on the immediate ground force front; (2) air defense of ground forces and rear areas; (3) air attacks against targets in enemy territory; (4) support of airborne forces; and (5) reconnaissance, liaison, and observation. The staff study remarked that the Army handled observation aviation well, but the Army should conduct tests in future maneuvers to validate air-ground procedures.<sup>403</sup>

McNair, as the Chief of Staff of General Headquarters (GHQ), initially viewed Major General Hap Arnold's Army Air Corps as an organization that he only had to monitor to know its capabilities and status. Yet, with the Marshall directive to conduct air-ground tests, McNair became directly involved with the air-ground training and urged the prompt publication of the reports from the spring's air-ground tests. He feared that the upheaval caused by the creation of the Army Air Forces would delay the formulation of guidance for air-ground action in the upcoming fall maneuvers. A new problem arose when the GHQ Air Section inspected observation squadrons in May 1941 and discovered they were unable to execute their mission despite the Training Branch's staff study assessment that aerial observation was adequate. Inspectors found that the Second Army

<sup>402</sup>David Syrett, "The Tunisian Campaign, 1942-43," in Benjamin F. Cooling, ed., *Case Studies in the Development of Close Air Support* (Washington: Office of the Air Force History, 1990), 155; Kent R. Greenfield, Robert R. Palmer, and Bell I. Wiley, *The Army Ground Forces: The Organization of Ground Combat Troops* (1947; reprint, Washington: GPO, 1983), 99-102.

<sup>403</sup>Greenfield, et al., *Army Ground Forces*, 101-2, 108.

air officer had given only superficial tests to his observation squadrons. An angry McNair labeled the tests "classroom stuff and consequently ordered further tests during field force exercises. This created a knee-jerk reaction throughout Army subordinate commands to respond to the Chief of Staffs directive to "fix" the poor state of the observation squadrons.<sup>404</sup>

Echoing the GHQ Air section critique, Third Army Commander Lieutenant General H. J. Brees wrote to his commanders: "From reports of recent inspections of the observation squadrons, and observations at certain maneuvers, including my own observation it is apparent that the training and the opportunity for training of the squadrons are being overlooked."<sup>405</sup> Brees noted that the observation squadrons were not up to strength in equipment or personnel, supported extraneous missions that interfered with required training, and endured the upheaval of the many divisional air officer transfers. The War Department had exacerbated the plight of the air observation units when it announced that it would transfer all its experienced Regular Army observer

<sup>404</sup> After much wrangling between ground and air force officers over what units to select, tests were completed in June 1941, the same month that the Air Corps became the Army Air Forces (AAF). Debate over the tactical air support for ground forces centered on the AAFs organizational relationship with the first types of air support defined in the Training Branch staff study: Should Army air assets be centralized or decentralized? Air Force officers supported the idea of centralized planes. They asserted that it retained the integrity of their organization and argued that to parcel out aircraft to ground commanders, who did not understand air support and reduced the combat effectiveness of air assets. Those desiring decentralization, primarily ground force commanders, argued that this system best suited their organizations and missions for it ensured that they had air assets when they were needed and did not have to request it. However, after the reorganization of the Air Corps into the Army Air Forces, the question of aerial observation became a part of the larger air-ground debate. Greenfield, et al., *Army Ground Forces*, 108.

<sup>405</sup> H. J. Brees to Krueger, 6 May 1941, Serial 15, File 16, Box 3, Krueger Papers, USMA. Greenfield, et al., *Army Ground Forces*, 108.

pilots to fighter and bomber units. This prompted Brees to recommend that authorized artillery and infantry liaison officers replace the vacant air officer slots within Third Army. Knowing that many of these new pilots had barely learned the rudimentary artillery observing and flying skills, Brees concluded, "I cannot overemphasize the importance of this combined training and that every opportunity offered by marches, exercises and maneuvers, regardless of the size, be used to bring about this coordination and perfect the means of communication between these two arms."<sup>406</sup> Perfecting the means of coordination would take time and practice.

Not slow to respond to his commander's guidance, Third Army's VIII Corps commander, Major General Walter Krueger immediately had his air officer suggest various training exercises for the corps' upcoming training weeks to involve the two observation squadrons and the 2<sup>nd</sup> Infantry Division. These included having air observers drop flares to observe command posts, troop or truck columns, and concentrations, and to drop flour bombs on similar targets, simulate air attacks, and provide liaison support for corps, division, and regimental combat team headquarters. Krueger's interest in air observation and ground training did not cease after he assumed command of Third Army on 16 May 1941. On 21 June 1941, Marshall wrote Krueger that he was concerned about the poor state of readiness of the observation battalions. Krueger replied that he too was concerned that the lack of equipment and training support missions that had hindered observation training, but that he had corrected some

<sup>406</sup>Ibid.

of these shortcomings. Moreover, taking a page from Brees' guidance, Krueger stated that "In recent exercises, observation aviation has been used extensively, and close tab is being kept on all phases of its combat readiness. I have given stringent instructions to intensify this activity, directing corps commanders to give it their personal attention, and shall, of course, give it personal attention myself."<sup>407</sup>

Observing the 1941 spring maneuvers, General McNair concluded that aerial observation had not progressed far since the end of World War I. To fix the U.S. Army Air Forces problem of poorly trained observer units, McNair and General Delos C. Emmons, commander of GHQ Air Force, agreed to pool the observation squadrons into five groups, one for the armor force, the remaining for the continental armies. For a considerable portion of the year, these observation squadrons would be detached from their ground forces and fall under the command of the air support commands to direct and manage their training.<sup>408</sup> This agreement attempted to solve the issue of training observation pilots for the U.S. Army and provide competent observers for the Field Artillery. However, this solution did not consider the reality of a rapidly expanding Army Air Force focused on strategic bombers and fighters that gave scant attention to ground force commanders and the aerial observation problem.

<sup>407</sup>Krueger to George C. Marshall, 3 July 1941, Serial 33; Brees to Krueger, 30 September 1941, Serial 86. "Suggested Use of VIII Army Corps Observation Aviation During Period May 8 to 16 May," n.d., Serial 15, all found in File 16, Box 3, Krueger Papers, USMA; Walter Krueger, *From Down Under to Nippon* (Washington: Combat Forces Press, 1953), 4. Krueger was promoted to lieutenant general when he assumed command of 3<sup>rd</sup> Army.

<sup>408</sup>Futrell, *Ideas, Concepts, Doctrine*, 1:104-5.

Proponents of organic air renewed their campaign in 1941 to "fix" artillery aerial observation. In the February *Field Artillery Journal* issue, Lieutenant Colonel John B. Wogan applauded the release of Technical Manual 6-210, *Air Observation and Adjustment of Artillery Fire*, a product reflecting the study and testing at the Field Artillery School to simplify procedures to "speed up air-ground shoots which in the past have been painfully slow."<sup>409</sup> Wogan argued that if the observation on the ground was manned by an artilleryman, then it made no sense to have some young pilot, who had no conception of how indirect fire worked, call for artillery fire from the air. He asserted the problem of timely and competent air observation would never be solved until the artillery had its own aerial observers and planes. Wogan calculated that in one day's shooting that the aerial observers would pay for themselves with the rounds saved. He concluded his article by pointing out that the inadequacies in aerial observation would remain "as long as we [artillerymen] must depend on another agency for air observers and observation planes."<sup>410</sup>

Throughout 1941, a series of articles in the *Field Artillery Journal* indicated the artillery community's interest in light aircraft. In the October edition, Captain T. L. Crystal proclaimed the merits of a recently approved light plane as a logical choice for an organic artillery plane. As a battery commander, he wished that the new plane would be authorized in his Table of Basic Allowances. In a similar vein, Lieutenant Colonel Ivan

<sup>409</sup>"Aerial Observation," *FAJ* 30 (September-October 1940): 355.

<sup>410</sup>John B. Wogan, "Air Observation of Artillery Fire," *FAJ* 31 (February 1941): 115-16.

L. Foster in the December issue explained that the hills and trees that God gave the artillerymen were sometimes not high enough. He resounded the often heard plea to give artillerymen the "airplane necessary to extend their observations and they will accomplish their missions."<sup>411</sup> Foster reasoned it only made sense that the Air Corps would be occupied with combat planes, long-range reconnaissance, and other combat aviation and would not have a capability to devote itself to "low priority" missions of coordinating and observing targets for the artillery and maneuver forces.<sup>412</sup> Though these articles pleaded the case of the artillery, an article published in April proved to be the *Journal's* pivotal exposition. In "Wings for Santa Barbara," Major William W. Ford provided a well-reasoned argument for an organic artillery air unit. A private pilot since 1934 with more than five hundred flying hours. Ford explained that during the 1940 Third Army maneuvers and other field problems he could not find a "decent" OP in the thick woodlands. Moreover, his battalion never had an air observer available to call its fires. He maintained that because the battalion has evolved into the primary fire unit for artillery, then the battalion must have at its disposal immediate means to observe its fires. A low cost "little flivver" plane, such as the Piper Cub, provided the answer. Ford outlined a program to train artillery officers as pilots and concluded all the elements to create organic artillery aviation existed now and if adopted, would "insure the ability of

<sup>411</sup>Ivan L. Foster, "With the Other Arms and Services, Part VI – The Army Air Forces," *FAJ* 31 (December 1941): 969.

<sup>412</sup>*Ibid.*

our artillery to *shoot!*<sup>413</sup> Ward's article served more than a notice to the Field Artillery community; it also served as Ford's résumé. Recalling the persuasiveness of the article, the Chief of Field Artillery would appoint Ford to lead the Field Artillery School's aerial observer training program in 1942.

With the Field Artillery community speculating about the possibilities of a light airplane for observing and the news of the success of the Piper Cub tests with the Texas National Guard maneuvers spreading throughout the Army, senior ground force commanders began to express interest in testing the light airplane. Brigadier General Adna R. Chaffee argued that a light airplane offered an ideal platform from which a commander could manage rapidly advancing armor columns and adjust tank fire. Chaffee called the Piper Aircraft Corporation in early 1941 to see if the corporation would conduct tests with the armor forces at Fort Knox, Kentucky. The company agreed, and from 10 to 15 February, Case flew evaluation missions in a radioless Cub for Chaffee's staff. Again, as with the Field Artillery, Chaffee's staff was impressed with the command and control possibilities and capabilities that small airplanes offered a ground commander.<sup>414</sup>

<sup>413</sup>William W. Ford. "Wings For Santa Barbara," *FAJ* 31 (April 1941): 232-34. Saint Barbara is the patron saint of the artillery. The legend of Saint Barbara can be found in "Saint Barbara," *FAJ* 10 (November-December 1920): 563-66. Ford's remarks about the centralization of fires at the battalion refer to the establishment of the battalion FDC. Instead of each battery commander commanding and controlling his battery's fires, the FDC consolidated the computation and fire direction of all the battalion's firings batteries at the battalion headquarters. See Chapter III, "Eliminating the Middleman: The Fire Direction Center."

<sup>414</sup>Tierney, "The Army Aviation Story, Part I," 15-21; Epstein, "Army Organic Light Aviation," 4-5, 10-11.

Piper Aircraft Corporation President William T. Piper saw a potentially lucrative business opportunity if the Army would adopt the light airplane for its forces. On 18 February 1941, Piper wrote Secretary of War Henry L. Stimson urging the adoption of civilian aircraft for army ground forces in the nation's expanding mobilization effort. Piper also had his salesmen call Army units around the country to see if they would be interested in using the Cub. With an effective lobbyist in Washington and ground commanders espousing the merits of the light airplane, the War Department agreed to let the Aeronca, Piper, and Taylor airplane aircraft companies lend twelve planes for testing in the 1941 maneuvers.<sup>415</sup>

Against the Army Air Corps' wishes, the Army General Staff approved the use of the light planes in divisional and corps level maneuvers. The Army first used the airplanes in the Second Army maneuvers in Tennessee in June 1941 and then during the Third Army maneuvers at Fort Bliss, Texas, in July 1941.<sup>416</sup> Pleased with their performance, the Army requested the purchase of twenty airplanes for the coming army maneuvers, but the War Department denied the appropriation. This setback did not end

<sup>415</sup>Not knowing anything about the Army's organization, a Piper Aircraft Corporation salesman called Fort Lewis and talked to many individuals to arrange a visit. Finally, he contacted Lieutenant Colonel Dwight D. Eisenhower, a private pilot himself. Eisenhower explained that he was excited about the possibilities of the light plane, but that a Piper demonstration at Fort Lewis would serve no purpose. Eisenhower would later fly a Piper Cub during the Louisiana maneuvers. Tierney, "The Army Aviation Story, Part I," 15-21; Epstein, "Army Organic Light Aviation," 4-5, 10-11; William T. Piper to Henry L. Stimson, 18 February 1941, Grasshopper Record, 1941-1942, Piper Aviation Museum, Lock Haven, Pa. (hereafter Grasshopper Record); John E. P. Morgan, Piper Aviation, to Robert A. Lovett (Assistant Secretary of War (Air)), 18 June 1941, Grasshopper Record.

<sup>416</sup>It was during the Fort Bliss maneuvers that the light airplane earned its sobriquet as "grasshopper." Observing a Piper Cub land in the desert next to his headquarters, 1<sup>st</sup> Cavalry Division Commander Major General Innis P. Swift remarked to the pilot Henry Wann that he looked like a "damned grasshopper" as he

the Chief of Field Artillery's efforts. In August 1941, Danford went to England and visited various British artillery training camps and the Royal Field Artillery School, where he witnessed the British experiment with the light airplanes as an air OP. Convinced that the British were proving the validity of an organic artillery air OP, Danford sought and received permission to contract civilian pilots and aircraft to test the light airplanes during the upcoming Second and Third Army maneuvers. Danford and his fellow artillerymen realized that if the artillery was to ever have its own pilots and airplanes, then civilian pilots and airplanes would have to prove their tactical feasibility to Marshall and McNair in Louisiana.<sup>417</sup>

bounced his aircraft during the landing across the desert floor. Epstein, "Army Organic Light Aviation." 12.

<sup>417</sup>A month before the Louisiana maneuvers and in the midst of Danford's battle for organic light airplanes, the 13<sup>th</sup> Field Artillery Brigade Commander wrote to the Chief of Field Artillery Office in August requesting observation balloons for corps artillery. World War I artillerymen, "old school" war fighters, refused to part with the past and embrace present technology. Brigadier General J. A. Crane stated that recent training exercises revealed the need to have balloons because they were the only means of aerial observation available. Reflecting the Chief of Field Artillery Office's on going campaign for using light airplanes against the Air Corps, Major Rex E. Chandler recommended to Danford that he refuse the request. Chandler explained that considering the availability of the Air Corps' O-49 and the light commercial types the development of a twenty-seven thousand cubic foot balloon and the accompanying personnel and equipment made little sense. He argued: "the air corps is retaining the present balloon squadrons only as a haven for a few old lighter-than-air specialists and using the field artillery as an excuse. If we gave the slightest indication that we would keep balloon observation alive, the air corps would turn it over to us lock, stock, and balloon. Thereafter, we would have a hard time getting any other form of air observation." Danford instructed Chandler to draft a reply that advised Crane that office would put his request on hold because "we are trying desperately to get our own flying OP's and that to take this up now could complicate matters." The Chief of Field Artillery realized that a month before the Louisiana maneuvers was the worst time for his branch to put such an improbable request forward for an obsolete technology. Christopher R. Gabel. *The U.S. Army GHQ Maneuvers of 1941* (Washington: GPO, 1991, 181-82; Programme of Visits of the Chief of Field Artillery, United States Army, August 1941, Danford Folder, Box 3, G. Bryan Conrad Papers, USMA; Headquarters, 13<sup>th</sup> Field Artillery Brigade to Chief of Field Artillery, Subject: Observation Balloons for Corps Artillery," 28 August 1941, File #320.1-PA-1, Box 19, E 34. RG 177, NARA.

