EVOLUTION OF THE FIELD ARTILLERY ACQUISITION BATTALION (FATAB)

A thesis presented to the Faculty of the U. S. Army
Command and General Staff College in partial
fulfillment of the requirements of the
degree

MASTER OF MILITARY ART AND SCIENCE

by
WILLIAM B. NOLDE, LTC, USA

Fort Leavenworth, Kansas
1967

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The Field Artillery Target Acquisition Battalion occupies a key position among the various agencies involved in the artillery target acquisition problem. As such, the FATAB's organizational structure, mission, and employment doctrine is being subjected to continuous evaluation and review. Proposals are made that would eliminate the FATAB as a battalion size unit assigned to the corps artillery and substitute separate field artillery target acquisition batteries at division artillery level. To properly evaluate these and other FATAB matters, it is important that the decision makers have an appreciation and understanding of the factors and experiences which have made the FATAB what it is today. With this background knowledge, the decision maker will be better able to adjudge the validity of proposed changes by correlating and analyzing them with related changes in the total military environment.

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The opinions and conclusions expressed herein are those of the individual student author and do not necessarily represent the views of either the U. S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

THESIS ABSTRACT

Artillery target acquisition is a matter of prime importance to field commanders today. The Field Artillery Target Acquisition Battalion (FATAB) occupies a key position among the various agencies involved in the artillery target acquisition problem. As such, the FATAB's organizational structure, mission, and employment doctrine is being subjected to continuous evaluation and review. From time to time, proposals are made and recommendations submitted that, if adopted, would eliminate the FATAB as a battalion size unit assigned or attached to the corps artillery and substitute separate field artillery target acquisition batteries at division artillery level. To properly evaluate these and other FATAB matters, it is important that the decision makers have an appreciation and an understanding of the factors and experiences which have made the FATAB what it is today. With this type of background knowledge, the decision maker will be better able to adjudge the validity of proposed changes by correlating and analyzing them with related changes in the total military environment. In this manner the lessons of the past, rather than being ignored, can be molded and adapted to the realities of the present and the future.

In tracing the evolution of the FATAB, books, documents, articles, and reports that reflected the changing artillery target acquisition problems, organization, and doctrine down through the years have

been examined. The circumstances which dictated the initial establishment of a type FATAB have been identified, among with an appraisal of foreign army influence in that decision. The organization, mission, and employment doctrine of the type FATAB from its initial appearance to the present have been traced. The rationale behind past FATAB changes has been identified, to include the wartime experiences which have influenced present organization and doctrine. The present organization is evaluated briefly in light of the current artillery target acquisition problem. Following is a brief of the data and findings of this historical study.

Until the dawn of the twentieth century, field artillery was essentially a direct fire weapon, and target acquisition was not a major problem. Because of late nineteenth century improvements in artillery ammunition and materiel, indirect fire became increasingly more important, and its usefullness was accepted before World War I had begun. The magnitude of the target acquisition and counter battery problem resulting from increased artillery ranges and the indirect fire technique was not anticipated by the allied powers. Flash ranging and sound ranging were developed during the early years of the war to assist in the counter battery effort. Flash ranging was an outgrowth of field survey work while the initial developmental work on sound ranging was done by the French. These techniques were fairly well perfected and accepted by both the British and the French forces by the time the United States entered the conflict. The French perfection of modern unobserved fire techniques by 1916-1917 increased the importance of such target acquisition techniques as flash and sound ranging.

The American Expeditionary Forces (A.E.F.) incorporated flash

and sound ranging sections into their artillery target acquisition and counter battery organization, although these sections were not then authorized in the United States War Department force structure. The flash and sound sections of World War I were corps of engineer units under the operational control of the Artillery Information Service. The organizational structure, operational techniques, and employment doctrine for the American flash and sound ranging sections of World War I are recorded in various A.E.F. publications. Results achieved and problems encountered were also reported.

An Observation (Flash) Battalion first appeared in the U. S. artillery force structure in 1922. The sound ranging capability was, at the same time, centralized in a separate Artillery Sound Ranging Service consisting of ten sound ranging companies. In 1930, as a result of further tests and evaluation, the sound and flash capabilities were united in an Observation (Flash and Sound) Battalion. In 1931 the separate Sound Ranging Service was eliminated.

During World War I, the artillery counter battery mission was transferred from the division artillery to the corps artillery. Postwar reviews upheld the validity of this decision. As a result, the Observation Battalion, when it appeared in the artillery force structure, was authorized for each corps artillery with an additional battalion to be found in the army artillery. The army battalion was to be used to supplement the corps artillery battalion efforts where needed.

World War II experiences produced some significant changes in the type FATAB mission and organization. The type FATAB was employed in a great variety of situations and under varying circumstances. Experience was gained in both centralized and decentralized operations.

Because the European Theater received priority on available military assets, the concentration of FATAB units was found there. The Pacific Theater experiences of World War II have made important but lesser contributions to the FATAB evolution.

The Korean War produced the first real combat test for counter battery radar and it provided further experience in FATAB decentralized operations. Fought in the shadows of the nuclear and missile age, it provided the arena for a detailed artillery target acquisition study.

The threat of nuclear weapon use has had a profound effect on artillery target acquisition thinking in the past decade. The "timeliness" and the "completeness" standards for a nonnuclear environment would be totally inadequate for a nuclear war. The greatly increased ranges of artillery missiles have further complicated the entire problem. These considerations have influenced recent FATAB developments.

A detailed analysis of the foregoing data produces the following conclusions:

1. The FATAB organization and mission that has evolved to date reflects artillery target acquisition problems and experiences faced in two World Wars and in a limited conventional war (Korea). To a lesser extent, it reflects projected requirements for this type unit on a nuclear battlefield.