The Louisiana maneuvers between the Second and Third Armies involved the largest prewar display of American military aviation: eight Army Air Corps groups and seven squadrons of Navy and Marine units. Included in the air armada was an Army air observation unit with a squadron composed of the civilian light airplanes – the "Grasshopper Squadron." Consisting of twelve airplanes, pilots and mechanics from the Piper, Aeronca, Taylorcraft, and Continental Engine companies, the contracted squadron impressed senior army officers by performing liaison and spotting duties twelve to fourteen hours a day. The civilian pilots and mechanics worked directly with soldiers during the Louisiana maneuvers to maintain, support, and operate the airplanes. The success of the light airplanes in the army maneuvers and the poor performance of the Air Corps' own aerial observers opened the door wider for Chief of Field Artillery Danford to make possible the assignment of organic aircraft to the divisions and corps units. Danford later remarked in October that the Air Corps' Air Support Command failed to provide effective observation support and that the civilian operated grasshopper squadron provided the only successful observation for the artillery.<sup>418</sup>

Beyond the many officers within the artillery calling for organic artillery airplanes, other Army officers recognized the value of the artillery having organic aircraft. Serving as chief of staff for Krueger's Third Army, Colonel Dwight D. Eisenhower participated in the Louisiana maneuvers in September 1941. As Chief of

<sup>418</sup>Sam L. Ellis, Lieutenant Colonel, Air Corps, Chief of Aviation to Morgan, 12 September 1941, Grasshopper Record; "80 Light Planes for Army Observation," *Aviation* 41 (January 1942): 161; "Light Planes Accepted For Army Fire Patrol," *Aviation* 41 (February 1942): 288; "Light Planes Classes As 'Liaison' Types," *Aviation* 41 (April 1942): 168; Tierney, "The Army Aviation Story, Part I," 20.

Staff, Eisenhower had directed the Piper Aircraft Corporation manager to draw up a contract to rent the private aircraft for the maneuvers after the War Department had denied the Army request for the twenty airplanes early in the year. The exercise provided Eisenhower, a private pilot himself, an opportunity to see the usefulness of the airplanes in support of liaison and observation duties.<sup>419</sup> He observed that:

These planes enabled our heavy and long-range artillery to gain an accuracy and quickness of adjustment previously restricted to the light guns within eyeshot of the target; and field commanders could get a grasp of the tactical situation – terrain, avenues of movement, concentrations of troops and artillery – almost as complete as in the eighteenth century, when the opposing commanders, from horseback or a hillock, could view all the regiments committed to battle.<sup>420</sup>

Other officers, such as the president and officers of the Armored Force Board, gave their support for field artillery organic aircraft. After visiting the Armor Board, Field Artillery Board member Lieutenant M. K. Kurz recorded, "It is the general opinion of artillery officers and of Colonel John D. Kelly, president of the Armored Force Board, that artillery air observation was vitally important if the artillery is to be effectively

<sup>419</sup>Dwight D. Eisenhower, *Crusade in Europe* (Garden City, N.Y.: Doubleday and Co., Inc., 1948), 10-12; Epstein, "Army Organic Light Aviation," 13-14.

<sup>420</sup>Eisenhower, *Crusade in Europe*, 12. Morgan to John J. McCloy, Assistant Secretary of War, 9 January 1942, Grasshopper Record. Other general officers that flew in the light airplanes during the 1941 maneuvers included Krueger, Jacob L. Devers, and George S. Patton.

employed in armored divisions."<sup>421</sup> These officers asserted that the airplanes should be "sports" type and each battalion should have three airplanes.<sup>422</sup>

On 21 October 1941, perhaps in response to successful experiments with the grasshopper squadrons in the Army maneuvers, Danford wrote McNair that the Chief of Staff should consider permitting the artillery to have its own airplanes. McNair disregarded the request. Without air superiority, McNair reasoned that the light observer airplanes would be too vulnerable and he also wanted to exhaust the possibilities of the new air-ground commands.<sup>423</sup> Undeterred, Danford remained steadfast to the idea of organic air for artillery battalions and persisted in bringing the issue before the Secretary of War's office. According to Danford, General of the Army Air Forces "Hap" Arnold was at first in favor of the artillery having its own airplane for aerial observation but changed his mind and fought against the proposal. The debate over airplanes for the Field Artillery culminated at a General Staff meeting with Assistant Secretary of War John J. McCloy, attended by some forty officers in late 1941. Danford argued before the staff "we had learned by experience that observing fire of the Field Artillery by Air Force officers was a job they thoroughly disliked – and that I did not blame them. I wanted 'my work' to be done by 'my own men' and not by officers whose chief concern was Air

<sup>421</sup>Field Artillery Board, Subject: Report of Visit to the Armored Force Board, 8 November 1941, File #320.2/BA-45, Box 19, E 34, RG 177, NARA. Morgan to John J. McCloy, Assistant Secretary of War, 9 January 1942, Grasshopper Record; Eisenhower. *Crusade in Europe*, 12.

<sup>422</sup>Field Artillery Board, Subject: Report of Visit to the Armored Force Board, 8 November 1941, File #320.2/BA-45, Box 19, E 34, RG 177, NARA.

<sup>423</sup>Greenfield. et al.. *Army Ground Forces*, 110-11; William E. Lynd, "New Combat Teams Support Commands Provide Lighting Punch," *The Air Forces News Letter* 25 (February 1942): 31-32.

Force problems and not those of the Field Artillery.<sup>424</sup> Danford concluded: "Two or three years ago the Army was struggling to carry on its work with a few millions of dollars – now it has suddenly been given billions – I believe that a few hundred thousand should be given to the Artillery with which to purchase a few of these planes – send them to Sill and give them a good try-out."<sup>425</sup> McCloy, impressed by Danford's appeal, announced to the committee that he would recommend to the Secretary of War that the Field Artillery should be authorized to test the airplanes and then adjourned the meeting.<sup>426</sup>

Danford had taken the first successful step in winning his branch's battle against the Army Air Forces. The War Department authorized the Field Artillery to conduct field tests to determine whether the liaison airplanes could function as aerial OPs. Additionally, the success of the Grasshopper Squadron in the GHQ maneuvers provided the impetus for it to purchase eighty more airplanes in early 1942. Danford was elated, "If we can show the experiment a success, as I confidently believe we can, we will get organic artillery airplanes. The fact that the British are solving the problem [responsive aerial observation] this way helped in my arguments."<sup>427</sup> Selecting pilots among its own

<sup>424</sup>Danford to Salet, 28 April 1967, Danford Papers, MHI.

<sup>425</sup>Ibid.

<sup>426</sup>Not to be outdone by Eisenhower or Danford, Carlos Brewer, already known not to be shy of taking credit for the establishment of the FDC, also claimed to be a major proponent for the "flying OP." Ibid.

<sup>427</sup>Danford to G. Bryan Conrad, 24 December 1941, Danford Folder, Box 3, Conrad Papers, USMA. British Royal Artillery Flying Club members immediately saw the advantages of using a small plane as an aerial OP and pushed for its acceptance as a part of the field artillery battalion. The Royal Artillery encountered the same sort of inter and intra service obstacles as the Americans. The British did not establish their air OPs until 1940. Shelford Bidwell, *Gunners at War*, 103-17.

commissioned officers and enlisted men, the Field Artillery School at Fort Sill, Oklahoma, trained crews with their airplanes in February and March 1942 for six weeks. Danford appointed Lieutenant Colonel William Ford, author of "Wings for Santa Barbara," to organize the School's aviation training program. At the end of the pilot and mechanic training 28 February 1942, the Field Artillery School sent one group of pilots and ten airplanes to Fort Sam Houston, Texas, to work with the 2<sup>nd</sup> Infantry Division, and the other group of pilots and ten airplanes to Fort Bragg, North Carolina, to conduct corps level tests with 13<sup>th</sup> Field Artillery Brigade.<sup>428</sup>

In contrast to the previous year's maneuvers that used civilian pilots and mechanics, only Field Artillery personnel flew and maintained the aircraft. Logging more than six hundred flight hours in the 2<sup>nd</sup> Division exercises, the airplanes successfully made more than three thousand takeoffs and landings on unimproved fields and roads without a major accident. Tests included adjustment of artillery fire, vehicle convoy control, locating possible enemy units and batteries, battery camouflage checks, and verifying prearranged fires from photomaps. After completing the tests in April and sending the results that strongly recommended organic air observation to the War Department, the artillery community waited. Adding uncertainty to the Field Artillery's campaign for its own aviation was the 9 April 1942 release of *Field Manual 31-35, Aviation in Support of Ground Forces*. The manual confirmed that the Air Support

<sup>428</sup>Unfortunately for Danford, he would not see the fruits of his efforts. In March 1942, the Chief of Staff abolished the branch chief offices when he realigned the Army's training organizations and programs. Lowell M. Riley, "Organic Air Observation for Field Artillery," FAJ 32 (July 1942): 498; "Light Planes Accepted For Army Fire Patrol," 288; Epstein, "Army Organic Light Aviation," 17; McCloy to Morgan, 5 May 1942, Grasshopper Record.

Command would provide observation aircraft for ground units, not the ground force.

This regulation for the observation air was short-lived. On 6 June 1942, satisfied with the artillery's air OPs test results, the War Department approved the establishment of organic field artillery aviation. The War Department authorized each artillery unit (battalion, division artillery headquarters, and brigade headquarters) two liaison type aircraft, two pilots, one mechanic, and the necessary support vehicles, radios, and supplies. Furthermore, the approving memorandum stipulated that Army pilots, not Army Air Forces pilots, would fly the airplanes.<sup>429</sup>

After nearly a quarter of a century, the Field Artillery at last now had its own airplanes. With an organic air force, the updated June 1942 Army regulations reflected the artillery's new autonomy when it stated that Army observation would not be "responsible for any missions for field artillery units which can be performed with liaison aircraft."<sup>430</sup> The guidance also recognized the vulnerability of these light airplanes and stressed that the first responsibility was reconnaissance and not combat. Moreover, it noted that pilots should avoid combat and "insure success of their primary

<sup>429</sup> Army aviation considers the War Department memorandum authorizing the Field Artillery its own pilots and planes as its "birth certificate." U.S. War Department, *FM 31-35, Aviation in Support of Ground Forces* (Washington: GPO, 9 April 1942), 1; Memorandum for the Commanding General, Army Ground Forces, Subject: Organic Air Observation for Field Artillery, WDGCT 320.2 (2-5-42), 6 June 1942, in Tierney, "The Army Aviation Story, Part II," *USAAD* 8 (July 1962): 12.

<sup>430</sup> U.S. War Department, TC-36, *Tentative Guide for Observation Aviation* (Washington: GPO, 16 June 1942), 4. Twenty-two years earlier, Pershing, in his Indorsement Wrapper to the Superior Board, proposed that the "division should have an observation flight of some eight planes; since it is only through the closest personal association that real cooperation between the air and ground can be obtained, and since the division habitually requires some air service." Wrapper Indorsement, Forwarding Report of AEF Superior Board on Organization and Tactics, G.H.Q., AEF, Washington, D.C., 16 June 1920, Reports of Proceedings of Boards of Officers Appointed to Examine the Organization of the Arms of Service and Other Matters, 1917-1919, Box 12, E 23, RG 120, NARA.

mission will be recognized as equal in merit to those successful combat mission."<sup>431</sup> For the field artillery observers, this was not troublesome guidance. With the exception of the pilot's and observer's personal weapons, the Cub airplanes were unarmed.<sup>432</sup> Even with its inability to defend himself except to flee, a Cub pilot could direct the massive fire of multiple artillery battalions against any enemy who dared to show himself.

Originally designated the O-59 and O-59A, the War Department renamed the Piper Cub the L-4. The L-4 Grasshopper became the most widely used liaison light airplane in World War II. Slightly modified to meet military specifications, the Cub had tandem seats, a single high-wing, and a sixty-five-horse power engine, and could reach a maximum speed of 115 miles per hour. All Piper models had a rear cockpit with a swivel seat, rear table and all-around view with two-way radios and dual controls. In addition to the Piper, the War Department in 1942 purchased another civil aviation airplane for liaison, reconnaissance, and artillery observation, the L-5 Sentinel. Manufactured by the Stinson Division of Consolidated Vultee, the Sentinel, first designated the O-62 then redesignated the L-5, resembled the Piper Cub in its single high wing, seats, controls, and radios. The L-5 had hinged-sloping cabin side windows that could open during flight and had a 185-horse power engine that propelled it to a maximum speed of 130 miles per hour. Taking off and landing on strips less than the length of football fields, an L-4 or L-5 pilot could use rough fields, country dirt roads, or

<sup>431</sup>U.S. War Department, TC-36, *Tentative Guide for Observation Aviation*, 4.

<sup>432</sup>Enzo Angelucci and Paolo Matricardi, *World War II Airplanes*, 2 vols. (Chicago: Rand McNally and Co., 1977), 2:60.

even deeply furrowed farm fields. With its low maintenance requirements, simple construction, and ease of flying, a field artillery unit could easily maintain the airplane and disassemble it to move to a new position. The Army, Army Air Forces, and the Allies used the Piper and Stinson airplanes extensively throughout the war in all theaters with more than nine thousand airplanes manufactured for military use.<sup>433</sup>

In combat, the flying OP exceeded the expectations of the Field Artillery and dramatically increased the organization's ability to mass lethal fires. The first American use of the flying OP occurred in the Allied North African Campaign (November 1942 – May 1943) and proved its worth despite many administrative, supply, and maintenance difficulties associated with its introductory use in combat. With this experience as a guide, the 12<sup>th</sup> Army Group Air OP section, before its invasion of Normandy, France, took various measures to correct these minor deficiencies for U.S. units.<sup>434</sup> For the

<sup>433</sup>John E. P. Morgan to Krueger, 30 September 1941, Serial 86; Krueger to Morgan, 4 October 1941, Serial 86, both found in File 16, Box 3, Krueger Papers, USMA; William Strohmeier, "Light Planes At War," *Aviation 41* (May 1942): 138; Bernard Fitzsimmons, *The Illustrated Encyclopedia of 20th Century Weapons and Warfare*, vol. 16 (New York: Columbia House, 1978), 1689; Angelucci and Matricardi, *World War II Airplanes*, 60; "Military Aircraft Types," *Aviation 41* (February 1942): 91, 145; "Light Planes Classed As 'Liaison' Types," 168; "'Grasshoppers' for AAF," *Aviation 41* (May 1942): 185.

<sup>434</sup>The Twelfth Army Air OP Section ensured that the artillery air OPs received additional equipment and training, and more importantly, established depot level maintenance procedures with Ninth Air Force (23d Mobile Reclamation and Repair Squadron of the Ninth Air Force Air Service Command) to repair planes that were beyond the ability of a unit (first echelon maintenance). The section by war's end had repaired and returned to service twenty-five L-5's and 218 L-4's. First Army required each field artillery group, brigade, and division commander responsible for requisitioning supplies for their air OPs and their battalions. However, the Air Section efficiently solved support problems such as providing clean fuel. The supposed convenience to use regular gasoline caused many aircraft engine problems, and eventually the Air Section arranged to supply the planes with aviation fuel. To prevent accidents due to pilot fatigue, each army established an Air OP Rest Center. The First U.S. Army established a Rest and Recreation Center in Liege, Belgium that authorized each pilot and air observer a period of three days a month respite. Seventh Army established their center at Grenoble, France, with guidance not to send more than ten percent of their pilots each week for a week's worth of rest and recreation. Third Army and Ninth Army also established Air OP Rest Centers (Esch, Luxembourg and Maastricht, Holland). First US Army,

Normandy invasion, the light airplane's vulnerability to anti-aircraft and short flying range caused Allied forces not to use their air OPs until they could secure crude makeshift airfields beyond the beachhead. Once established, the air OPs proved extremely useful, as they were the only effective artillery observers who could see the battlefield in the Normandy hedgerow country. The First Army Report for June-August 1945 concluded that, "As realized in other theaters the use of air OPs proved to be of inestimable value ... the presence of air OPs caused the enemy to curtail his artillery activity in order to avoid disclosure of his positions to our counter battery fire."<sup>435</sup>

After the Allied breakout from their beachheads, practically all divisions kept their air OPs active during daylight hours and centralized control at the highest headquarters to prevent duplication of missions. Night flights were rare occurrences. Each flight lasted approximately one hour, enough for the observers to identify many targets of opportunity to destroy. The standard flying tactic for the air OP pilot was to fly perpendicular to the gun target line fifteen hundred yards in front of forward artillery batteries at an altitude of two thousand feet.<sup>436</sup> To avoid enemy aircraft, the pilots monitored the corps' anti-aircraft artillery nets to receive warnings of approaching enemy aircraft. To evade anti-aircraft fire, pilots flew between fifteen hundred and two

*Report of Operations, 1 August 1944 – 22 February 1945* (n.p.): 18-20, MHI; General Board, Study No. 66, *Report on Study of Organic Field Artillery Air Observation*, (hereafter General Board, FA Air), 31.

<sup>435</sup>First Army, *Operations*, Book I, 123. First US Army, *Report of Army Operations. 20 October 1943 to 1 August 1944*, Annex Nos. 3 to 11 (n.p.), 171, 177. 180-1, MHI.