2. There is little requirement for a FATAB in a low level insurgency war such as Vietnam.

3. The maximum range capability of the currently available sound, flash, and radar equipment would be a severe limitation in an active missile and rocket environment and against long range cannon.

4. The FATAB has wide responsibilities and broad artillery

missions, no longer confined to the field of hostile artillery location as was true at the time of its origin.

5. Today the FATAB is only one element in a vast artillery target acquisition complex extending throughout all levels of command. Alone, its value in an active nuclear and missile environment would be severely limited. The value of the FATAB is enhanced when it is properly meshed with the remaining target acquisition agencies found in the division, corps, and army zone.

6. The FATAB organization that has evolved today is quite flexible. It can be effectively fragmented with target acquisition batteries attached to an artillery group or to a division artillery.

7. There is no one "correct" or "best" way to deploy a type FATAB. The situation will dictate the decision. The flexibility of the FATAB is a significant asset when viewed aside the wide variations to be found in the potential battlefields of this era.

8. The FATAB cannot provide the artillery target acquisition service that would be desired in an active nuclear environment. However, its value and worth should not be measured against the nuclear standard. Until some significant target acquisition breakthrough occurs, and as long as tube artillery weapons and conventional artillery ammunition retain a useful battlefield role, the current FATAB concept appears sound. The military considerations and the battlefield experiences which have shaped its growth and molded its employment doctrine are still valid today.

The author of this thesis entered the military service in February, 1951, was commissioned in the artillery on July 1, 1952, and served with the 1st Field Artillery Observation Battalion in Korea from

June, 1953, to August, 1954. The first four months of this period in the 1st Observation Battalion were served in "A" Battery, which was under centralized control of the battalion; the last of these four months as "A Battery Commander. From September, 1953, to August, 1954, the author served as Commanding Officer of "B" Battery. "B" Battery was employed in a decentralized role directly under X Corps Artillery and later under an artillery group when X Corps was deactivated. He graduated from the Field Artillery and Surface to Surface Missile Battery Officers Course (FASSMBOC) in 1957 and the Artillery Officer Career Course in 1962. He is currently a student in the 1966-67 Command and General Staff Officer Course at Fort Leavenworth.

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INTRODUCTION

One of the major problems facing army commanders at the present time is that of artillery target acquisition. By that term is meant, very basically, the acquiring of enemy targets, including hostile batteries, in sufficient three dimensional accuracy to permit successful engagement with one or more of the artillery weapon systems available. Unless one reflects rather seriously on the state of the artillery art through the years, one might assume that the problem has been with us to some degree as long as have artillery weapons themselves. Such is not the case. Until the dawn of the twentieth century the artillery target acquisition problem, as we know it today, simply did not exist. It is a product of twentieth century change in military science—a term meant to include military doctrine, thought, and equipment technology.

An account of the evolution of the field artillery target acquisition battalion (FATAB) must of necessity then include an outline and an analysis of the entire target acquisition problem as it developed through the years. Changes in target acquisition requirements generated changes in the organization and/or procedures employed to meet these new demands. Requirement changes were affected by changes in artillery employment doctrine; which was, in turn, influenced significantly by artillery materiel developments and the changing doctrine and equipage of the associated arms.

The FATAB organization that exists today as a part of United

States artillery force structure has evolved over the years because of the changes that occurred in the areas noted above. It is the purpose of this thesis to trace the evolution of the FATAB and to identify, analyze, and appraise not only the FATAB organization itself but those various forces within our military environment that dictated the need for and influenced the development of this rather unique artillery unit—a unit which often is neither understood nor appreciated by military officers, including those of its own arm.

This paper will be divided into two parts. Part one will trace the changes in military doctrine and materiel that led to a requirement for the FATAB. It will examine the factors which influenced the type FATAB's initial establishment and employment doctrine, and it will examine the resulting organization found within and outside the artillery during World War I. The scope of part one will be broad. Foreign influence will be identified, examined, and explained.

Part two will be focused on the FATAB itself. The changes in the organization, mission, and employment doctrine of the unit will be traced, from its initial appearance in the artillery force structure to the end product as it exists today. The scope will be relatively narrow. Outside factors will be discussed only briefly and as required to identify the rationale behind specific FATAB mission or organization changes.

PART I

REQUIREMENT AND ORIGIN

CHAPTER I

ARTILLERY MODERNIZATION PERIOD 1885-1914

Over View

During the latter years of the nineteenth century and the early part of the twentieth many important changes were taking place within the artillery arm. As will be pointed out later, artillery was the focus point of a revolution in military thought and doctrine among the leading nations of Europe. Technological advances affecting military weapons and ammunition were a motivating force. The United States, as we shall see, appears to have lagged behind other world powers in exploiting the advances and achievements in materiel development that foreshadowed modern artillery weaponry.

Prelude to Change

Before beginning an analysis and appraisal of those changes which presaged and nurtured the FATAB, it is important that we understand artillery weaponry and doctrine as it existed through the nineteenth century.

Artillery Weapons

United States Civil War weapons—The United States Army ended the Civil War with thousands of artillery pieces in its inventory. These included a great variety of guns, howitzers, and mortars; primarily smooth bore, muzzle loaders but including a sprinkling of rifled

tubes. They were further broken down into such classifications as "mountain," "field," "seige," or "coastal" batteries.[1,2] The field batteries, whose role it was to accompany the infantry or cavalry on a fluid battlefield, were relatively light, horse drawn, highly mobile, and capable of being swung rather quickly into action by the "redlegs" who served them. On the other hand, the heavy cannon which would accompany the army in the field, to be used to batter down or fire over enemy fortifications, presented a different picture. These too were horse drawn by multiple teams; however, movement was much slower because of the great weight of the load, and bringing the piece into action was a more burdensome process. Some of the heaviest of the artillery cannon available was located at fixed firing stations guarding our sea ports.[3,4]

It should be noted that even the most mobile weapon carriages in the army inventory at that time were extremely crude when compared with those of the twentieth century. They were of mixed wood and metal construction; elevating, traversing, and sighting mechanisms of the type we take for granted were yet to be introduced; recoil mechanisms which permitted a fixed main-carriage position were a development of the future. All of the foregoing combined to restrict the rate of fire of even the best crew to a very modest three to four rounds per minute.