<sup>436</sup>Reflecting the early accident rate with the planes. 391<sup>st</sup> Armored Field Artillery arrived on Omaha Beach on 25 June. On 30 June, its L-4 liaison plane crash-landed, injuring its crew and destroying the aircraft. Bowdle, *Combat History of the 391<sup>st</sup>*, 51-52; Riley, "Organic Air Observation," 498-501; Angus Rutledge, "Organic Air Observation for Field Artillery," *FAJ* 32 (July 1942): 498-501; General Board, FA Air, 52.

thousand feet. Accidents during take off accounted for more than fifty percent of the first month's losses in First Army units with eight pilots missing in action, killed, or seriously injured. With combat experience and a waning *Luftwaffe* presence in late 1944 and early 1945, the First Army suffered few losses in aircraft and pilots. For example, in January, the First Army had 213 operational artillery aircraft, yet only suffered two pilots lost with nine aircraft missing or salvaged. Third Army, from 1 August 1944 to 8 May 1945, sustained sixty-six pilots and seventy-five aircraft lost due to pilot error, operational accidents, and combat. To replace pilots and aircraft, 12<sup>th</sup> Army Group Artillery Section managed to ferry six hundred aircraft across the English Channel and linked them up with artillery pilots. By the war's end, the Air Section had coordinated the delivery of approximately 350 replacement aircraft.<sup>437</sup> Despite the prewar fears of Air Corps officers that the air OP's could not operate in combat, the grasshopper pilots and airplanes proved themselves durable, survivable, and most importantly, effective.

Depending on the number of field artillery battalions in the divisions (ten airplanes per unit), each corps contained fifty to seventy aircraft. Most divisional battalions pooled their aircraft at a division airstrip, and if a corps headquarters attached a field artillery battalion to the division, the attached battalion stationed its airplanes at the strip. Non-divisional artillery units, artillery groups and brigades also followed the practice of establishing a common airfield for its aircraft. A standard Air Section

<sup>437</sup>First US Army, *Report of Army Operations, 20 October 1943 to 1 August 1944*, Annex Nos. 3 to 11 (n.p.), 171, 177, 180-1, MHI; Twelfth Army Group, *Report of Operations (Final After Action Report)*, vol. 11,99-100. USMA; General Board. FA Air, 28-29.

contained an officer, aircraft mechanics, and an office assistant. With this pool of aircraft, a Grasshopper squadron similar to the one established during the 1941 maneuvers, the Air Section headquarters assigned specific air OP teams to patrol missions that ensured that a airplane was aloft to observe and cover the friendly frontline from dawn to dusk. German soldiers nicknamed the regularly patrolling grasshoppers the *Schildwache*, the sentry, because of their constant presence flying back and forth parallel to the frontline.<sup>438</sup>

Working directly with the FDC, at division level and higher, the air OP, upon finding a target, would contact the controlling FDC, which in turn would assign a specific artillery battalion. The battalion would then contact the aircraft on the proper radio channel to fire the mission. Naturally, visibility affected the ability of an observer to see a target. If the weather was clear, the observer could fly higher, and thus look farther into enemy territory. The observer used the standard forward field artillery observer method of adjusting fire on a target. For example, the observer would "sense" the adjusting round so many yards right or left, over or short of the target line, along the gun to target line before he called for the fire for effect phase of the mission. Air OP's requested smoke or white phosphorus rounds for the initial rounds to establish an identifiable adjusting point. Because of their vulnerability to ground fire and anti-aircraft fire, air OPs remained over friendly lines and did not have the ability to observe long-range artillery fires. Consequently, corps artillery assigned these long-range artillery

<sup>438</sup>General Board. *FA Air*, 2-3; Bidwell. *Gunners at War*, 103.

missions to high performance Army Air Forces observation aircraft. After-action reports stressed the need for the Air Section to brief the pilot and artillery observer with current air photographs and S-2 (Intelligence Section) information about enemy dispositions and where to locate enemy command posts, units, and a primary target, enemy artillery batteries. After the mission, the air photo interpretation team would debrief crews and have them point out suspected enemy locations. Such debriefings often verified enemy units from recent aerial photographs.<sup>439</sup>

Counterbattery fire, the primary mission of the artillery brigades and groups, became an air OP specialty. Air sections would fly missions at dawn and dusk to find the muzzle flashes of enemy cannons. The 28<sup>th</sup> Infantry Division artillery Air Officer remarked that: "We make it a practice to put an additional cub plane in the air just before evening twilight and keep it up until last light. Hostile batteries are spotted most easily at this time of day. The pilot's only mission is spotting and plotting the flashes. As soon as he lands he transmits the information obtained to the counterbattery intelligence section."<sup>440</sup>

The effectiveness of the air OPs enabled divisional and brigade FDC's to direct battalions to accurately and immediately destroy or silence enemy artillery. The 5<sup>th</sup> Infantry Division Artillery reported in September 1944 that its air OP operations were responsible for spotting sixty-one enemy batteries and neutralizing fifty. The United

<sup>439</sup>General Board, *FA Air*, 6.

<sup>440</sup>Ibid., 5

States Forces General Board noted that: "The German artillery soon learned that when they fired they were observed by the air OP's that immediate counterbattery fire could be expected. The result was that hostile artillery fire was reduced and sometimes eliminated by an air OP remaining in the area."<sup>441</sup> Use of the grasshoppers for counterbattery work, reconnaissance, directing convoy traffic, and adjusting on targets of opportunity became standard procedures for all artillery units whether assigned to corps, divisions, brigades, or groups. In the European theater alone, air OP's flew 244,397 combat missions while firing 62,640 artillery fire missions. Indeed, the air OP became and was an integral part of the American field artillery team. It is little wonder that the United States Forces, European Theater General Board's last recommendation stipulated 'That no change be made in assignment of liaison aircraft to field artillery units.'<sup>442</sup>

In the Pacific theater, a field artillery battalion's air operations generally mirrored their European counterparts and experienced similar successes in combat. Fighting on jungle islands presented many additional hazards for the "Grasshoppers" – infiltrating Japanese infantry attempting to destroy battalion airplanes, taming jungle terrain to build airstrips, and enemy airplanes. The famed steel matting used to make usable airstrips on

<sup>441</sup> Ibid. Learning that to return counter battery while a Grasshopper observed equated to a swift and destructive response from the Allies, the enemy artillery many times stopped shooting to avoid Allied counterfire. Knowing this, the Allies would sometimes send a Cub Plane up to patrol front lines just to silence the enemy guns. With or without the artillery fire, the Grasshopper could put enemy artillery out of action.

<sup>442</sup> General Board, *FA Air*, 6-7, 36. It is difficult to adjust artillery rounds onto targets that impact in a tree line or behind hills, where most artillery units emplace. It only makes sense that an aerial observer, flying 1500 to 2000 feet over friendly lines and looking into enemy territory, would need smoke or phosphorus rounds to use as markers to make the needed corrections to hit the target. Air OPs also adjusted mortar units.

the coral islands did not work on soggy, muddy ground. Though artillery pilots used aircraft carriers for a base of operations, after-action reports revealed that the Navy's flattops were impractical because the airplanes had limited navigational equipment, and with carriers stationed fifty miles off shore, pilots became disoriented when trying to find land on the featureless ocean. Compounding operational difficulties, long supply lines to logistic centers hampered aviation maintenance operations. At the beginning of combat operations, artillery units initially had enough aircraft replacement parts, but with the rapid attrition rate caused by the harsh jungle environment and a determined enemy, battalions resorted to pooling their resources and consolidated their wrecked airplanes for part cannibalization.<sup>443</sup>

During the Pacific island hopping campaign, the 7<sup>th</sup> Infantry Division artillery used its artillery air observers in the capture of Kwajalein in the Marshall Islands from 31 January to 6 February 1944. After establishing a secure neighboring island for the headquarters elements and the division's organic and attached field artillery battalions, the division kept one airplane in the air and at often had three simultaneously in the air during the battle. With the air OP, the artillery battalions could provide continuous communication and support for their assigned infantry units with pilots flying three to

<sup>443</sup>Even in combat, the Army Air Forces placed the needs of artillery aviation last. A severe shortage of 73-octane fuel (the aviation fuel used in liaison aircraft) in the Philippine Theater caused the Air Corps to only let artillery units use 80-octane fuel and 100/130-octane. Using fuels designed for ground vehicles or high performance aircraft engines, artillery units found out what their European counterparts already knew, improper fuel shortened engine service life by fouling and damaging motor parts. Consequently, the substitute fuels exacerbated the operational readiness problems of artillery liaison planes even more. Headquarters Sixth Army, Subject: Report on Leyte Operation, 30 November 1945, Report of the Artillery Officer, Item 279, Reel 46, 226-27, WDHD; History of the 61<sup>st</sup> Field Artillery Battalion in the Admiralty Islands (Brewer) Campaign from 6 March to 2 May 1944, 2 May 1944, Item 2490, Reel 2239, 7, 10, WDHD.

eight hour missions. Airplanes equipped with sea floats compensated for the scarcity of suitable landing strips on the islands. Occupying an island four thousand yards from Kwajalein, the artillery battalions relied solely on the air OPs to adjust their fires on aiming points in the main assault area until the forward observers arrived on the beach. Air OPs also reported the progress of landing waves and ordered the lifting and shifting of artillery fire as the infantry advanced inland. Observers fired at targets of opportunity, registered guns, and observed the artillery fires as the division systematically assaulted the neighboring islands in the chain. The division artillery only lost one airplane because it apparently strayed into the trajectory of its own artillery. Not surprisingly, the division artillery after-action review stated that "maximum dependence was on Air Observer" and that the air OPs "were a major factor in the success of the Artillery support of the operation."<sup>444</sup>

In the Sixth Army's Leyte campaign of 17 October to 25 December 1944, artillery pilots broke from their European counterparts and flew over enemy territory to spot artillery fires accurately. During the first week of operations, enemy airplanes shot down two division artillery airplanes and strafed an airstrip, destroying four additional airplanes.

In total, Krueger's Sixth Army lost thirty-two OP airplanes to accidents and

<sup>444</sup>Headquarters Seventh Infantry Division Artillery. FLINTLOCK OPERATION – SOUTHERN FORCE ARTILLERY, 22 February 1944, Reel 116. 10, 13, WDHD. The technique of placing artillery battalions on a secure island within range of the intended invasion island was a common technique. The artillery units did this not only in the Marshalls, but for example the Admiralties and Okinawa operations. Headquarters Seventh Infantry Division, Enclosure "A," Narrative of Events, 13 February 1944,4; Headquarters Seventh Infantry Division Artillery, Report of Artillery Communications Kwajalein Operation. 21 February 1944, 2, all found in Item 1340, Reel 116, WDHD; Headquarters, Sixty First Field Artillery Battalion, History of the Sixty First Artillery Battalion in the Admiralty Islands (Brewer) Campaign from 6 March 1944 to 2 May 1944, 2 May 1944, Item 2490, Reel 2239, 9, WDHD.

enemy actions in the Leyte campaign. Field artillery battalions often operated from their own airstrips during the day, and established divisional and corps strips at night for protection against infiltrating Japanese infantry. Reflecting the effectiveness of the American liaison airplane and artillery team, the Japanese made special efforts to destroy the airplanes, and in one case sent paratroopers on a mission to destroy airplanes at an artillery headquarters airstrip. Strong enemy opposition and hazardous flying conditions did not deter pilots from completing their assigned missions. An X Corps pilot "played hide and seek" with three enemy aircraft while observing a fire mission. Using a cloudbank for concealment, the pilot accomplished the mission by darting out long enough to spot the round and then dashed back into the clouds. Adding to the gutsy reputation of the grasshopper pilots, 61<sup>st</sup> Field Artillery liaison airplanes responded to a request to drop urgently needed medical supplies near a pinned down unit. After completing the mission, the pilots returned to land their airplanes in the dark. The first pilot landed unaided and then guided the other airplane's pilot with a flashlight. These are but a sampling of the many stories of artillery pilots' daring exploits in combat. Despite the substantial challenges of waging war in the Pacific Theater, the air OP pilots were a critical component in the artillery's ability to support tactical operations.

Interrogated Japanese prisoners said that their commanders had given them strict orders not to fire at the liaison airplanes or to attract notice because of the fear of retaliatory artillery fire. Whether operations occurred on the small island chains or large jungle-

covered islands, the artillery air OP was the only means to see the battlefield and direct accurate fire to support the infantry and armor.<sup>445</sup>

The issue of organic aerial observation for the Field Artillery remained unresolved from America's entry into World War I until the first year of its involvement in World War II. Though the Field Artillery argued and pleaded for their own aerial observation for more than twenty years, it was only when the American army's senior leadership examined the lessons of the war in Europe that it finally agreed to establish an artillery owned and operated flying OP. Clearly, once the Field Artillery, Signal Corps, and aviation organizations overcame the technical problems of trying to communicate between the airplane and the individual computing and relaying the commands to the guns, the most critical obstacle to the establishment of aerial observers was the Army itself. Nobody among the Army Air Forces and the Field Artillery questioned the need for an aerial observer – the fight was quite simply a bureaucratic power struggle for who was going to train, maintain, fly, and own the pilots and aircraft. For the artillery, using Air Corps' airplanes did not provide their need for continual and responsive aerial observer support. For the aviation proponents, the artillery observation was an addendum for the Army Air Corps' expanding missions of pursuit and bombing during the interwar period. The army's aviation community put the artillerymen and their desire for reliable aerial observation in the backseat of the air power cabin. In contrast to the

<sup>445</sup> Headquarters Sixth Army, Subject: Report on Leyte Operation, 30 November 1945, Report of the Artillery Officer, Item 279, Reel 46, 226, WDHD. Headquarters, 61<sup>st</sup> Field Artillery Battalion, Field Order No. 1, 5 March 1944, Item 2490, 1; 61<sup>st</sup> Field Artillery Battalion, Leyte-Samar Islands Campaign, Chronological Record of Events, Item 2491, 19, both found on Reel 2239, WDHD.

acceptance and integration of the FDC, the institution of an organic aerial observer within the U.S. divisional field artillery is a story of organizational inaction until global war prompted the U.S. Army to implement a solution. Only then did the Field Artillery gain one of its most vaunted World War II assets – the flying OP.

### Ode to the Grasshopper

I'm one of those pilots the people all dub  
     As a "grasshopper" pilot – I fly a Cub.  
 You've heard many tales of bombers and fighters  
     But nary a word of these small sturdy blighters.  
 A cub is a plaything to people back home  
     But up at the front we come into our own.  
 When the enemy's shelling comes in thick and fast,  
     Does the Infantry call for a big bomber's blast?  
 No! They swear, whoop, and holler, and tear at their hair:  
     "Get that Goddamn Cub back into the air!"  
 For the Infantry knows that a Cub, although slow,  
     Can give old Tojo one hell of a blow.  
 Back forth o'er our cannon, seeming to hang in the air,  
     We direct Allied fire on the enemy's lair.  
 Then out of a cloud comes the Rising Sun  
     In the shape of a Zero; boy! do we run!  
 Down on the treetops, in and out 'round the hills,  
     While "Slant-eyes" still follows, trying hard for a kill.  
 He spends all his ammo, and then he must run  
     For maybe, by chance, a P-40 may come  
 So back to his cannon, with shirt wringing wet,  
     Flies the Liaison Pilot, his job to do yet.  
 The radio sputters, "Mission accomplished—go home!"  
     (The four nicest words that we've ever known)  
 There is just one more thing that I'd like to say  
     Before landing my Cub and going my way:  
 Give the bombers and fighters their headlines galore—  
     Just give us more Cubs, and we'll end this damn war!!<sup>446</sup>

<sup>446</sup>Edward E. Baker. "Ode to the Grasshopper." *FAJ* 34 (July 1944): 480.

## CHAPTER VIII

### MODERNIZING THE MOVERS AND SHAKERS

*Modernization includes the adaptation of the latest commercial types of vehicles, communications, and other equipment, to our needs, as well as the improvements in materiel made possible by new design and invention. The development of new materiel must be completed, including the plans for manufacture in quantity. We know that war is the time for mass production, not for development.*

*MG Upton Birnie, Jr.  
Chief of Field Artillery  
13 September 1935<sup>447</sup>*

After World I, the Field Artillery, along with aid of the Ordnance Department and Quartermaster Corps, attempted to improve the three primary functions associated with the artillery mission: shoot, move, and communicate. Artillerymen responded differently to each type of technology associated with each task. With unwavering faith in improving communications technology, artillerymen were convinced, and eventually proved right, that it was only a matter of time before a portable and effective radio solved the infantry-artillery liaison problem.<sup>448</sup> The remaining two technologies deserve closer

<sup>447</sup>Birnie, "Developments in the Organization, Armament and Equipment of the Field Artillery," AWCL, 13 September 1935, G-3 Course No. 6, 1935-1936, MHI, 7.