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[1]U.S., War Department, Instruction for Field Artillery (Washington: U.S. Government Printing Office, 1864), p. 2.

[2]Joseph Roberts, The Handbook of Artillery for the United States: Army and Militia (10th ed.; New York: D. Van Nostrand, 1875), pp. 8-26.

[3]Ibid., pp. 27-58.

[4]U.S., War Department, Instruction for . . ., pp. 11-25.

Officers or gunners would have to sight along gun barrels, estimate the range and elevate or depress the barrel by a wheel screw beneath the breech. If a time fuzed bursting shell was being used, the officer in charge called for the fuze to be cut at the mark in seconds required to burst the projectile in front or above the target. Using hand motions, cannoneers were directed to shift the trail right or left to bring the line of metal on to the target. Crews then stood clear and on signal the lanyard was jerked. The smoking piece which was rolling backwards in recoil would have to be manhandled forward into battery; then to be swabbed, loaded, sighted, and fired again.[5,6]

Post Civil War stagnation—It was necessary to review the weapons available at the close of the United States Civil War because these weapons, and the employment techniques they generated, were the essence of the United States artillery arm through most of the nineteenth century. From the end of the Civil War until the Spanish-American War in 1898 the artillery was almost a dormant power within the United States military establishment. During this period the role of the army was tied to the continued westward expansion of our country and the resultant conflicts with the American Indian nations which such an expansion engendered. An examination of the history of these Indian campaigns shows that, with very few exceptions, the United States army force committed to the "winning of the West" was essentially one of cavalry and infantry. Artillery was little used. An exception to this general

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[5]Roberts, pp. 96-97.

[6]Arthur R. S. Hyde, Drill Regulations for Batteries Armed with the 7-inch Seige Howitzer: United States Army Artillery Corps (United States Army, n.p., 1903), pp. 15-26.

statement must be made in regards the Gatling gun. The Gatling did make a significant contribution to our military successes during this period. It was then regarded as artillery equipment and not the infantry weapon that later types of machine guns became.[7] In addition, the relatively small, short range 1.65 Hotchkiss mountain gun performed a useful service. For the most part, however, the artillery, as we think of that arm today and which had grown to great prominence in the Civil War armies, was relegated to a very minor role. The state of artillery weaponry remained essentially what it had been when the federal service of the many state and volunteer batteries of the Civil War was terminated.[8,9,10]

Artillery Ammunition

U.S. inventory—Late nineteenth century ammunition included bursting projectiles, solid shot, grape, cannister, and shrapnel—all in a separate loading configuration capable of being propelled from several hundred to several thousands of yards, depending upon the type ammunition and type weapon used. Fuzes available were "time" and "impact," and the propelling and bursting charges were, as far as the United States army was concerned, essentially the same black powder that had been in military use for some six hundred years.[11]

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[7]Roberts, pp. 31-32.

[8]U.S., War Department, Instruction for . . ..

[9]Roberts.

[10]U.S., War Department, Drill Regulations for Light Artillery United States Army (Washington: Government Printing Office, 1896).

[11]Roberts, pp. 69-91.

Explosive improvements available—Smokeless powder had been introduced by the Prussian artillery by the time the United States Civil War drew to a close, and the French had developed a much more efficient propellent by 1884—a propellent capable of giving artillery greatly increased ranges.[12] At about the same time Alfred Nobel was making his great explosive breakthrough on the use of nitroglycerin and of fulminate of mercury detonators. The forerunner of modern TNT was developed, permitting a significant increase in the destructive power of the artillery shell.

United States lag—Despite the advantages these compounds provided the artillery force that employed them, economy apparently dictated that the United States artillery forestall their use until all black powder stocks were exhausted. Consequently, when 1898 found the United States at war with Spain, the artillery was ill-prepared to make its proper contribution to our military efforts; it was in the position of trading shots with a second rate European power whose artillery arm was furnished more powerful high explosives and smokeless powder while the United States artillery continued to "pop away" with the black powder of our ancestors. Besides the shortened range and lesser explosive power, black powder was a serious handicap in two other aspects: (1) its dense smoke cloud pinpointed the position for the enemy and gave him an excellent target to sight on; (2) the dense smoke produced at firing temporarily blinded the gun crew, delaying their preparation of

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[12]A. B. Warfield, Notes on Field Artillery: Lecture Delivered March 5, 1917 (Fort Leavenworth: Army Service Schools Press, 1917), p. 35.

the piece for a subsequent round.[13] These were obstacles that artillerymen had faced for centuries; they were, however, no longer necessary.

Artillery Doctrine

General—Artillery has always been a supporting arm, charged with the task of aiding the infantry or the cavalry in their mission of gaining or holding terrain objectives, or destruction of an enemy force. While the nineteenth century mission was basically the same as we know it today, the details of execution were perforce different.

Direct fire standard—We have noted the capabilities and limitations of the weapons and ammunition available. Because of these limitations, artillery was, for the most part, a direct fire weapon—those targets that could be seen from the vicinity of the battery were engaged; those that were out of sight were not. The indirect fire capability which today is synonymous with the very word "artillery" was little known and less used. Of course, artillery cannon and mortars had for centuries been used to rain death and destruction down upon defenders inside walled cities and redoubts; however, this type of random hit and miss targeting has little in common with the connotation of that word today.[14]

Employment unit—The battery was the normal unit of employment. If it were desirable to mass a great volume of artillery fire on one portion of the enemy line, it became necessary to mass a corresponding

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[13] Ibid., pp. 20-21.