<sup>448</sup>World War I era radios were heavy and unreliable. Artillery officers accepted it as a matter of fact that the Signal Corps would develop and produce a portable and reliable radio. In 1921, Field Artillery Major, D. M. Beere wrote that the "greatest problem of Divisional Artillery will be solved by the aid of Radio; i.e., the accompanying of the infantry with fire." Signal Corps officers were also keenly aware of the possibilities of a reliable radio. Signal Corps Major Joseph O. Mauborgne identified the need succinctly: "The problem of rapid and dependable communication between attacking infantry and its supporting artillery is probably the most important with which communications personnel have to deal. Many lives have been lost and many attacks failed to attain their maximum success on account of the lack of instant and unfailing communications between the combat battalion of infantry and its supporting artillery." Before 1926, radio development within the Army was unorganized. Unifying the Army effort, the War Department Rosenbaum Board recommended a program that resulted in the production of various types of

examination for understanding the Field Artillery efforts to modernize in the interwar period: weapons and transportation.

The primary document that guided Field Artillery materiel development in the interwar period was the Report of the Westervelt Board. More commonly referred to as the Caliber Board, this board convened after the Chief of Field Artillery, Major General William J. Snow, obtained approval from Army Chief of Staff to form an "Organization of officer to make a study of the armament and types of artillery materiel to be assigned to a Field Army."<sup>449</sup> Major General William I. Westervelt, the chairman, convened the

radios. By the late 1920's, the Field Artillery experimented with equipping the liaison sections with using new "portable" radios (SCR-77-B) as an "alternate" means of communication along with a radio trucks with its motorized units. In the early 1930's, the Signal Corps developed the SCR-161 radio that the Chief of Field Artillery adopted as a standard piece of equipment for its battalions. Throughout the 1930's, Field Artillery officers worked closely with the Signal Corps engineers to improve the radio's reliability, utility, and frequency management. The Field Artillery School taught it students how to effectively employ radios and telephones among headquarters, observers, and firing batteries. On the eve of World War II, the artillery had its own portable radio for infantry-artillery liaison and forward observing missions – the SCR-194. Chief of Field Artillery Danford was confident that the SCR-194 would ensure "adequate and continuous communication from artillery liaison officers and forward observers with the infantry across shelled areas where the maintenance of continuous wire communication is often impossible." The first practical radio, the SCR-77 series consisted of three pieces: operating chest, transmitting and receiving with a loop antenna, 80-volt dry battery box, and two 4-volt storage batteries carrying case. The radio set had a range of about 4½ miles with a ten to twelve hour operating time and weighed 41½ pounds. The successor to the SCR-77-A and prototype for the World War II models was the SCR-194. It weighed 22 pounds and had a 5-mile range. Joseph O. Mauborgne, "Radio Communication for the Field Artillery," *FAJ* 11 (May-June 1921): 274-75; D. M. Beere, "Lessons of the War as Affecting American Artillery, Particularly Divisional Artillery," *FAJ* 11 (September-October 1921): 443; J. G. Burr, "The Influence of Radio Communications on Conduct of Fire," *FAJ* 13 (March-April 1923): 92-94; Field Artillery School Commandant to Chief of Field Artillery, Memorandum, Subject: Progress on Development Work, 12 December 1929, File #319. I/J-3/a, Box 14, E 34, RG 177, NARA. Guraey to John H. Wallace, letter, 10 October 1933, File #322.991/B-Gurney; Augustus M. and Wallace to Gurney, letter, 13 November 1933, File #322.991/B-Gumey, A. M., both found in Box 23, E 34, RG 177, NARA; Birnie, "Developments in Organization, Armament, and Equipment of the Field Artillery," AWCL, 20 September 1934, G-3 Course No. 5, 1934-1935, MHI, 12; Danford, "Developments in Organization, and Employment of Field Artillery," AWCL, 28 September 1938, G-3 Course No. 9, MHI, 6; Danford, "The Field Artillery," AWCL, 23 September 1939, G-3 Course No. 8, 1939-1940, MHI, 8.

<sup>449</sup>The War Department approved the Caliber Board Report on 25 May 1919. In his World War I autobiography, Snow boasted that, under the guidance of the Board, the United States Field Artillery had made "more progress and development than in any other equal period in the world's history in any nation."

board on 12 January 1919 at the AEF Chamount headquarters, interviewed Allied and American officers, toured armament factories in Europe and the United States, and assessed current artillery equipment.<sup>450</sup> Upon completion of their work, the Board had its findings approved by the War Department on 25 May 1919. The Board recommended that every artillery gun, howitzer, carriage, and projectile in the inventory be modernized. Recognizing that a financially strapped postwar Army could not achieve this goal, the Board divided its recommendations into two categories: Ideal, outlining specifications for future weapons and vehicles when funds became available; and Practical, modifying and improving the massive surplus of World War I materiel.<sup>451</sup>

Snow, *Signposts of Experience*, 303, 305. Westervelt Board, Box 3, E 23, RG 120, NARA. Also see "Study of the Armament and Types of Artillery to be Assigned to a Field Army," FAJ 9 (July-August 1919): 289-347, for a complete summary of the Caliber Board Report.

<sup>450</sup>William I. Westervelt guided the post-World War I development of artillery material when Pershing appointed him as the president of a board to study the armament used in the war. The purpose of this board was to provide a report to guide future development of American artillery materiel: armament, calibers, ammunition, and transportation. Board members toured armories in France, Italy, and Great Britain, and studied German materiel closely. Originally appointed as a Field Artillery Officer after graduating from West Point in 1900, Westervelt served at a variety Ordnance Depots and staffs of arms manufacturing plants. During World War I, he served first as the adjutant of the 1<sup>st</sup> Division Artillery and ended the war as brigadier general as the Assistant Chief of Field Artillery, AEF. He then transferred to the Ordnance Department on 1 July 1920 and commanded the Watervliet Arsenal near Albany, New York, until September 1923 when then became the military attaché for ordnance at the American Embassy in Paris. Retired from the Army in 1927, he then served as a research director for Sears, Roebuck, and Company. In 1933, the Roosevelt Administration appointed him as Director of Processing and Marketing in the Agricultural Adjustment Administration. In July 1920, the Ordnance Corps civilians and officers formed a professional society and published its first journal: *Army Ordnance*. "Colonel Westervelt Retires." *Army Ordnance* (hereafter AO) 8 (May-June 1928): 382-3; "Association Affairs," AO 14 (July-August 1933): 46-47.

<sup>451</sup>Divisional artillery guns had a 3-inch bore (75-mm), corps 4.7-inch (120-mm) army 6 to 8 inches (155 to 203-mm). Lucian B. Moody. "Motorized Artillery," AO 1 (July-August 1920): 9-11; Glen F. Jenks, "Post-War Artillery Materiel," AO 2 (July-August 1921): 1-2. Jenks served as the Chief of Artillery Division, Ordnance Department, after World War I.

In the early 1920's, the Ordnance Department embarked on loosely organized program to design guns that met the Caliber Board "ideal" requirements. One requirement was the need for a common carriage that could accommodate both a gun and howitzer of similar caliber. Engineers soon found out that trying to build a dual-purpose carriage reduced the capabilities of both weapons and abandoned this effort. But by the mid-1920's, the Ordnance Department had built pilot models for the divisional, corps, and army guns and howitzers stipulated by the Caliber Board. With the exception of the full-circle traverse specification and dual-purpose carriages, most pilot weapons met or exceeded the Board's firing requirements. The biggest challenge for the Ordnance Department was not engineering a better howitzer or gun, but trying to modernize the massive amount of war surplus.<sup>452</sup>

The most pathetic example of modifying and using war surplus was the French 75-mm gun. In 1938, the Army still had over three thousand 75-mm gun carriages and gun tubes on hand. Among those gun tubes, there were four versions: the French M1897 and M1897M1; the M1917 British 18-pounder chambered for 75-mm ammunition; and the American 1916 3-inch chambered for 75-mm ammunition. By 1939, the Ordnance Department had modified the 75-mm gun so extensively that it recorded fifty-three different versions of the forty-year-old weapon. Throughout the duration of the interwar period, the Ordnance Department, along with the Field Artillery Board, tested and modified the French 75-mm for "high speeding" – making it road

<sup>452</sup>B. P. Joyce, "New "Four-Point-Seven" Guns." *AO* 2 (January-February 1922): 215; Jenks, "Progress in Artillery Development," *AO* 3 (September-October 1922): 78.

worthy to be pulled by trucks on improved and unimproved roads. Coupled with the requirement to fire upon fast moving tanks and to shift the gun tube rapidly from target to target, the improved versions of the 75-mm gun included modified wheels, brakes, suspension, trails, gun mounts, lunettes, and fire control sights systems. In late December 1925, the Army adopted the Model 1923 75-mm gun, (M1) as the standard divisional artillery piece.<sup>453</sup>

After another round of successive modification, the Ordnance Department replaced the M1 in 1935 with the 75-mm gun M1897 M2, which had a modernized split-trail gun carriage built to be towed at high speeds by truck. The Chief of Field Artillery, Major Upton Birnie, proclaimed it was "an efficient and modern divisional light gun" and easily mass-produced from existing war stocks.<sup>454</sup> Modified to remove its wheels during firing operations, the M2 traversed eighty-five degrees, nearly twice as much as the M1, and could elevate to forty-five degrees and had a range of over 13,500 yards.<sup>455</sup>

<sup>453</sup>S. L. Conner, "The 75-mm. Gun," *AO* 19 (May-June 1939): 347; 369; House Committee on Appropriations, *Military Establishment Appropriation Bill for 1939: Hearings on H.R. 9995*, 75<sup>th</sup> Cong., 3<sup>rd</sup> Sess., 1938, 369.

<sup>454</sup>Birnie, "Developments in Organization, Armament, and Equipment of the Field Artillery," AWCL, 13 September 1935, G-3 Course No. 5, 1935-1936, MHI, 7.

<sup>455</sup>Mounted on a split-trail carriage, the M1 had a drop-block breach, 45-degree elevation and traversing capability, and a range of 14,880 yards. Engineers attempted to mount a 105-mm howitzer on the M1 carriage, but it failed during firing tests and the M1 105-mm program was discontinued. Birnie, "Developments in Organization, Armament, and Equipment of the Field Artillery," AWCL, 13 September 1935, G-3 Course No. 5, 1935-1936, MHI, 7; Birnie, "Developments in Organization, Armament, and Equipment of the Field Artillery," AWCL, 13 September 1935, G-3 Course No. 5, MHI, 7-8; Danford, "Developments in Armament, Organization and Employment of Field Artillery," AWCL, 28 September 1938, G-3 Course No. 9, 1938-1939. MHI, 3; "New Standard 75-mm Artillery Weapon," *AO* 16 (March-April 1936): 301-2; Martin Parry Corporation, "Buquor Adaptor," *AO* 18 (May-June 1938): 322-23; Conner, "The 75-mm. Gun," 347-48.

American ordnance and artillery officers realized that the large surplus of 75-mm guns guaranteed the 75-mm gun would remain the backbone of divisional direct support artillery, but they also recognized that a howitzer of equal mobility was needed to provide the infantry more firepower. The Caliber Board addressed this artillery shortcoming: "the division artillery missions are best fulfilled by a light field gun and a light field howitzer having a range of at least 11,000 yards."<sup>456</sup> For most artillery officers the ideal divisional weapon was the 105-mm howitzer. Besides its ability to shoot a heavier and consequently more destructive shell, the 105-mm howitzer shot rounds at a higher and steeper trajectory, thus allowing it to shoot at targets behind hills and in trenches denied to the flat-trajectory field gun.<sup>457</sup>

Early Ordnance Department efforts to build a 105-mm howitzer in accordance with the Caliber Board specifications began with the Model 1920, a split-trail carriage, and the Model 1921, a box-trail design. A split-trail design had trails that opened to form an inverted "V" at the breech end and permitted the weapon to have a wider traverse, higher elevation, and easier loading, but it added more weight. Conversely, a box-trail carriage had parallel trails permanently fixed, weighed less, had a simplified

<sup>456</sup>H. C. Zimmerman. "The Light Field Howitzer," *AO* 3 (July-August 1922): 41. "Light Field Howitzer in France," *FAJ* 10 (September-October 1920): 549-51; Golden L'H. Ruggles, "Artillery Design," *AO* 4 (July-August 1923): 16.

<sup>457</sup>Another catalyst in the development of an American 105-mm howitzer was the German 105-mm. With about one hundred German 105's in its possession, the Field Artillery experimented and even outfitted a test battery with the German howitzers. Eventually, artillery and ordnance leaders dismissed the idea of using the German howitzers in 1925 to conserve funds for the development an American 105-mm howitzer. "Light Field Howitzer in France," 549-51; "The Field Artillery Board," *FAJ* 13 (May-June 1923): 257; "The Annual Report of the Chief of Field Artillery for 1924-1925," *FAJ* 16 (March-April 1926): 200; Ralph McT. Pennell, "A Field Artillery Viewpoint of Ordnance Development," *FAJ* 16 (May-June 1926): 229.

construction, but it reduced the weapon's ability to traverse and elevate. Both carriage models had gun tubes with sliding breechblocks, solid-rubber tires, and a hydro-pneumatic type recoil mechanism. After conducting tests, the Field Artillery Board rejected the Model 1920 as too heavy to pull for a six-horse team, too unwieldy for a crew to move, and too structurally weak for sustained firing operations. The Board found that the Model 1921 had passed its road and firing tests satisfactorily and recommended that the Ordnance Department build an improved box-trail pilot using the Model 1921 as a guide.<sup>458</sup>

In his 1924-1925 annual report, Snow repeated his recommendation for the development of a light field howitzer because the World War I surplus 155-mm howitzers were too heavy for rapid transport to support divisional operations. In 1925, the Ordnance Department answered the call with an improved 105-mm box-trail carriage howitzer, the Model 1925, and two split-trail 105-mm howitzers, Models T-1 and T-2. The T-2 had an improved recoil system. After testing these prototypes, Snow considered the split trail 105-mm howitzers the most important ordnance development for the Field Artillery because the U. S. Army remained the only great power without a 105-mm howitzer. Accordingly, the Ordnance Department suspended development work on the

<sup>458</sup>A sliding breechblock was one that locked in place behind the powder canister of the artillery shell. Sliding block breeches were common in lower caliber weapons. For heavy calibers, the breechblocks were step-threaded interrupted screw – the breach block when closed, rotated and interlocked with the threads in the cannon breech, and thus formed a seal. In comparison to the German 105-mm, Model 1898-09, the American 105-mm fired nearly three thousand yards farther and weighed a thousand pounds less. "New 105 mm. Howitzer Carriage," *AO* 2 (January-February 1922): 236; Zimmerman, "The Light Field Howitzer," 41; "Annual Report of the Chief of Field Artillery," *FAJ* 14 (March-April 1924): 119; Pennell, "A Field Artillery Viewpoint of Ordnance Development," 229; "The Annual Report of the Chief of Field Artillery for 1925-1926," *FAJ* 17 (January-February 1927): 5.

Model 1925 box-trail model and manufactured split-trail units for testing at Fort Bragg.

After three years of service tests, the T-2 was adopted as the 105-mm standard and renamed the M-1. The Ordnance Department issued four guns each to a battery at Fort Sill and one at Fort Bragg for extensive testing.<sup>459</sup>

Most Ordnance and Artillery officers believed that the 75-mm needed replacing, but successive Chiefs of Field Artillery still defended the 75-mm over the 105-mm. In the 1930's, Major General Birnie argued that though a light howitzer (105-mm) could fire a heavier shell, the 75-mm was still more effective against personnel, had greater range, better ammunition, and with the new fire direction techniques, the 75-mm had greater flexibility. He concluded that the Germans had sacrificed mobility with their adoption of the 105-mm howitzer and "it would be a mistake to reduce our proportion of the 75 weapon in favor of the 105 caliber."<sup>460</sup> Nonetheless, the Ordnance Department built and improved 105-mm howitzer test models throughout the 1930's.<sup>461</sup>

<sup>459</sup>A recuperator was a hydro-pneumatic shock absorber that greatly reduced the shock of a gun/howitzer tube during firing operations. "The Annual Report of the Chief of Field Artillery for 1924-1925," 198-99; "Annual Report of the Chief of Field Artillery for 1925-1926," 5; "The Annual Report of the Chief of Field Artillery for 1926-1927," *FAJ* 18 (January-February 1928): 5-6; "The Annual Report of the Chief of Field Artillery, 1928," *FAJ* 18 (November-December 1928): 584; "105 mm. Howitzers Issued to Troops," *FAJ* 20 (November-December 1930): 719.

<sup>460</sup>Birnie, "Field Artillery Developments," AWCL, 8 October 1936, G-3 Course No. 7, 1936-1937, MHI, 8. Leroy P. Collins. "The Division Light Howitzer," *FAJ* 19 (September-October 1929): 483-84.