[14] U.S., War Department, Drill Regulations for Light . . ., pp. 385-423.

volume of artillery tubes on the friendly side.

Techniques of engagement—The fire of the battery was directed in most instances by the battery commander. He determined the priority target, in accordance with the guidelines of his battalion commander and/or supported force commander, and ordered the guns into action. Silencing of opposing artillery was of prime importance and these counter battery, direct fire duels were executed at very close range—often times measured in hundreds of yards. If fire were to be directed on opposing ground troops, the same procedure applied.

While artillery fire could with extreme care be directed over the heads of friendly infantry, this was usually avoided. The short range, direct fire standard for artillery militated against such a technique. Doctrine dictated that artillery after firing the preparation, if one were scheduled, would limber up and accompany the infantry or cavalry line in their advance on the enemy. Other batteries would be emplaced on the flanks of the friendly line so as to be able to support the final assault without being masked by their own supported troops. In the defense, the artillery pieces were again found in the line along side the infantry and cavalry rather than to their rear as later doctrine would prescribe.[15]

Target Acquisition/Counter Battery

Nature of the problem—It is apparent from the preceding discussion that the nature of the artillery target acquisition problem, in general, and that of counter battery, in particular, was very different

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[15] Ibid.

in the nineteenth century from that which faces us today. As a direct fire weapon, artillery firing was artillery located and exposed. The commander's primary concern was that he have sufficient tubes with his force and that these tubes be located so as to permit effective, timely engagement against priority targets, when these targets presented themselves. Certainly he was required to consider likely enemy dispositions to include their artillery positioning when he determined his own course of action.[16]

Enemy artillery could not be expected to expose itself prematurely. It would be kept hidden as long as possible in most cases; just as the enemy would do his best to conceal his main infantry strength and other position information. Thus the nineteenth century commander did have to concern himself somewhat with enemy battery location, and we did find various techniques being explored and utilized where feasible to assist him in this aspect of battlefield intelligence production. Some examples of these are balloon observation stations and observation patrols.[17] The basic time orientation of this enemy battery location effort, however, was pre-firing or pre-battle.

Counter battery task—The first essential element of any effective counter battery program is a sufficiently accurate enemy position location. It is apparent that through the nineteenth century when artillery occupied a position and began firing, this information was almost immediately provided the opponent. The commander's principal

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[16] Ibid., pp. 396-97.

[17] C. N. Simpson, The Eyes and Ears of the Artillery (London: Hugh Rees, Ltd., 1905).

counter battery concern was that his own artillery be in an acceptable position in sufficient strength to engage the enemy guns with the maximum possible speed, alacrity, and advantage.

Change Occurs

Weapons and Ammunition

Quick fire gun—A true revolution in artillery weaponry occurred as the nineteenth century drew to a close and the twentieth century opened. This was the introduction of the "quick fire" gun. Introduced by the French in the last years of the nineteenth century, its great superiority was quickly established. All other nations were forced to redesign their ordnance as soon as its closely guarded secret could be determined.[18]

The heart of the new piece, the 75mm gun, was a hydropneumatic recoil system, much as we still use today, which allowed the main carriage to remain stationary while the tube recoiled on a slide. Other design improvements, coupled with the revolutionary recoil system, allowed the tube to be rotated quickly in azimuth to the right or left and to be fired from this oblique position with excellent carriage stability. As a result, the tube retained its proper relationship to the target for immediate subsequent rounds.[19] Previous developments in artillery ordnance had permitted some on-carriage flexibility in azimuth and elevation adjustments; however, these were rather crude and

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[18]Harry G. Bishop, Elements of Modern Field Artillery: U.S. Service (2d ed. rev.; Menasha, Wis.: George Banta Publishing Co., 1914), p. 10.

[19]Gabriel Rouquerol, The Tactical Employment of Quick-Firing Field Artillery, trans. P. De B. Radcliffe (London: Hugh Rees, Ltd., 1903), pp. 1-12.

ineffectual as compared with the French design.

Effect of design change—The suppression of main carriage recoil and the action of the elastic buffer in returning the gun after each round to the same relative position as regards the carriage, enabled relaying to be done away with in carrying out rapid fire, as long as the target or pointing data did not change—this was a contribution of the hydropneumatic recoil system. The other improvements in carriage design and the advent of the panoramic sight permitted very rapid application of new pointing data between rounds if this were necessary.[20]

Previous guns, because of their recoil, required the crew to step clear from their posts at the moment of firing. In those circumstances the addition of protective shields as a part of the carriage could not be justified. The benefit to be derived from part time cover for the crew would not compensate for the disadvantage of the increase in weight to materiel. When carriage recoil was eliminated, the protection to be afforded by metal shields became quite continuous and thus more effective. It was no longer necessary to move out from behind the piece to escape the danger of a moving carriage. The gun crew operating behind well designed shields could carry out its duties expeditiously while enjoying some protection from enemy artillery shrapnel or small arms fire.[21]

As a result of these improvements, what rate of fire was now attainable? For a short period, firing on the same target a good crew could achieve rates of fire reaching twenty to thirty rounds a minute.

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[20] Warfield, pp. 35-37. [21] Rouquerol, pp. 11-12.

If pointing data changed this would naturally be reduced.[22]

Ammunition improvements—Early twentieth century changes so important to the artillery were not limited to carriage and on-carriage equipment design. There were parallel improvements in artillery ammunition which had equally far reaching effects on the future employment of the arm. It was previously noted that explosive breakthroughs had occurred as early as 1884 which affected propellent efficiency. Further improvements in this area maintained pace with tube design so as to permit vastly increased artillery ranges. Light artillery could now achieve ranges in excess of 6,000 yards while heavier guns and howitzers could engage targets beyond 10,000 yards with ease.[23,24,25]

Weapon and ammunition change effects—Each of the changes noted above was extremely significant. Taken together they dictated a searching re-examination of artillery doctrine and techniques of employment during the closing years of the nineteenth century and the first decade of the twentieth.[26]

Artillery Doctrine

Doctrinal lag—One might conclude that the transition from

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[22]Warfield, p. 37.

[23]A. B. Dyer, Handbook for Light Artillery (1st ed., New York: John Wiley & Sons, 1896), pp. 104-107.

[24]U.S., War Department, Office of the Chief of Ordnance, Firing Tables for 75mm Model 1916 (American) and Model 1917 (British) Guns (n.p., n.d.).

[25]U.S., War Department, Office of the Chief of Ordnance, Firing Tables for 155mm Howitzer Model 1918 Mark I (n.p., n.d.).

[26]E. S. May, Achievements of Field Artillery (Published at the Royal Artillery Institute, Great Britain, 1893), pp. 157-65.

direct fire to indirect fire as a primary employment means of artillery was an immediate and obvious accompaniment of the new artillery materiel. Such appears not to be the case. There were many military officers that did sense the advantage to be gained by an indirect fire technique, and they were quick to advocate its adoption. On the other hand direct fire had the weight of tradition and experience and it resisted the efforts of those who sought its demise as an artillery employment standard. Writing in 1903 Major Gabrial Rouquerol of the French Artillery noted:

> For more than twelve years the indirect fire of field artillery has formed the subject of assiduous study and many experiments, it has also given rise to very keen controversy.
>
> The adoption of indirect fire meant bringing batteries into action behind cover. The novelty of the idea impressed many people, who were much struck with the increased power of the weapons then in use and especially of the forth coming quick-firers, but tradition was against them.[27]

The officer goes on to tell us that when the twentieth century opened the advocates of direct fire were still very much in command. German maneuvers held in 1897 employed direct fire exclusively—not once employing the indirect fire technique. The same year certain French corps forbade indirect fire to be used during their maneuvers. Although not so stated, we may imply from this that in other French corps indirect fire as a technique was allowed even though not encouraged.[28]

Indirect fire application recognized—Despite the favorable position still held by the traditionalists, an examination of the French and German artillery drill regulations in effect at the turn of

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[27] Rouquerol, p. 50.

[28] Ibid., p. 51.

the century reveals that the proponents of indirect fire had made themselves heard. The German drill regulations on this subject stated:

> Direct fire is the rule; indirect fire is made use of when the tactical situation or the nature of the ground requires a position to be taken up behind cover. In some cases, indirect fire may make it possible to cause loss to the enemy without revealing one's strength or exposing oneself to hostile fire. (Italics mine.)[29]

The French drill regulations of the period took a similar line and noted that advantages were to be gained by concealed positioning. At the same time it stressed the fact that such a technique was not always admissible on the battlefield.[30]

The United States War Department's Drill Regulation for Light Artillery, 1896, makes no provision for indirect fire in its school of the cannoneer nor is indirect fire even mentioned in the chapter that discusses the employment techniques for artillery. By 1916 United States doctrine had changed considerably. The regulations published that year had elevated indirect fire to a level above direct fire as an employment technique. In its discussion of the methods of laying it says:

> For direct laying, the target must be distinctly visible through the sights; the guns must therefore be more or less exposed. For indirect laying the target need not be visible to the gunners; the guns may therefore be concealed. For these reasons and because indirect laying leaves to the captain complete independence in the manipulation of the sheaf of fire and ordinarily results in great regularity of heights of burst, ranges and distribution, it is the usual method. (Italics mine.)[31]

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[29] Regulations for Field Artillery Drill German , August 10th, 1899, par. 289, cited by Gabriel Rouquerol, The Tactical Employment of Quick-Firing Field Artillery (London: Hugh Rees, Ltd., 1903), p. 52.

[30] Rouquerol, pp. 51-52.

[31] U.S., War Department, Office of the Chief of Staff, Drill and Service Regulations for Field Artillery (Horse and Light) (4 vols.; Washington: Government Printing Office, 1916), p. 51.

Value proven—What had caused this great shift in artillery doctrine? We have already identified the prophetical materiel changes and we have noted the existence of a group of far-sighted officers championing its advancement before the nineteenth century closed; however, it remained for the test of battle to overcome the toehold of tradition and to advance the indirect fire technique to a position of dominance. In the first real test of direct versus indirect fire the traditionally trained and oriented British artillery was out-gunned and out-fought by the Boers of South Africa, who were quick to adopt new techniques to new situations and equipment. They employed indirect fire and concealed positions to the maximum and were so successful in their efforts against the British direct fire standard that at long last the British were forced to re-examine their doctrine or face annihilation.[32]

An additional nail in the coffin of the direct fire disciples occurred during the Russian-Japanese War of 1904. This war saw both adversaries armed with modern artillery weapons. It was some time before the full capabilities of the new materiel was realized; but when the smoke of final battle was cleared, the advocates of indirect fire and concealed positions had won the day. The superiority of such techniques had been conclusively demonstrated to the military thinkers of all nations.[33] If there were any "doubting Thomases" remaining, the Balkan Wars of 1912-13 must surely have silenced even the most adamant and inflexible of them. An account of a single battle will serve to illustrate the lessons to be derived from this conflict. Two Turkish

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[32]Warfield, pp. 21-24. [33]Ibid.

batteries opened fire while in the open. They were immediately put out of action by the Servian guns. A third battery, firing from a concealed position which provided flash defilade, was able to stop the advance of the entire Servian Corps. It was eventually silenced by converging fire from enemy artillery batteries, but not until it had caused considerable havoc and consternation to the enemy. Before World War I descended upon mankind, the military powers of the globe must have busied themselves with rewriting their artillery drill regulations and adjusting their military doctrine to conform to the newly accepted truths.