<sup>461</sup>As with the 75-mm and 105-mm, the Caliber Board recommended that the medium artillery, 155-mm and 8-inch (203-mm) guns and howitzers be replaced. The Ordnance Department produced a few pilot models, but funding prevented the fielding of any systems to field units. However, this still did not stop the Army from designing and building new medium artillery guns. In August 1929, the Ordnance Department authorized Rock Island Arsenal to develop and build a carriage that could mount the 155-mm gun or the 8-inch howitzer and overcome the problems of the Model 1920: excessive 14-ton weight, split load configuration, 500-pound spades, and solid rubber tires designed for slow tractors that provided little road shock protection. In the early 1930's the Ordnance Department, using new welding techniques (gas and electric) and improved steel alloys, built the T2 155-mm and 8-inch carriage. The T2 carriage had

Even the very senior Army leadership was unwilling to let millions of dollars worth of 75-mm gun and ammunition go to waste. Faith in the 75-mm gun's ability to meet the needs of the infantry divisions remained until the Army mobilization for World War II. Before Congress in 1939, General Malin Craig, Chief of Staff of the Army, justified modifying the 75-mm instead of opting for the more powerful, but more expensive 105-mm, stated: "We have adopted the modernized 75-mm. gun as our standard divisional gun due to its outstanding characteristics. The estimates set up for these guns are deemed sound. They are based on present standards in weapons and on the requirements of our existing troops. Regardless of what use is eventually made of the 105-mm. howitzer, we will always have a need for the modernized 75-mm gun in larger quantities than are now on hand. I strongly recommend modernizing 75-mm guns."<sup>462</sup> Not until after watching the war games in the spring of 1940 and the success of

pneumatic tires, weighed about a ton less than the M1920, was transportable in one load, and could be towed at speeds approaching 45 miles per hour. The Ordnance Department touted the T2 as an engineering feat that not only exceeded the Caliber Board requirements but also represented the future of artillery design and fabrication. Unfortunately for the Field Artillery, it did not have the money to procure this vastly improved weapon system. The Field Artillery would settle with World War I modified for "high-speed" towing howitzers and guns well into World War II. Fighting in the Pacific Theater, the 43<sup>d</sup> Division Artillery medium howitzer battalion did not receive the new M1 155-mm howitzer until February 1944. Replacing the World War I era Schneider, the new howitzer shot an additional 5000 yards farther. Joyce, "New "Four-Point-Seven" Guns," 212-14; Elmer C. Goebert, "American Heavy Artillery. Model 1931" *AO* 11 (March-April 1931): 355; Samuel Hof, "Army Ordnance During 1931," *AO* 12 (January-February 1932): 242-43; Goebert, "Corps Artillery Weapons," 40-12 (January-February 1932): 234-40; John W. Slattery, "Building a Great Weapon in Record Time," *AO* 12 (May-June 1932): 391, 394; "155 Howitzer Modified for Towing by Truck," *FAJ* 25 (May-June 1935): 286; Birnie, "Developments in Organization, Armament, and Equipment of the Field Artillery," AWCL, 20 September 1934, G-3 Course No. 5, 1934-1935, MHI, 8; Birnie, "Developments in Organization, Armament, and Equipment of the Field Artillery," AWCL, 13 September 1935, G-3 Course No. 6, 1935-1936, MHI, 10; "The Year in Review," *FAJ* 28 (January-February 1938): 27; Ralph McT. Pennell, "Our Heavy Field Weapon," *AO* 20 (July-August 1939): 22-24; Restudy of the Caliber Report, March 1939, MSL.

<sup>462</sup>Malin Craig, "From the Record," *AO* 20 (September-October 1939): 110.

the German army with their 105-mm howitzer in France did the Army leadership confront the obsolescence of the 75-mm gun and begin to replace it with the 105-howitzer – the mainstay of direct support artillery battalions in World War II.<sup>463</sup>

With few public disputes, the Ordnance Department and Chief of Field Artillery Office exhibited an amicable relationship in the development of interwar artillery materiel. One glaring project that defied this working relationship was the all-purpose gun mount. American officers reasoned that future wars would see the introduction of high-speed targets, tanks, trucks, and aircraft that rendered existing field artillery guns obsolete. Army Chief of Staff General Charles P. Summerall believed that the time had come for an "extreme change in form and mobility to meet new demands."<sup>464</sup> Responding to the need for such a weapon and desiring to reduce costs with a "one weapon fits all" tactical situations, the Ordnance Department used new welding techniques and alloyed steels to create all-purpose 75-mm gun carriages: the T-2, T-3, and ultimately, the T2E1. All three models had improved fire-control instruments to track moving targets (tank or airplane) and a multi-functional firing platform to permit direct and indirect fire. A split-trail design, each model had two additional outriggers that enabled the gun to traverse 360-degrees and elevate to nearly 80-degrees. Single or dual mounted pneumatic tires allowed trucks to tow the weapon up to thirty-five miles per hour. The editor of *Army Ordnance* proclaimed that to "combine in one piece of

<sup>463</sup>"The Annual Report of the Chief of Field Artillery for 1924-1925," 200; Janice E. McKenney, "More Bang for the Buck in the Interwar Army: The 105-mm Howitzer," *Military Affairs* 42 (April 1978): 84-85.

<sup>464</sup>Charles P. Summerall, "Field Artillery Progress," *FAJ* 20 (November-December 1930): 605.

field caliber the functions of ground and air defense, as the new weapon does, is nothing less than epoch-making. Hats-off to the Ordnance engineers who have produced this newcomer on the battle front!"<sup>465</sup>

An Ordnance engineer associated with the mounts' development deemed it the responsibility of Field Artillery officers to "work out the tactical uses to which this new high-powered mobile weapon can be put."<sup>466</sup> Yet for the artillery, the weapon may have met the challenges of defeating tanks and airplanes, but it failed to perform its primary mission as a divisional artillery gun to support the infantry. The Ordnance Department had gone forward and produced a weapon that the artillery did not want. The Chief of Field Artillery Birnie represented his branch when he judged that 'This gun is an excellent piece of ordnance. The designers and manufacturers did their work well. It has been found, however, an unsatisfactory compromise weapon and it has been proven, it is felt, that antiaircraft and light artillery must rely upon separate types of guns for some

<sup>465</sup>"The All-Purpose Gun Mount," *AO* 10 (May-June 1930): 432. The primary difference between the two mounts was their systems for putting the pedestal on the ground for firing operations. Using built in screw-jacks, the outriggers on the T-3 lifted the carriage pedestal to protect the wheels from the shock of firing. Using a self-contained lifting mechanism built within its pedestal, the T-2 mount had a cylindrical pedestal that lowered and raised a circular spade underneath the gun. In this configuration, the gun could traverse 45 degrees left and right and had a maximum elevation of 80 degrees. The second method of firing position was for all-around fire. Removing the wheels and axle assembly, the crew lowered the gun on its pedestal and moved the outriggers to form an "X" with the gun trails. Impressively, an untrained gun crew emplaced the T3 weapon for unimproved fire in four minutes. A T2 mount required even less time. In addition to its 360-degrees firing capability, the gun had the elevation capability of 80 degrees. The mount could also use a 105-mm howitzer gun and be fired from the truck on outriggers or use the truck's built-in crane to place the gun on the ground. G. M. Barnes, "A New Weapon for Field Artillery," *10 AO* (May-June 1930): 391-92. Goebert, "Modern Thought in Division Artillery." *AO* 11 (July-August 1930): 35, 37; Barnes, "The Universal Gun and Mount, T3," *AO* 11 (November-December 1930): 187.

<sup>466</sup>Ibid.

years to come.<sup>467</sup> As a traditional artilleryman, Birnie judged that the all purpose gun as "trying to mix oil and water – a compromise – and in doing so we have neither an effective antiaircraft weapon nor an effective ground weapon."<sup>468</sup> Without any support from the senior artillery leadership, the all-purpose gun had no chance to become the standard divisional gun for the field artillery.<sup>469</sup>

In contrast to the use and integration of the all-purpose gun, the development and integration of the pack 75-mm howitzer occurred at lightning speed. A pack howitzer was a small caliber howitzer that a crew could easily disassemble into separate components and transport by mule. This was an ideal weapon system for mountainous or difficult terrain inaccessible by wheeled vehicles. The Caliber Board specified that a future pack howitzer should have a caliber of 3-inches (75-mm), use divisional gun ammunition if possible, have an elevation of not less than 45 degrees, a range of not less than five thousand yards, and that each pack load not exceed 225 pounds. On 12 September 1919, the Ordnance Department revived its prewar pack artillery program and developed two

<sup>467</sup>Birnie, "Developments in Organization, Armament, and Equipment of the Field Artillery," AWCL, 20 September 1934. G-3 Course No. 5, 1934-1935. MHI, 5-6.

<sup>468</sup>When Birnie saw how a crew put the all-purpose gun into action at Fort Bragg, he was surprised that it required the crew much time to emplace and displace the gun. Birnie, "Notes of Discussion Following Lecture By Upton Birnie, Jr., Chief of Field Artillery, Subject: Developments in Organization, Armament, and Equipment of the Field Artillery." AWCL, 13 September 1935, G-3 Course No. 6, 1935-1936, 8.

<sup>469</sup>The All-Purpose 75-mm Mount could also be placed on a 3½-ton 6-wheel truck. The gun could be fired from the truck on outriggers or use the truck's crane to place the gun on the ground. G. M. Barnes, "A New Weapon," 391-92; Goebert, "Modern Thought in Division Artillery." 37; Conner. "The 75-mm. Gun," 148.

new guns, Model 1920.<sup>470</sup> During its service tests, the new pack howitzers showed promise but required redesigning spades, trunnions, cartridge extractors, as well as a reduction in weight, before they were ready for service tests. Development and testing ceased in 1922 when the Chief of Field Artillery Office discovered that the howitzer was inferior to newly produced foreign weapons and demanded that the Ordnance Department go back to the drawing board.<sup>471</sup>

In June 1922, the Ordnance Department started designing a new model and produced the Model 1923E. After a preliminary proof firing and short road test at Rock Island Arsenal, the gun underwent further testing at Aberdeen Proving Ground in May 1924. Correcting faults discovered during the tests, the Ordnance Department built another set of test models and shipped the guns to the Pack Field Artillery Board, Aberdeen Proving Grounds, and a pack artillery battalion at Fort Robinson, Nebraska for testing in 1925 and 1926. Upon completion of those tests, the War Department authorized a service test of the first battery of the 75-mm pack howitzer in March 1927. Beginning with a five hundred mile march from Laredo, Texas to San Antonio, Texas, the battery participated in the 2<sup>nd</sup> Division maneuvers, conducted live fire tests, and returned to Laredo. On 22 September 1927, after passing Pack Artillery Board's tests,

<sup>470</sup>The only difference between the two new models were their breechblocks: No. 1. a sliding breechblock; and No. 2, a swing and screw breechblock. Both prototypes used a hydro-pneumatic recoil mechanism and could fire 75-mm projectiles to a maximum distance of 6,500 yards.

<sup>471</sup>On 26 June 1923, the Field Artillery Board recommended that the Model 1920 not be adopted for the service. European countries had developed pack howitzers that could fire 9,000 yards, 40% farther than the American Model 1920. Jenks, "Post-War Artillery Material." 4; O. L. Beardsley, "75-mm Pack Howitzer vs. 2.95 inch V. M. Mountain Gun," *AO* 2 (July-August 1921): 38-40; Jenks, "Progress in Artillery Development," 84; Goebert, "Our New Pack Artillery," *AO* 13 (November-December 1932): 148.

the weapon was designated the M1 75-mm Pack howitzer and became the U.S. Army standard. Several reasons account for its rapid acceptance. First, the howitzer was a marked improvement over the previous one in all technical and firing categories. Secondly, it only required modest modifications to pack artillery operations. Finally, it was an inexpensive weapon to field because it was relatively cheap compared to other artillery systems and few units required it. The M1 Pack 75-mm was not a break from the past and won acceptance easily within the field artillery community.<sup>472</sup>

Between weapon and transportation modernization, transportation proved to be the most controversial – the machine replacing the horse as the artillery's prime mover.<sup>473</sup> Unquestionably, better weapons would fire deeper into enemy territory, but how to move the artillery and ammunition on the battlefield remained a critical tactical problem. The Caliber Board members were well aware of the Field Artillery's transportation shortcoming in World War I. Because the artillery could not move itself effectively across the battlefield to support the advance, the enemy defense and counterattack was "unhampered" and able to resist the "rapidly diminishing offensive mass."<sup>474</sup>

<sup>472</sup>Goebert, "Our New Pack Artillery." 148; "Pack Howitzers to Be Given Service Test," *AO* 7 (March-April 1927): 397.

<sup>473</sup>A field artillery prime mover was the "power unit employed to move a section of Field Artillery. It may be animal or motor." Harry G. Bishop, "The Trend of Field Artillery," *FAJ* 21 (March-April 1931): 124-25.

<sup>474</sup>"Study of the Armament and Types of Artillery to be Assigned to a Field Army," 326. Joseph M. Colby, "The Guns Must Travel Fast." *AO* 13 (May-June 1933): 347.

Field artillery transportation in World War I divided into two different types: strategic mobility, wheeled vehicles that moved ammunition and supplies using roads; and tactical mobility, tracked vehicles and horses that pulled weapons and ammunition across a chumped-up battlefield. Ideally, artillermen wanted a vehicle that could meet both requirements, but with two such diverse transportation requirements and such nascent technology, postwar development would focus on improving both the tractor and truck.

Officers often used two terms interchangeably to describe military vehicle modernization efforts – mechanization and motorization. Mechanization was associated with tractors and self-propelled gun mounts, while motorization referred to trucks and cars. The Ordnance Department was the primary War Department agency that developed and tested tracked vehicles and weapons, while the Quartermaster Corps had the responsibility of procuring and testing cars, trucks, and trailers. After their tests, the Ordnance Department and Quartermaster Corps sent equipment and vehicles to the various branch schools and boards for further testing. The Chief of Field Artillery had two primary test beds to evaluate new and improved materiel: the Field Artillery Board at Fort Bragg, North Carolina, and the Field Artillery School at Fort Sill, Oklahoma.<sup>475</sup>

<sup>475</sup>The Field Artillery Board was first located at Fort Sill, Oklahoma, and moved to Fort Bragg, North Carolina, in September 1922 to reduce travel and shipping costs of equipment and staff to and from Washington, D.C. and Aberdeen Proving Grounds, Maryland. The board tested various items that ranged from plastic rulers, raincoats, graph paper, and equipment normally associated with the artillery: guns, howitzers, ammunition, and vehicles. Rounding out the artillery test boards was the Pack Artillery Board. As its namesake implied, the Pack Artillery Board tested items associated with mountain artillery such as saddles, mountain artillery pieces, and configuring artillery equipment for mule transport. All the boards focused their efforts on equipment that enhanced the ability of a field artillery battalion to shoot, move, and communicate: weapons, vehicles, and communications equipment. The Field Artillery Board, Field Artillery School, and Pack Artillery Board conducted over nine hundred equipment tests between World

Early postwar development of an artillery prime mover, a vehicle that transports an artillery gun or howitzer, involved both tracked vehicles and trucks. Tracked vehicles could be either a tractor to pull the gun, or a self-propelled mount – a tracked vehicle with the gun mounted on top of the chassis. Tracked vehicles used interconnected steel plates that formed a continuous belt on the outside of a series of wheels. A drive sprocket, located on the front or rear of the vehicle, meshed with the belt and turned it, and thus moved the vehicle over the ground. With a belt's large surface ground contact, tracked vehicles could negotiate soft and steep terrain, but were slow and noisy. Trucks, on the other hand, offered faster, relatively quiet transportation, but early models could not cross difficult terrain. Immediately after the war, the AEF and Field Artillery School experimented with tractors and trucks to begin formulating a program of future transportation development, instruction, and fielding.<sup>476</sup>

Army officers recognized that with austere postwar finances vehicle development efforts would focus on the use commercial engines and vehicles to reduce costs. The immediate reality was that neither the tractor nor truck met their requirements. Nevertheless, they held an unswerving belief in the advancement of technology and were certain it would only be a matter of time before industry would combine strategic and

War I and II. In the hierachal chain of positions within the Field Artillery, the President or the Field Artillery Board was a senior colonel and an influential player of the Field Artillery modernization effort. Adjutant General to Commanding General, VIII Corps Area, 2 September 1922, File #334/O-1, Box 40, E 34, RG 177, NARA.