Target Acquisition/Counter Battery

A problem to be recognized—With the advent of indirect fire as an acceptable technique, the entire question of target acquisition to include counter battery required extensive re-examination. The drill regulations in effect at the turn of the century considered this subject in terms of individuals responsible for establishing target priorities and for designating targets to be engaged; occupation of suitable positions; and technical conduct of fire by the battery commander from a position permitting a good view of both the target and his guns. It recognized the necessity of reconnaissance but restricted its application to reconnaissance of general enemy dispositions, and to the locating of suitable artillery positions from which effective fire could be brought to bear on enemy lines. It devotes one sentence to the problem of observation of targets or artillery fire effectiveness from a position other than in the immediate vicinity of the guns. That statement reads as follows: "The observation of the fire will be facilitated by the reports of an officer or noncommissioned officer stationed

some distance in advance and outside one of the flanks of the guns."[34]

Problem in retrospect—To the mid-twentieth century artillerymen it is obvious that to fully exploit the range and flexibility of artillery weapons, while utilizing the indirect fire technique, it is necessary to have observing stations (forward observers) located well in front of the gun positions in close proximity to the enemy. It may seem incomprehensible today that the adoption of some such forward observing system was not almost concurrent with the acceptance of the indirect fire, concealed position employment concept. We must, however, consider the total military environment, doctrine, and materiel as it existed at that time. Indirect fire was accepted and firmly established, but direct fire was not relegated to the historical. It continued to hold an important though diminished role in the minds of military thinkers, and this role was recognized in the drill regulations as revised.[35]

We must also consider the communication systems available to the army in the field. Telephones were in use, but their application was considered limited. Primary reliance for communications was still placed on direct voice with wire and signal flags supplementing messenger service.[36]

The army was for the most part horse or foot mobile. Although

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[34]U.S., War Department, Drill Regulations for Light . . ., p. 410.

[35]As we have previously noted the U.S. drill regulations of 1916 accepted the indirect fire technique as normal; however, this document retains complete instructions and guides on the employment of artillery in a direct fire role. To the general reader and user direct fire as a technique would still appear of great importance.

[36]U.S., War Department, Drill and Service Regulations for Field . . ., Vol. III, 1916, pp. 77-78.

the airplane and motor vehicle were making their military debut, their real significance was yet to be established.

With the preceding frame of reference it should become more apparent why the target acquisition aspect of indirect fire, with all of its potential difficulties, was not immediately recognized as the major problem that it soon would become.

Solution offered—What then was the answer proposed by responsible military authorities? By artillery drill regulations that accepted the new fire techniques and were cognizant of the greater artillery ranges to be effected by ammunition and materiel improvement? The United States drill regulations published in 1916 still make no provisions for a forward observing station taking control of the artillery fires. It still discusses the battery commander conducting the fire from an observing station which permits simultaneous observation of the target and his guns, normally in close proximity to the battery position area. It does, however, recognize the part time need for auxiliary observing stations forward of the main observing post, in captive balloons, or in mobile aircraft.[37] These auxiliary observers were to assist the battery commander at his main observing station by providing him more detailed information of the terrain, enemy target, and friendly fire effects. In addition to the auxiliary observing stations, these regulations provided for two battery scouts whose duties were to facilitate the movement and employment of artillery; they were to reconnoiter, to observe, to report. Included in these functions

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[37] Ibid., pp. 76-77.

were observing the effect of the battery's fire, and indicating needed corrections to the battery commander. Although they were not to control the fire of the battery directly, they, like the auxiliary observers, assisted the battery commander by providing him more detailed information than he could get from his more distant observing post.[38]

The 1916 drill regulations devote several pages to the question of counter battery. It notes that the pinpointing of enemy artillery positions will present some problems. It places the highest priority in engaging enemy artillery while it is still moving into position, with the implication that such enemy position occupation can usually be observed. It recognizes that direct observation at times will not be possible and discusses a method whereby a general enemy battery location can be determined by observing the gun flash, the smoke, or dust of firing, and by applying this information to a detailed examination of map and terrain.[39]

The United States army position on target acquisition in the face of greatly increased ranges and indirect fire methods is summed up by Captain Warfield in a lecture to a class of provisional second lieutenants in 1917 as follows: "The duty of locating the enemy and securing information concerning him in general develops on troops of the other arms. This information should be promptly transmitted to the artillery."[40]

Conclusions

The changes in official U.S. artillery doctrine indicate a

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[38] Ibid., IV, 31-34.

[39] Ibid., III, 153-56.

[40] Warfield, p. 45.

general awareness that indirect fire and increased ranges would be attended by target acquisition/counter battery difficulties. With the benefit of hindsight, our criticism might focus on the evaluation made of the magnitude of these difficulties.

It seems fair to conclude that on the eve of World War I, a gap had occurred between the capability of the artillery to engage targets with the weapons, ammunition, and techniques known and on hand and the accepted techniques of target acquisition—particularly hostile battery location.

CHAPTER II

FRENCH AND BRITISH EXPERIENCES, 1914-1917

Relationship to United States Development

In discussing World War I and its total impact on the evolution of the Field Artillery Target Acquisition Battalion (FATAB), it is essential that we examine the developments that took place within the military arm of our allies, particularly that of France. As will be shown in the next chapter, the United States forces, upon entering the conflict, adopted with very little modification the materiel and techniques of the French artillery. This included the target acquisition/counter battery equipment, procedures, and policies which they had perfected to date.

Artillery Doctrine

Pre-war Thought

General Herr, a prominent French artillery officer, was serving as a corps commander in May, 1915, when he was commissioned by General Petain, the French Commander-in-Chief, to re-examine artillery employment doctrine. He was to determine proper tactics, publish documents, and establish necessary training centers to place on a firm foundation, the correct employment of artillery in modern battle.[1] Writing in

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[1]General Herr, The Artillery: What It Has Been, What It Is, What It Should Be, trans. in Military Intelligence Division, U.S. (Paris: Berger-Levrault, 1923), p. 75.

1923, he sums up pre-war French thought as follows:

> The War will be a short one with quick changes of place where maneuver will have the principle role; it will be an open warfare.
>
> The battle will mainly be a fight between two infantries where the victory will be on the side of the greater number of battalions. The army must be an army of effectuals and not an army of materiel.
>
> Artillery will be a dependent arm with only one mission; to support the attacks of the infantry. Thus it will need only a limited range and its main quality must be rapid fire in order to comply with the numerous and fugitive objectives which will be put up by the infantry.
>
> Obstacles which will be met in open warfare will not be very important; light artillery will have sufficient power to attack them.
>
> To be able to follow the infantry which is to be supported as closely as possible the materiel must be light, supple and easy to maneuver.
>
> The usefulness of heavy artillery will not be felt very often; it will of course, be wise to have some batteries but these batteries must be comparatively light in order to have enough mobility and this fact excludes the use of large calibers and powerful materiel.[2]

Some other salient features of pre-war French thought are that the artillery duel, i.e., counter battery, was not particularly critical, nor was an extensive artillery preparation necessary to battle success.[3] All of the above appears to reflect French preoccupation with the decisiveness of maneuver over fire, and their lack of appreciation for the tremendous destructive power of modern artillery arms.

Importance of 75mm gun—In 1914, the embodiment of the French Artillery was the 75mm gun, the modern, quick fire weapon France had developed around the turn of the century.[4] The many excellent features incorporated into this artillery piece had convinced the dominant French military and national authorities that this single weapon system

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[2] Ibid., pp. 5-6.

[3] France, Arty. School, Course in Artillery Tactics. Started under the direction of COL Pujas, was finished under the direction of COL G. Alexandre, 1925. Trans. 1941 by MAJ John J. Burns, U.S. Field Arty., pp. 3-5.

[4] Herr, p. 5.

could satisfy all or most field artillery mission requirements.[5] As a result the production of modern medium and heavy field artillery pieces was neglected in the years immediately preceding the war. Military doctrine in France was oriented on maneuver and offensive actions, with the infantry being the predominant arm. It was not envisioned by the proponents of this doctrine that longer range artillery could make any significant contribution to this war of maneuver.[6]

Disagreement expressed—Fortunately for France and the impending allied cause, there were some influential dissenters—those who were just as certain that the maximum attainable range and the flat trajectory of the 75mm gun were serious limitations that must be compensated for by heavy artillery, to include howitzers. Although the influence of this group was not sufficient to force the adoption and production of medium and heavy weapons in significant numbers, basic research and development was accomplished in this area. This preliminary work was extensive enough to permit early manufacture of heavy and medium artillery materiel very soon after the war began.[7]

War's Reality

At the outbreak of the War in 1914, France was able to field 3,840 guns of 75mm caliber and only 308 heavy guns. On the other hand, Germany, whose military leaders believed in the efficacy of heavy artillery[8,9], fielded 5,500 guns of 77mm and 105mm calibers, and 2,000 heavy

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[5]France, Arty. School, Course . . ., p. 6.

[6]Herr, pp. 1-4. [7]Ibid., pp. 29-30.

[8]A. B. Warfield, Notes on Field Artillery: Lecture Delivered March 5, 1917 (Fort Leavenworth: Army Service Schools Press, 1917), p. 32.

[9]France, Arty. School, Course . . ., p. 7.

guns designed for field warfare.[10] The light weapons had a maximum range of 7,000-8,000 meters, compared with the 10,000-20,000 meter range of the various medium and heavy calibers.

The importance of long range artillery was quickly established. The German army, employing the relatively long range fires of its heavy and medium artillery, was able to overwhelm the shorter ranging 75mm guns of the French. The 75mm gun batteries proved worthy of the high esteem in which they were held by their advocates, as long as the battle was being fought at close range; however, they were often surprised and taken under long range fire while still in march column. The range limitation was such that the French batteries were helpless to retaliate, while the modest amount of French heavy artillery available usually precluded its employment at the time and place needed.[11,12]

The war, while it was essentially a battle of maneuver at the start, did not end quickly. After its first few indecisive months, the war became one of position and trenches. In the above areas, and in the interpretation of the destructive power of modern artillery, the French pre-war estimates were far afield.

Policy Change

As a result of early battle experience, French policy quickly changed. It was proven that the 75mm gun could not satisfactorily perform all battlefield artillery missions. Within thirty days after World War I had begun, General Petain was doing everything possible to increase the quantity of heavy artillery to be made available to his

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[10] Herr, pp. 15-16.

[11] Ibid., p. 33.

[12] France, Arty. School, Course . . ., p. 11.

subordinates. Measures taken included: (1) diversion of guns and personnel from fortress artillery (95mm, 120mm, and 155mm long guns; 155mm howitzers and 220mm mortars) and from the coast artillery (270mm mortars, 14cm and 16cm guns); (2) ordering the immediate production of modern medium and heavy field artillery weapons; (3) the reactivation and modification of field artillery weapons discarded as obsolete in the years preceding the outbreak of war.[13]

The importance of an effective counter battery program and the significance of the artillery preparation were also recognized. The role of large masses of field artillery, shifted by the higher military headquarters to influence the outcome of battles, was accepted. Concentration of fire took its place along side the massing of troops as a revered principle of war.[14,15] French tactics were modified accordingly, although the shortage of heavy and medium artillery hampered execution, and shaped somewhat the interim solutions the French were forced to adopt pending their weapon build-up.