<sup>476</sup>Trucks used as prime movers were six-wheeled (2 x 4): two-front wheels and a four-wheel dual axle. Currie to Snow, 25 June 1919, Miscellaneous Correspondence, MSL, 2-3; G. B. Allen, "Notes on Report of Demonstration and Test of Ordnance Tractors for 8-inch Howitzer and 155-mm. G. P. F. Gun Equipped with Caterpillar Attachment Units," FAJ 10 (September-October 1920): 522.

tactical mobility into one vehicle. Their hope in technological advancement had quantifiable evidence. Whereas World War I tracked vehicles had a top speed of five miles per hour, commercial firms produced by 1921 tractors that met the Caliber Board requirements of being capable of at least 15 miles per hour, mounting a howitzer, and carrying sufficient ammunition.<sup>477</sup> For the next decade, the Ordnance Department, Field Artillery School, and Field Artillery Board tested steadily improving tractors and self-propelled guns.<sup>478</sup>

One of the top priorities for the artillery was a self-propelled howitzer. A self-propelled gun used less road space and was more maneuverable than a towed gun. The Ordnance Department, in conjunction with tracked vehicle manufacturers such as Holt Manufacturing Company, Best Tractor Company, and the Front Drive Motor Company, mounted light, medium, and heavy guns and howitzers to self-propelled carriages.<sup>479</sup> Ordnance and Field Artillery Board testing revealed significant problems with early models of self-propelled mounts. The 1921 proving road march of the Christie self-propelled 155-mm mount illustrated the challenges. During testing, the Christie model had disproportionate track wear after 109 miles, broke a road wheel after 213 miles.

<sup>477</sup>Moody, "Motorized Artillery," 12-13; Maxwell Murray, "Discussion," *AO* 1 (May-June 1921): 308; Jenks, "Post-War Artillery Materiel," 2.

<sup>478</sup>"Caterpillar Mounts," *FAJ* 10 (November-December 1920): 636-38; "Motor Carriages for Divisional Artillery," *FAJ* 11 (July-August 1921): 412-13; Pennell, "The Experiment of Equipping a Light Regiment of Field Artillery with Tractors." *FAJ* 11 (September-October 1921): 460.

<sup>479</sup>In May in 1925, the Caterpillar Tractor Company acquired both the Best and Holt companies and provided the Field Artillery a light, medium, and heavy class tractors. The first postwar Caterpillar tractors could only attain a speed of 4½ miles per hour. Walter Christie was the president and primary designer for the Front Drive Motor Company.

consumed a "normal" 1.5 gallons of gasoline per mile, required a half gallon of water for its radiator every mile, and burned an "excessive" one gallon of oil per three gallons of gasoline.<sup>480</sup> During the first half of 1923, the Field Artillery Board conducted a series of tests on improved Christie and Holt self-propelled gun mounts and concluded that the vehicles still had all the characteristic problems associated with all self-propelled artillery: "mechanical unreliability, noise of operation, large size, great weight, and general undependability for performance of missions assigned."<sup>481</sup> Future experiments with subsequent self-propelled mounts convinced many field artillery officers that building a reliable and efficient self-propelled gun remained a significant challenge.<sup>482</sup> Before Congress in 1929, Chief of Ordnance, commented that the Army had stopped development of the self-propelled mount because the Infantry and Field Artillery "thought we had too many eggs in one basket, when we had the gun mounted right on top of the tractor."<sup>483</sup>

<sup>480</sup>Test of Christie Motor Materiel." *AO* 2 (July-August 1921): 52.

<sup>481</sup>Field Artillery Board, "Report of Test of 75mm. Gun and 105mm. Howitzer Motor Carriage, Model 1921 (Christie), 27 August 1923, File #472/BA-8, E 34, Box 108, RO 177, NARA.

<sup>482</sup>Moody, "Motorized Artillery," 10-11; Webster A. Capron, "Homogeneity of Field Artillery Motor Equipment," *AO* 1 (May-June 1921): 307-08; "Status of Track-Laying Vehicle Design," *AO* 2 (November-December 1921): 160; C. C. Williams, "Modern Ordnance," *AO* 5 (November-December 1924): 568; Ruggles, "Artillery Design," 18; "105-mm Howitzer Materiel," *AO* 1 (March-April 1921): 285; "Service Test of Divisional Motor Carriages." *AO* 2 (November-December 1921): 181-82.

<sup>483</sup>In late 1921, the Ordnance Department reported that it was stymied in attempts to use commercial tractors in the development of artillery tractors. Commercially, companies built tractors that were rigid in construction with a maximum speed of 5 miles an hour. The need for high-speed tractors that could pull very heavy loads, i.e. 240-mm howitzers, remained a military requirement. High-speed tractor development and production did not become a reality until 1942. Most American artillery tractors in World War II were modified versions of tanks. "General Williams Urges Mechanized Development," *AO* 10 (January-February 1930): 252. Capron, "Caterpillar Tractors," *AO* 1 (January-February 1927): 273; C.

To move their weapons with a more reliable tracked vehicle, artillery officers chose the tractor. Advantages of tractor-drawn artillery included weighing less than a self-propelled system making it more practical to cross bridges, available for other tasks when not pulling its weapon, and perhaps most importantly, if a tractor became broken, another tractor could be used to move its assigned weapon. If a self-propelled mount became inoperable, the weapon and vehicle both became a casualty. After extensive testing, the Field Artillery Board judged tractors acceptable as prime movers, and in 1928, the Caterpillar 35 (2½-ton) became the standard tractor to pull light artillery. Later that same year, the Field Artillery adopted the Caterpillar 30 (5-ton) for medium artillery, and the Caterpillar 60 (10-ton) for heavy artillery.<sup>484</sup>

Senior officers favored the use of trucks and tractors over horses for medium and heavy artillery transport.

Motorized and mechanized vehicles had a number of advantages over horses: they were cheaper to operate, required less fuel and maintenance, shorter training time, were easier to transport by rail and water, and were less vulnerable on the battlefield.<sup>485</sup> But artillery officers were far less unanimous in deciding whether motors were better than horses for divisional light artillery. At the

C. Williams, "Mechanization: The New Era of the Armored Fighting Vehicle," *AO* 9 (March-April 1929): 301-2; Colby, "The Guns Must Travel Fast," 348.

<sup>484</sup>William B. Dunwoody, "Problems of Mobility in Motorized Artillery," *FAJ* 15 (July-August 1925): 331; "Annual Report of the Chief of Field Artillery for 1925-1926," 6; William Bryden, "The Present Status and Future Development of the Field Artillery," AWCL, 25 September 1928, MSL, 4; "Annual Report of the Chief of Field Artillery – 1929," *FAJ* 20 (January-February 1930): 15. After the Caterpillar Company bought the Holt Company, the Holt 35 became the Caterpillar 35.

<sup>485</sup>W. R. Conolly, "Motor Transportation for Artillery," *FAJ* 9 (July-August 1919): 275; Capron, "Ordnance Motor Equipment for Artillery Transport," *FAJ* 10 (September-October 1920): 467; Moody, "Motorized Artillery," 9.

Field Artillery School, Lieutenant Colonel Fred T. Austin confirmed the consensus opinion of the senior artillery leadership: "Many predictions have been made that the days of the horse, as far as his use with the Field Artillery is concerned, are numbered, and that in the near future all types of Field Artillery carriages will be motor drawn. While it is possible that, soon or later, mechanical traction will entirely replace the horse, and I think experiment should be continuously carried on to that end, it is apparent that the time has not yet arrived when we can safely abolish animal traction for our light regiments."<sup>486</sup> In his 1923 annual report, Chief of Field Artillery Snow observed that tractors had proven themselves to be "reasonably reliable means of transportation," but maintained that "artillery in divisions should be horse-drawn, and not motorized."<sup>487</sup> The fact that senior artillery officers still favored horses to pull divisional artillery is not surprising. The Caliber Board, composed of officers whose careers started in the horse artillery, refused to embrace mechanization fully and chose a compromise: "While there is no question that the tendency is towards complete motorization, the Board, from a result of its investigation, does not feel justified at the present time in recommending complete motorization of all division artillery."<sup>488</sup> This unswerving belief in the superiority of horse-drawn divisional artillery even caused the Chief of Field Artillery to direct the 75-mm gun demonstration battalion at the Infantry School to make the costly

<sup>486</sup>Fred T. Austin, "Artillery Harness and Animal Traction," *FAJ* 11 (January-February 1921): 1. Austin became the Chief of Field Artillery in 1928, but became ill and retired early in 1930.

<sup>487</sup>"Annual Report of the Chief of Field Artillery, 1923," *FAJ* 14 (March-April 1924): 117.

<sup>488</sup>William T. Carpenter, "Self-Propelled Track-Laying Artillery: Part II. 'The Self-Propelled Track-Laying Gun Mount,'" *AO* 2 (November-December 1921): 159.

conversion from tractor-drawn to horse-drawn in 1927. For senior officers, tractors and trucks were still inadequate to support the infantry.<sup>489</sup>

In contrast to their superiors, junior officers touted the merits of motors over the horse. Captain Christiancy Pickett, 83<sup>rd</sup> Field Artillery Regiment, wrote in the 1923 *Field Artillery Journal* that "it may be argued that green and undisciplined men will also work havoc with motor transport. True. But then how much easier for our great industrial nation to replace motor vehicles as they wear out in war than to replace horses, who have to be bred, raised, broken and trained to harness. And how much quicker it is to repair a burned-out bearing than to knit a broken bone!... Finally, a new motor vehicle will stand up with a certain amount of repair through months of neglect and poor lubrication, while the life of a hungry tired, rain-soaked horse is a matter of days, and when he falls he has to be destroyed."<sup>490</sup> For the younger generation of officers, there was little debate about the superiority of the truck and tractor. They pointed out that a failure to modernize risked that their army would find itself once again the second-rate military power it had been at the beginning of World War I.<sup>491</sup>

<sup>489</sup>In the summer of 1926, the Chief of Field Artillery asked the Chief of Infantry to convert the field artillery demonstration battalion at the Infantry School from a tractor-drawn to a horse-drawn unit. The Chief of Field Artillery reasoned that because the Infantry School dealt primarily with the infantry division, that the artillery unit should be "typical" of what was in an infantry division Table of Organization - a horse-drawn direct support battalion. A year later in July 1927, the 1<sup>st</sup> Battalion, 83<sup>rd</sup> Field Artillery, field artillery completed its conversion. Chief of Field Artillery to Chief of Infantry, Memorandum, Subject: Change of Eighty-Third Field Artillery from Tractor-drawn to Horse-drawn, 2 July 1926, File #322.012.012/E, Box 22, E 34, RG 177, NARA; "83<sup>rd</sup> Field Artillery Now Horse-drawn," *FAJ* 17 (July-August 1927): 427.

<sup>490</sup>Pickett, "Remarks on the Operation of Motor Materiel," *FAJ* 13 (July-August 1923): 323.

<sup>491</sup>Malcolm R. Cox, "Operation and Maintenance of Motor Vehicles," *FAJ* 19 (January-February 1929): 1-2.

Concurrent with its efforts to develop self-propelled guns and tractors, the Field Artillery sought better trucks. The Ordnance Department believed that the commercial development of 6-wheel trucks provided excellent candidates for artillery prime movers. As had been the case with tracked vehicles, the Field Artillery Board and field units conducted extensive road tests immediately after the war and throughout the interwar period. The typical army cargo truck was a six-wheel (2x4) vehicle with two-front-free spinning steering wheels with a dual set of rear drive wheels.<sup>492</sup>

The first postwar military truck was the Militor, a four-wheel drive cargo truck designed in World War I and produced after the Armistice. Tested by the Field Artillery Board at Fort Bragg, the truck proved superior to commercial models, but still was difficult to repair, lacked sufficient power, and had a defective gearbox. Reasoning that Army-built vehicles such as the Militor would prove to be too expensive to produce and maintain, the Army turned to private industry, confident it would provide cheaper and better vehicles. Consequently, the Quartermaster Corps, along with the Field Artillery, embarked on a two decade long campaign, to test, modify, and procure commercial trucks as prime movers at the Field Artillery School, Fort Bragg, and with artillery units in the field. Manufacturers such as Ford, General Motors, Dodge, Coleman, and White all provided trucks. The majority of Field Artillery Board reports deemed these commercial trucks as adequate for movement on improved road, but they never met the

<sup>492</sup>John J. McCollister, "Motorized Artillery in the Field," *FAJ* 13 (May-June 1923): 219; Barnes, "A New Weapon," 391-92, 397.

envisioned standard of horse-drawn or tractor-drawn artillery over rough battlefield terrain.

To bridge this gap between the tractor and the truck, the Field Artillery experimented with, and then adopted an organization known as portéed artillery – a cargo truck with a tractor in the cargo bed and a gun towed behind. Moving long distances over improved roads, a battery then unhitched its guns and used the tractor to move them cross-country into firing positions. A portéed battery appeared to fulfill the need for strategic and tactical mobility. The road march of Captain Edward F. Hart's portée battery became a celebrated event in the motorization of the Field Artillery. In September 1927, Hart's battery drove to 1<sup>st</sup> Cavalry Division maneuvers near Marfa, Texas, to test the capabilities and limitations of tanks and motorized artillery. Using 3-ton Liberty trucks, Hart's battery traveled 650 miles from Fort Sill, Oklahoma, participated in the maneuvers, and returned with only minor mechanical problems. The Quartermaster Corps and Ordnance Department admired the effort, but ruled that the battery commander's use of the portée configuration put undue stress on the trucks. In fact, the Quartermaster General, Major General Benjamin F. Cheatam, argued that the trip had not proven anything.<sup>493</sup> Artillery officers disregarded the Quartermaster and Ordnance Department responses, and remained convinced that Hart's success

<sup>493</sup>Report of March of Motorized Battery from Fort Sill, Oklahoma to Marfa, Texas, 3<sup>rd</sup> Indorsement, 15 December 1927, File #451-B-1-aa/RA, Box 68, E 34, RG 177, NARA.

represented an acceptable interim solution to solve the artillery's operational and tactical transportation conundrum between using trucks and tractors.<sup>494</sup>

In the summer of 1929, after a decade of experiments with tracked vehicles, trucks, and reconnaissance cars, the War Department put into action the recommendations of the Mechanized Development Board and formed a mechanized force to undergo exercises at Fort Meade, Maryland. Using 75-mm guns drawn by Caterpillar "20" tractors and portéed on Class B Liberty trucks, a battery from 6<sup>th</sup> Field Artillery once again proved the merits of mechanization. In his 1929-1930 annual report, Chief of Field Artillery, Major General Fred T. Austin agreed that some divisional artillery battalion should be motorized, but pointed out that insufficient funds had already taxed available maintenance funds and prevented procurement of new motor equipment to replace worn out vehicles. It was "most inadvisable" to proceed with the partial motorization of horse-drawn units.<sup>495</sup> His successor, Major General Harry G. Bishop, acknowledged that the field artillery transport problem would "remain for some time in a state of flux ... While the principal foreign nations seem to be deeply interested in complete motorization, they also seem loath to give up the tried and true means of transport of divisional troops, the horse, and the question is still unsettled in

<sup>494</sup>By 1935, the Chief of Field Artillery considered ported artillery as obsolete with the development and use of commercial trucks. The Cavalry, Field Artillery and the Quartermaster Corps also experimented with trucks and trailers to move horses for long distances. "Tanks and Motorized Artillery Participate in Cavalry Maneuvers" *AO* 8 (November-December 1927): 186-87; William Bryden, "The Present Status of Future Development of the Field Artillery," 25 September 1928, Lecture, MSL, 6; Henry C. Lodge, Jr., "Cavalry "Marches" on Wheels," *AO* 14 (November-December 1933): 135-139;

<sup>495</sup>"The Annual Report of the Chief of Field Artillery – 1929," *FAJ* 20 (January-February 1930): 23.

our service."<sup>496</sup> Bishop realized that his branch would not have time during a national mobilization to train recruits accustomed to trucks and automobiles to handle horses.

In August 1930, the War Department directed that the Chief of Field Artillery "to settle upon the nature of the prime mover to be employed in the 108 regiments of 75-mm divisional artillery" and "formulate and conduct a comprehensive test which will involve the employment of both animal and mechanical power under identical conditions."<sup>497</sup>

After observing a light commercial 2 x 4 truck with a Hopkins traction device mounted on the rear dual wheels successfully pull a 75-mm gun over a difficult course at Aberdeen Proving Ground, Bishop became inspired about the possibilities of using these light trucks for the artillery. The Chief of Field Artillery announced his mechanization policy in his 1931 annual report: "I want to be able to fill all motor requirements in the Field Artillery from vehicles which may be found on the streets of any American city and whose spare parts and accessories are found in a multitude of repair shops."<sup>498</sup> Putting substance behind his words, the Chief requested \$12,000 from the War Department on

<sup>496</sup>"Annual Report of the Chief of Field Artillery – 1930," *FAJ* 21 (January-February 1931): 12. U.S. Army officers followed closely the mechanization efforts of European armies. Drawing especially close scrutiny was the British mechanization effort. British officers and theorists writings could be found in almost every issue of the *Field Artillery Journal* in the late 1920's and early 1930's. "Permanent Mechanized Force Recommended for United States Army," *FAJ* 19 (January-February 1929): 46; Burton O. Lewis, 'The Mechanized Force, U.S. Army.' *AO* 11 (May-June 1931): 430-3; L. R. Cole, "All-Purpose Artillery Traction," *FAJ* 19 (November-December 1929): 644.

<sup>497</sup>Competitive Test of Motorized and Horse-drawn Field Artillery, 5 August 1930, File # 537.3/C-2. Memorandum, Subject: Motorization of Light Field Artillery, 1 September 1931, File # 537.3/B-1, both found in Box 127, E 34, RG 177, NARA. Bishop also wanted to experiment with the truck battery because he knew that tractor-drawn artillery was too noisy and slow, while portéed artillery was doubtful on poor roads.

<sup>498</sup>John H. Wallace. "Test of the Truck-Drawn 75mm Battery," *FAJ* 23 (July-August 1933): 301; 'The Annual Report of the Chief of the Field Artillery – 1931,' *FAJ* 21 (November-December 1931): 595.

31 September 1931 to procure eleven 1½-ton trucks and five station wagons. Gaining support from the Army General Staff, Bishop received the funds, competed the contract, bought the trucks from Ford, and modified them for artillery operations – brush guards to protect lights and the radiator, a multi-gear transmission for forward and reverse, and a heavy-duty trailer hitch. When asked by a Congressman William C. Wright of Georgia how he went about deciding to procure commercial trucks for testing, Bishop replied: "You can obtain that information by standing in any window and watching these trucks running through the streets."<sup>499</sup> Seven months later, the Field Artillery Board signed for four 1½-ton Ford trucks with 75-mm guns in tow to begin testing.<sup>500</sup>

In the test directive to the Field Artillery Board, the Chief of Field Artillery outlined a basis for the considering commercial trucks as prime movers for divisional batteries: "rapid diminution of the horse population of the United States, probable industrial and mechanical development of the country, probable experience and aptitude of the M-day [mobilization of all army forces] American soldier, probable facilities for motor vehicles during the next decade."<sup>501</sup> Fully manned and equipped, the "Ford Battery," began testing in the summer of 1932. In conjunction with the truck-drawn battery, the Board would also test a similarly equipped horse-drawn battery for

<sup>499</sup>House Committee on Appropriations, *War Department Appropriation Bill for 1933: Hearings on H.R. 11897*, 72<sup>nd</sup> Cong., 1<sup>st</sup> Sess., 1932, 672.

<sup>500</sup>W. C. Dunckel, "The Truck-drawn Battery," *FAJ* 22 (May-June 1932): 252-53; House Committee on Appropriations, *War Department Appropriation Bill for 1935: Hearings on H.R. 8471*, 73<sup>rd</sup> Cong., 2<sup>nd</sup> Sess., 1934, 315-16.

<sup>501</sup>"Tests of the Truck-drawn Battery," *FAJ* 22 (July-August 1932): 430.

comparative evaluation. Bishop, not hiding his intent, restated his guidance to the Board: "It is the mission of the Board to bring to a successful conclusion the preliminary work started in this office for the production of the Division Truck-Drawn Light Battery."<sup>502</sup>

The Field Artillery Board oversaw the testing of using standard commercial 1½ ton trucks to tow a battery of 75-mm guns trucks. Starting on 1 June 1932 at Aberdeen Proving Grounds, the battery traveled over three thousand miles on unimproved roads and through the sand, marshes, and forests of Fort Bragg, North Carolina. To test the practicality of the truck in winter conditions, the Board directed that the battery go Fort Ethan Allen, Vermont. Taking an advantage of a chance to show case the Field Artillery to Congress and the public, the convoy made a stop in Washington in early January 1933. The editor of the *Army Ordnance* stated that:

The outstanding characteristic of the test battery is that all sixteen automotive vehicles are standard commercial trucks and station wagons. The wisdom of the policy of using commercial equipment whenever possible for military use was established long since ... With our unsurpassed commercial automotive facilities and the alertness of our automotive designers and engineers, the national defense rest upon a firm foundation when its needs are drawn from everyday commercial sources which make unnecessary special military designs ... We are quite content to believe that in nine cases out of ten standard commercial 'jobs' will fill the Army's needs. Only in those categories where there is no commercial production need the military establishment spend its effort and money on special designs.<sup>503</sup>

<sup>502</sup>Ibid., 432.

<sup>503</sup>"An Exhaustive Field Artillery Test." *AO* 13 (January-February 1933): 232.

In February 1933, the battery convoyed to Fort Ethan Allen for two weeks of testing on snow and ice-covered mountain roads. After successfully completing tests, the battery returned to Fort Bragg before going to Fort Sill for additional testing.<sup>504</sup> The Chief of Infantry, Major General Paul B. Malone, lauded Bishop's effort to ensure that the artillery could overcome the problems it experienced in World War I and hailed the battery as "the most valuable contribution as yet developed in the American Army" to aid the infantry soldier.<sup>505</sup> The Chief of Field Artillery, enamored with his pet project, expanded the truck-battery to a battalion and purchased an additional six trucks to test a truck-drawn 105-mm battery. The truck battery's success and the envisioned financial savings to maintain trucks instead horses encouraged the Chief of Militia Bureau, Major George E. Leach, to convert nearly half of the National Guard horse-drawn and tractor-drawn light artillery units to light-trucks in 1933.<sup>506</sup>

In an interim Field Artillery Board Report on the truck-drawn battery, the Board sifted through all the issues and concluded: "The most serious considerations has been given the ability of the light truck-drawn battery to function as divisional field artillery. The battery has successfully executed all missions presented to it in typical tactical situations involving logical missions for divisional light artillery." The board deemed

<sup>504</sup>"Test of Light Truck-drawn Battery at Fort Ethan Allen," *FAJ* 23 (March-April 1933): 195-97.

<sup>505</sup>Paul B. Malone. "The Significance of the Truck-Drawn Battery of 75mm Guns," *FAJ* 23 (May-June 1933): 208.

<sup>506</sup>After converting the National Guard to truck-drawn units, the savings were reported to be as high as three quarters of a million dollars a year. "Truck-Drawn 75mm Gun Battery and Battalion," *FAJ* 23 (May-June 1933): 293; "Truck-Drawn National Guard Field Artillery Units," *FAJ* 23 (July-August 1933): 388.

the battery's performance as "highly satisfactory," but was "not ready to recommend substitution of this equipment to replace horse-drawn artillery." To which Bishop judged the Board finding as "indecision and passing the buck."<sup>507</sup> For Bishop, his idea had proven successful beyond his highest expectations.

In 1933, Secretary of Interior Harold L. Ickes stated publicly that the Army and Navy modernization programs "had no chance" in view of all President Franklin D. Roosevelt's economic recovery programs.<sup>508</sup> But the secretaries of War and Navy both backed their modernization program as necessary for national defense. More importantly, the military programs were necessary for employment, and on this basis they found the necessary support in Congress. The Army received ten million dollars with \$1.25 million earmarked for Field Artillery transportation.<sup>509</sup>

<sup>507</sup>Field Artillery Board, Report of Test of: "Light Truck-Drawn Battery, 15 February 1933, General Bishop's Copy, File # 537.3/B-11/D. Box 127. E 34, RG 177. NARA.

<sup>508</sup>"Mechanization and Motorization," *AO* 14 (September-October 1933): 100.

<sup>509</sup>In response to the restricted budget environment and reduced training ammunition allotments. General Bishop experimented with a miniature trainer to simulate the French 75-mm gun. After various prototypes, design modifications, and test firings, the Ordnance Department Chief Engineer built the Field Artillery Training Gun, M-2, for use by Regular Army, National Guard, and Reserve Officers' Training Corps. Using a standard 75-mm gun gunner's quadrant with an attached modified .22 rifle, the trainer fired a 1-inch steel ball that simulated the 75-mm gun at a 1/100 of its range. The simulator possessed all the characteristics of a gun mount in elevating and traversing a gun tube. With four M2 simulators mounted on a single base, a user could replicate an entire firing battery. The M-1 simulator reduced the need for training ammunition and allowed officers and students to practice the procedures to adjust fire on a terrain board. Not intended to replace actual gunnery, the low-cost and easily manufactured system nonetheless permitted a higher level of artillery training than "dry" fire missions. Bishop considered this his second best achievement as the Chief of Field Artillery after the Ford Battery. D. A. Gurney and T. A. Conlon, "A Miniature French 75," *AO* (November-December 1933): 158-60. Gurney and Conlon designed the M2 trainer; Richard B. Cowdery, "Firing in Your Own Backyard," *FAJ* 34 (January 1944): 59-60; "The Field Artillery Trainer," *AO* 14 (November-December 1933): 166-67; "The Annual Report of the Chief of Field Artillery – 1933," *FAJ* 34 (January-February 1934): 21; "Mechanization and Motorization," 100; "Forecast of Field Artillery Progress During the Next Five Years," *FAJ* 23 (November-December 1933): 510; House Committee on Appropriations, *War Department Appropriation Bill for 1935: Hearings on H.R. 8471, 73<sup>rd</sup> Cong., 2<sup>nd</sup> Sess., 1934*, 316.

At the end of his tenure as Chief of Field Artillery, Bishop had firmly put the Field Artillery on the road to motorization. Ironically, for all the success and support of he gave his experimental commercial truck battery, Bishop still believed that the horse was superior. Writing to the Fort Leavenworth artillery liaison officer in January 1933, Major Edwin P. Parker noted that the Chief of Field Artillery was "not ready to state that a motor vehicle has been found which can provide the necessary tactical mobility for division artillery."<sup>510</sup> In a statement before Congress in February 1934, Bishop announced he was pleased that the War Department had decided to retain one horse-drawn regiment per division. The Chief of Field Artillery reasoned that with a horse-drawn battery commander could survey difficult terrain to determine whether he could put in his battery in position and could definitely say "yes" or "no," but with a motorized battery, he must say: 'Maybe, I can get there.'<sup>511</sup> Despite the misgivings of the chief, the reality was that the horse was fast becoming obsolete. An anonymous *Field Artillery Journal* writer observed: "It is essential that the Field Artillery avail itself of the superior status of the automotive industry in this country. Recent tests indicate that the horse, as a means of field artillery transport, must go, and that the arm is now faced with the task of radically modifying its tactical and strategical doctrines due to this revolutionary change."<sup>512</sup>

<sup>510</sup>Parker to Huntley, letter, 25 January 1933. File # 322.991/C, Box 23, E 34, RG 177, NARA.

<sup>511</sup>House Committee on Appropriations, *War Department Appropriation Bill for 1935: Hearings on H.R. 8471*, 73<sup>rd</sup> Cong., 2<sup>nd</sup> Sess., 1934, 316.

<sup>512</sup>" Forecast of Field Artillery Progress During the Next Five Years," 510.

Bishop's motorization efforts were not appreciated by the incoming Chief of Field Artillery, Brigadier General Upton Birnie (1934-1938). Knowing that the War Department mandated motorization, Birnie still refused to accede that his branch would become completely motorized: "No one knows where our next theater of operations will be located, nor its suitability for the use of motor-drawn artillery or for horse-drawn artillery. By not replacing the horses by motors, we retain a nucleus to serve, if it be found necessary, as a framework for expansion."<sup>513</sup> Refusing to look outside his office window as Bishop had to realize the progress in vehicles, Birnie instead looked to his past as a horse artillerymen. Whether it was the retirement of senior horse-drawn artillery officers, the success of the commercial truck battery, and the increasing improvements in truck transportation, the superiority of the truck-drawn over horse-drawn were indisputable: a horse-drawn battery on hard surfaced road could at best average twenty-three miles a day, while a truck-drawn battery could travel over three hundred miles.

In addition to internal catalysts for change, the Field Artillery now had to comply with the 1 December 1934 War Department announcement regarding the Army's policy for mechanization and motorization. For the Field Artillery, it equated to converting all

<sup>513</sup>Birnie, "Developments in Organization, Armament, and Equipment of the Field Artillery," AWCL, 20 September 1934, G-3 Course, No. 5, 1934-1935, MHI, 5-6. With the reduction of horse towed artillery units and motorization of all service batteries, the Field Artillery significantly reduced its manpower requirements. The exceptions were the pack artillery battalions. Much to the chagrin of the Chief of Field Artillery, the surplus of men did not go to undermanned artillery units. The surplus did not include experienced non-commissioned officers, the primary trainers of gun crews to build new units. Decreasing the manpower even further, the War Department assigned the majority of these surplus soldiers to other branches. To compensate for the shortfall in men, the Chief of Field Artillery directed only two active batteries per battalion and consolidated regimental, battalion, and combat trains headquarters. Bishop, "Notes on War College Lecture," 1933, MSL, 18.

tractor-drawn units to truck-drawn, one-half of the horse-drawn artillery to truck-drawn, and all National Guard artillery units to truck-drawn.<sup>514</sup> An anonymous *Field Artillery Journal* writer in 1935, in a lighthearted piece entitled "Confessions of an Ex-Horseman," made it clear that truck-drawn artillery was gaining favor even among those who once favored the horse: "I merely contend that the object of any field artillery prime mover is to place a given gun in a given position at a given time and that the truck will do this with more speed, in greater comfort and with less general all around fuss and bother than the horse. 'Romance,' say you, 'tradition?' What place have these amid the stem realities of modern war... Time marches on!"<sup>515</sup>

The implementation of motor vehicles within the field artillery organizational structure was not as easy as turning in the horses and signing for the trucks. Though a unit could convert from horses to mechanization or motorization, it often was short the number of vehicles required to complete its mission. Before the October 1929 Stock Market Crash and War Department's concerted motorization effort, the Army did not have enough funds to modernize and maintain its vehicle fleet. In the four fiscal years (Fiscal Years 1924 to 1928) before the market crash, the Quartermaster Corps only received two thirds of its request to procure new vehicles, and in one extreme case (Fiscal Year 1926) the Quartermaster Corps received only a third of the funds it

<sup>514</sup>Not all field artillery units converted. Notable exceptions were pack and cavalry artillery units. Harry B. Allen, "The Maintenance of Field Artillery Motorized Units and the Control of its Supply Trains," *FAJ* 26 (May-June 1936): 239.

<sup>515</sup>"Confessions of an Ex-Horseman," *FAJ* 25 (July -August 1935): 344. Carl A. Shem, "Notes on a Regimental March, Truck-Drawn," *FAJ* 25 (November-December 1935): 568-71; Pierre Mallett, "A March on Hard Surfaced Roads," *FAJ* 25 (November-December 1935): 572-77.

requested for repairing Army vehicles. The Chief of Field Artillery for most the 1920's bemoaned the fact that his branch had inadequate funds to maintain or replace his aging vehicle fleet.<sup>516</sup>

In addition to the monetary issues, the use of tracks and trucks equated to new instruction in the classroom and negotiating who would fix what on a vehicle. After much debate in the early 1930's, the Ordnance Department and Field Artillery had shifted the maintenance responsibilities from the vehicle driver to the Army Depot. For the Field Artillery, the challenge was who had the responsibility to conduct repairs above the basic replacement of tires, belts, and lights. The Field Artillery would argue strenuously that it had neither the time nor personnel to repair its vehicles beyond the battalion level. The issue was more than who conducted the major repairs, for both the Quartermaster and Field Artillery realized that the organization that repaired the vehicle mostly likely incurred the costs.<sup>517</sup> It would not be until 1937 that Army the implemented a coordinated system of maintenance.

Ignoring both the War Department's directive for motorization and his own admission that a truck-drawn unit had superior strategic mobility, and "reasonably satisfactory" for tactical movement, Chief of Field Artillery Birnie still believed horse-

<sup>516</sup>C. C. Park, "Motor Maintenance," *FAJ* 15 (September-October 1925): 492-504; Report of March of Motorized Battery from Fort Sill, Oklahoma to Marfa, Texas, 3<sup>rd</sup> Indorsement, 15 December 1927, File #451-B-1-aa/RA. Box 68, RG 177, NARA.

<sup>517</sup>The Army had five maintenance echelons: The first and second, within the battalion (driver and unit maintenance), with third echelon at the division (medium maintenance) and corps (heavy maintenance) - major repairs and component replacements, with fifth echelon at Army Depot level - rebuilds, salvage. J. E. Lewis, "Field Artillery Motor Maintenance," *FAJ* 25 (January-February 1935): 10; John H. Wallace, "The Maintenance of Field Artillery Motorized Units and the Control of its Motorized Supply Trains," *FAJ* 25 (March-April 1935): 173-77.

drawn artillery had superior tactical mobility.<sup>518</sup> To compare the two, the Field Artillery School assigned a horse-drawn regiment and motor-drawn regiment for extensive testing at Fort Sill throughout the spring and summer of 1935. After observing both regiments during a five day exercise at the post, Birnie judged the horse-drawn artillery tactically more proficient.<sup>519</sup>

On the other hand, the comparative evaluation results persuaded the Field Artillery School Commandant, Brigadier General Harry W. Butner, to conclude: "truck-drawn units have a marked advantage."<sup>520</sup> Consequently, Butner recommended that "trucks should replace animal-drawn vehicles in combat and ammunition trains, in regimental headquarters and service batteries and be used as prime movers replacing tractors in tractor-drawn 75-mm gun units."<sup>521</sup> Confirming the commandant's assertions were his own school publications. The 1935 edition of *Digest of Artillery Developments* devoted an entire chapter to truck-drawn artillery procedures noting that there had been a "trend in professional thought is toward greatly increased speed of maneuver."<sup>522</sup> For the Field Artillery School, the immediate solution for speed was the truck, not the horse.

<sup>518</sup>Birnie, "Developments in Organization, Armament, and Equipment of the Field Artillery," AWCL, 20 September 1934, G-3 Course No. 5, 1934-1935, MHI, 11.

<sup>519</sup>Birnie, "Developments in Organization, Armament, and Equipment of the Field Artillery," AWCL, 13 September 1935, G-3 Course No. 6, 1935-1936, MHI, 13; Birnie, "Notes of Discussion Following Lecture By Upton Birnie, Jr., Chief of Field Artillery, Subject: Developments in Organization, Armament, and Equipment of the Field Artillery," AWCL, 13 September 1935, G-3 Course No. 6, 1935-1936, MHI, 5.

<sup>520</sup>1<sup>st</sup> Indorsement, Headquarters, The Field Artillery School to Chief of Field Artillery, 14 October 1935, File # 537.3/L-37. Box 128, RG 177. NARA.

<sup>521</sup>Ibid.

<sup>522</sup>U.S. Field Artillery School, 1935 *Digest of Field Artillery Developments*, 75.

Butner and the Field Artillery School were not alone in their confirmation of the superiority of the truck over the horse. Brigade and regimental commanders agreed with the school's assessment of the side-by-side comparison test. Brigadier General Robert C. Foy, 2<sup>nd</sup> Field Artillery Brigade Commander, admitted that a horse-drawn unit might move from position to position faster on a battlefield, but the collective advantages of truck drawn artillery vastly outweighed this one strength. In the 1936 prize winning *Field Artillery Journal's* 1936 essay, Captain John P. Eckert recounted a fictional war between two European countries: one that used motorization and divisional artillery composed of 105-mm and 155-mm howitzers; and the other retaining horse-drawn batteries and the 75-mm gun. The modernized country won the war. In a thinly veiled commentary, Eckert questioned the senior field artillery leadership's ability to transform the artillery into a viable and modern fighting force.<sup>523</sup> Despite the opposition of Birnie and other horse enthusiasts, the Field Artillery was rapidly transitioning to trucks. In 1935, seventy percent of the regular field artillery and a hundred percent the National Guard Field Artillery units were motorized. By 1938, over seventy-five percent of the active Army artillery was motorized with all artillery pieces, 75-mm, 105-mm, 155-mm guns and howitzers modified for high-speed towing.<sup>524</sup>

<sup>523</sup>John P. Eckert. "Trace Chains and Caissons Farewell," *FAJ* 26 (March-April 1936): 117-40.

<sup>524</sup>Robert C. Foy to Birnie, 24 December 1935, File # 537.3/L-7; C. D. Herron to Birnie, 9 December 1935, File # 537.3/L-7; A. F. Brewster to Chief of Field Artillery, 20 December 1935, File # 537.3/L-7, all found in Box 128, RG 177, NARA; Birnie, "Developments in Organization, Armament, and Equipment of the Field Artillery," AWCL, 13 September 1935, G-3 Course No. 6, 1935-1936, MHI, 2-3,6; Birnie, "Field Artillery Developments in Employment, Armament and Organization," AWCL, 14 October 1937, G-3 Course No. 13, 1937-1938, MHI, 9; Malin Craig, "The Military Establishment," *AO* 19 (January-February 1939): 204. Another huge advantage of truck-drawn artillery was that it reduced a unit's manning requirements by twenty percent.

The support of many senior field artillery leaders for horse-drawn artillery did not end with Birnie's retirement. The last interwar Chief of Field Artillery, Major General Robert M. Danford (1938-1941), an accomplished horseman, reasoned that because the National Guard was completely motorized, it was the responsibility of the Regular Army "to keep the torch of horsemanship burning against the day when horse-drawn artillery may yet be found indispensable in war."<sup>525</sup> He postulated that it was a "comparatively simple matter to change existing horse-drawn units into motorized units" but the ability of the Field Artillery to secure a considerable supply of young men with extensive horsemanship experience would be a "sorry" effort.<sup>526</sup> In a November 1938 memorandum to the Commandant of the Field Artillery School, the executive for the Chief of Field Artillery explained that the Chief of Field Artillery "repeatedly and strongly" opposed complete motorization because "in the event of war, all field artillery can readily be motorized if same proves out as practicable or desirable, but that, on the contrary, horse-drawn artillery can be effectively and efficiently mobilized in war only if there are on hand and available, sufficient Field Artillery officers of the Regular Army capable of handling horse-drawn artillery with the high efficiency traditional in our service."<sup>527</sup>

<sup>515</sup>Danford, "Developments in Organization, and Employment of Field Artillery," AWCL, 28 September 1938, G-3 Course No. 9. 1938-1939, MHI, 12.

<sup>526</sup>Ibid.

<sup>527</sup>Memorandum, Subject: Motorization of Field Artillery Units, 1 November 1938, File # 537.3/C-6, Box 127, RG 177. NARA.

The retention of the horse-drawn artillery changed after Germany's invasion of Poland in September 1939. The speed at which a mechanized and motorized force could advance demanded an artillery force that could move with it – horse-drawn artillery certainly could not. Development and production of new weapons and vehicles now became a national priority without monetary restraint. In his 1939 year-end message in the *Field Artillery Journal*, Danford declared "Transportation, not expected a year ago, is now on the way, and weapons of new manufacture and new design are being pushed for us by the Ordnance Department."<sup>528</sup> Throughout 1940, 1941, and 1942, the *Field Artillery Journal* became a virtual ordnance brochure describing new guns, howitzers, and vehicles. New more powerful vehicles now included 6-wheel drive trucks and a high-speed tractors to pull medium and heavy artillery. From this point, the interwar period of equipment development ended, the Army was now preparing for war.<sup>529</sup>

It would be easy to charge that the Chiefs of Field Artillery should have been more aggressive to modernize their branch. With an Ordnance Department developing few experimental test models and a Congress unwilling to fund the procurement of new weapons, artillerymen had no choice but to go with what was available and possible. Even with these handicaps, the Field Artillery continued to test, evaluate, and recommend the equipment it would need to fight in the next conflict. The mainstays of the American divisional artillery, the M1 105-mm howitzer (towed and self-propelled),

<sup>528</sup>Danford, "Message from the Chief of the Field Artillery," *FAJ* 29 (November-December 1939): 468.

<sup>529</sup>House Committee on Appropriations, *Military Establishment Appropriation Bill for 1940: Hearings on H. R. 4630*, 76<sup>th</sup> Cong., 1<sup>st</sup> Sess., 1939, 485-88; "Under Service and Supplies," *AO* 19 (May-June 1939): 363-64.

M1 155-mm towed howitzer, M2 155-mm towed gun "Long Tom," all stemmed from the research, testing, and production on the drawing boards and arsenals of the Ordnance Department and tested on the ranges at Fort Sill and Fort Bragg. Snow, in his 1925-1926 annual report, captured the essence of the Field Artillery modernization program in the interwar period: "the present economy régime indicates that it is impossible to hope for any considerable production of newly developed materiel and equipment. Under these circumstances our energies should be directed principally to development and standardization with a view to making production of improved models immediate and rapid when an emergency arises, or circumstances permit us to enter upon a production basis."<sup>530</sup> Indeed, this is what constituted materiel modernization for the Field Artillery between World Wars I and II.

<sup>530</sup>"The Annual Report of the Chief of Field Artillery for 1925-1926," 11.

## CHAPTER IX

### CONCLUSION

*That there was no substitute for massed artillery fires.*

*That these fires played a major role in the advance of our troops and in breaking up and disorganizing enemy counterattacks.*

*That these fires were carefully controlled and readily shifted to the desired location.*

*That these fires were available, on short notice, during all hours of the day and night and in all kinds of weather.*

*That the flexibility of organization permitted the massing of artillery units behind armies, corps and divisions, and insured the maximum support for the main effort.*

*The General Board  
United States Forces, European Theater  
1945<sup>531</sup>*

The spectacular success of the American field artillery in World War II was not the result of an instantaneous transformation that occurred during the 1939 to 1942 mobilization of the U.S. Army, but the culmination of a concerted interwar effort by artillery officers to improve their branch. A successive chain of Chiefs of Field Artillery shaped and oversaw a modernization program which improved, and at times hindered, the three imperatives of the artillery mission: shoot, move, and communicate. Major General Harry Bishop, Chief of Field Artillery (1930-1934) captured the mood of interwar field artillery when he said, "the arm can no longer be criticized for absence of

<sup>531</sup>General Board, Study No. 61, *Report on Study of Field Artillery Operations*, 106.

the proper doctrines and principles, nor for lack of methods to carry these doctrines and principles into effect. There is no abatement in its enthusiastic efforts to improve."<sup>532</sup>

Some artillerymen refused to replace their horses with trucks, innovative gunnery instructors encountered those hostile to battalion centralized fire direction, airmen rebuffed the artillery's effort to control their own airplanes, and the artillery leaders only put their men with the frontline infantry companies when war forced their hand. External and external organizational obstacles aside, interwar field artillery officers did make considerable improvements in their branch's ability to support the infantry.

This work has used the Field Artillery as a lens to evaluate the Army's interwar transformation and used four case studies: post World War I artillery doctrine, the Fire Direction Center (FDC), the artillery observer, and materiel development. All four reflect different examples of a military organization confronting change during peacetime. In the first instance, postwar artillery doctrine, it was an internal argument that not only influenced interwar artillery tactics and techniques, but reflected how artillery officers envisioned themselves supporting the infantry. The first doctrinal challenge was between senior leaders, such as Chief of Field Artillery William J. Snow (1918-1928) and others who wanted to return to pre-World War I tactics, and those officers who touted the "modern" techniques of trench warfare. Snow and his adherents unswervingly held the position that trench warfare robbed the artillery of its offensive spirit. Officers who served in the trenches of World War I realized that "open warfare"

<sup>532</sup>Bishop, *Field Artillery: King of Battles*, 9.

was inadequate on a modern battlefield and that improved artillery techniques were needed to meet the rapid war of movement that would arise in the next conflict.

Ultimately, the Field Artillery officers intertwined Snow's "open warfare" tactics with those of the AEF. The close support solution was no longer the rapid fire of a single firing battery or the rolling barrage, but a succession of intense artillery concentrations that preceded the infantry advance. Not a monumental tactical change from the AEF methods, the evolving and continual improvement in gunnery procedures throughout the interwar period ensured that massing artillery fire in synchronization with the infantry attack plan remained the doctrinal objective. Artillery officers required an organization that could deliver these fires in a timely manner.

The focus of the second case study was the development of the FDC. Creation of the FDC was a direct result of artillery officers recognizing they needed better ways to execute fire plans and targets of opportunity. Even with such an obvious need to improve the tactics and techniques of fire direction, Field Artillery School gunnery instructors encountered stiff resistance within the School and their branch when they tried to institute the battalion FDC. Ending the battery commander's traditional role as an independent fire director was a significant organizational change and an emotional event. Senior leaders were unwilling to see a combat command that they cherished as the epitome of the field artilleryman relegated to that of a supervisor of gun crews and weapons. Yet, the incredible advantages of centralized fire direction silenced all its critics. With the FDC, one observer could call upon the guns of a battery, battalion, division, or corps. After seeing the FDC's capabilities in combat, the army's senior

leadership understood quickly the awesome combat power that they now possessed. Lieutenant General Omar Bradley, Commander of the U.S. Army II Corps in the Tunisian Campaign, remarked, "the American field artillery technique of massed fires was a major contributing factor toward the early and successful conclusion of the operation."<sup>533</sup> Bradley's peers would echo his sentiments throughout the war on battlefields in Europe and the Pacific.

The institution of aerial and forward observers considered two different organizational challenges in implementing a new observation system: external and internal. In aerial observation, the Field Artillery since World War I had tried to obtain its own organic airplanes dedicated to call and adjust artillery fire. The issue for the artillermen was not that the airplane technology was unproven; but the twenty-year turf battle with the air force community over who should own and operate the observation airplanes. With the need to rapidly expand and train its squadrons of bombers and fighters in World War II, the Air Corps shifted its attention and acquiesced control of observation airplanes to the Field Artillery. The sudden appearance of the aerial observer in April 1942 was the manifestation of the Field Artillery winning the decades long intra-Army fight as the nation hurriedly mobilized and armed itself for war. In World War II, the artillery aerial observers proved themselves repeatedly as a major reason for the artillery's success in battle.

<sup>533</sup>Omar Bradley, "Official Commendation!" *FAJ* 23 (September 1943): 652.

The integration of the artillery forward observer within the ranks of frontline infantry and armor companies was a change that the artillery had gradually moved towards, but combat hastened its implementation. Until the institution of the FDC in the middle 1930's, the artillery liaison and observation post system changed little from that of the AEF. The idea of placing a "mobile" forward observer with frontline companies germinated along with the FDC and better radios. Field artillery commanders slowly recognized the need for the forward observer to move forward with the frontline units and made them a permanent fixture within maneuver companies shortly after the U.S. Army entered World War II. Armor and infantry commanders demanded that their direct support artillery commander place his artillery forward observer within their frontline units. Though carrying out a hazardous duty, forward observers met the challenge of obtaining and implementing effective close fire support. Unencumbered by the tenuous communication organization used in World War I, field artillery observers, equipped with updated communications systems connected to a centralized fire direction system, could make quick calls for fire to mass multiple battalions. Forward observers, whether from the air or the ground, provided the infantry and armor units continuous fire support beyond the initial preplanned fires and rolling barrages. An examination of the field artillery World War II battle record reveals that the 1944 artillery manual did not overstate: "[T]he artillery forward observer is potentially the most powerful individual in the forward area. Other officers control and maneuver the fire power of platoons or companies, but the forward observer may control and direct the sledgehammer power of

all the artillery within range. Supported-unit commanders realize this and are quick to nurture and protect the artillery observer and his party."<sup>534</sup>

Finally, in the last case study, materiel modernization, post-World War I artillery officers found themselves involved in internal and external organizational disputes on how best to equip their branch in a financially restrained environment. Undoubtedly, the large surplus of World War I stocks forced senior leaders to accede that the next war would be fought with World War I equipment. Some military historians point to the use of this World War I equipment as a prime example of an organization refusing to embrace new technology. That one third of the divisional artillery in September 1939 was still a six-horse team pulling a 75-mm gun is a vivid image of an interwar army stuck in the past. However, this statistic fails to explain the entire artillery modernization effort. Interwar officers followed a standard peacetime practice of using and modifying the surplus equipment on hand, and with limited funds, initiated new projects and test models to keep materiel development abreast with advancing technology. These programs, such as the 105-mm howitzer and the 155-mm gun carriage, met their developers' intent, they dramatically reduced developmental time as American industry raced to mass produce those weapons for a mobilizing and expanding army.<sup>535</sup>

<sup>534</sup>U.S. War Department, FM 6-135, *Forward Observation*, 14.

<sup>535</sup>Danford, "The Field Artillery," AWCL, 23 September 1939, G-3 Course No. 6, 1939-1940, MHI, 11.

Without the responsive aerial and forward observers connected to the FDC, American success on the World War II battlefield is difficult to imagine. Combat reports from Allied forces and the enemy attest to the fact that American artillery dominated the battlefield and was a primary factor in American victories. That a chance reading of the World War I memoirs of a British artillery officer sparked the Gunnery Department Officers at Fort Sill led to theorize, develop, test, and teach the FDC procedures was remarkable, but not a serendipitous stroke of luck. Memoir or no memoir, American artillery officers realized that their World War I legacy of not being able to support the infantry in the close support fight needed a solution. Improving communication and transportation technologies forebode a new era of mechanized "open warfare." Field Artillery officers grasped this new reality, experimented with improved technology, tinkered with their organization and doctrine, and built the FDC to enable an artillery forward observer to call for and receive timely, accurate, and massed artillery fires. The success of the field artillery in World War II was not an overnight transformation, but the result of interwar artillery officers reflecting upon their past record and steadily improving in preparation for the war to come.

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