Target Acquisition/Counter Battery

At War's Start

The words "direct observation" sum up very pointedly the target acquisition policies in being as the war began. Whether direct or indirect fire was to be employed, it was mandatory that the observer controlling the fire of the battery have the target in view. This was the procedure used by both sides, and it reflected the state of the artillery art at the time. Considering the French view of then pending

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[13] Herr, pp. 40-41.

[14] France, Arty. School, Course . . ., pp. 11-17.

[15] Herr. pp. 67-76.

military operations and their visualization of the artillery's role, it is doubtful that they would have contemplated any target acquisition or counter battery problems. As a result, there was little thought given to this area in the years immediately preceding the war, and subsequent to the acceptance of indirect fire techniques.

Problems Encountered

The long range capability of the German heavy artillery and the widespread use of the indirect fire technique caused some immediate target acquisition and counter battery problems. The allies found the location and engagement of enemy batteries a difficult task. Some German batteries were positioned five kilometers or more to the rear of their front lines, taking maximum advantage of their range to provide protection against counter battery fires and concealment from ground observation. Particular effort was made by the Germans to locate or to construct concealed positions. To increase the depth of surveillance, the allies countered with forward terrestrial observation stations, airplane, and balloon observers. All of these early solutions were dependent upon satisfactory visibility conditions and line of sight observation.

Observation material available was binoculars, and these were to be had in very limited numbers.[16] Since it had been anticipated that distances of 3,000 to 4,000 meters would be the outer limit of enemy artillery emplacements, binoculars were thought adequate. This did not prove to be the case. A more powerful observing instrument was needed.

Little provision had been made for communications between the the firing battery and distant observers—again reflecting the French

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[16] Ibid., p. 9.

view of a more compact battle area.

Aerial observation during periods of good visibility could have compensated for many of the problems noted. It was, however, of limited use during the early months of the war because the aerial observer could not communicate effectively with the ground. Aerial observation had to wait for the wireless communication technique to be perfected before its full capability could be realized.[17] In the meantime the aerial observer was dependent upon visual signaling of some type, message drop, or post flight debriefing to communicate target intelligence to friendly batteries or ground observers.

Wartime Developments

Over view—There were numerous and important changes that took place in the artillery target acquisition/counter battery area during the early years of the war. These changes did not occur in the exact chronological order discussed. There was much overlapping and concurrent development in each.

Battle map and aerial photography—Accurate mapping of the entire battle area was undertaken during World War I.[18] This work was expedited from the very start of the war and facilitated the perfection of unobserved fire techniques by the artillery. As an immediate target acquisition adjunct, accurate battle maps permitted refinement of rough

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[17] Ibid.

[18] U.S., War Department, Manual for the Artillery Orientation Officer, Consisting of Extracts from "Manuel De Officer Orienteur D'Artillerie," A French Official Manual Containing a Report of Conferences Held in the Army Centers of Instruction from November, 1916, to February, 1917; trans. by Army War College (Washington: Government Printing Office, 1917), p. 15.

enemy battery and other targeting locations made by distant ground or air observation stations. Aerial photography, in conjunction with an accurate battle map, performed a more complete target acquisition service. As improved equipment became available and experience was gained, aerial photography techniques were perfected. It became possible to scale fairly accurate target information directly from a photograph.

Sound ranging—Sound ranging was unknown in August, 1914. At that time a French professor serving in the army conceived the idea that the position of an artillery gun could be accurately determined by ranging on the sound wave generated at discharge. The general theory involved recording the arrival time of the sound wave, to hundredths of a second accuracy, at a series of known microphone locations. Based on the time differential involved, a back plot azimuth could be determined for a grouping of microphone midpoints. The point of intersection of these back plot rays was the sound source. He sold his idea to French military officials, and in September, 1914, he was returned to Paris to conduct experimental work in this area.[19] There were many initial difficulties encountered, not the least of which concerned the high velocity shell wave—a phenomena which was not understood at the time and which was at first confused with the shock wave generated at firing. This caused extremely large errors in locations and could have forced cancellation of the program, had it not finally been understood and explained.[20] Perfection of a suitable microphone, one sensitive to

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[19]John R. Innes (ed.), Flash Spotters and Sound Rangers: How They Lived, Worked, and Fought in the Great War (London: George Allen & Unwin, LTD., 1935), p. 139

[20]Ibid., p. 142.

the shock wave generated at artillery firing but sufficiently discriminatory to other noise, was another serious hurdle.

The British were apprised of French experiments in this area and they sent observers to investigate. After some initial reluctance, the British began experimenting in earnest with this target acquisition technizue.[21] In mid-1916 sound ranging became an accomplished fact. By this time, although experimental work continued, equipment had been sufficiently perfected to warrant field deployment throughout the battle zone by both the French and the British armies.[22,23]

Flash ranging and surveying—Flash ranging and surveying, while two different subjects, will be viewed together. As topography operations became more commonplace and the number of topographic units engaged in battle map production and revision multiplied, the artillery made increased use of the services these units could perform. It had been recognized for some time that if the position of the guns, the observing station, and the target were accurately fixed on a common grid, pre-firing mathematical computations could determine pointing data which would place the first round near the target. Savings in ammunition and time could then be effected in the adjustment. The gunnery techniques involved were very similar to what had been known and used for years by the artillerymen of the coast and fortress batteries. In 1915, as the war settled down to that of position warfare and survey data became more readily available, the adoption of these techniques was dictated. Survey operations became an integral part of

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[21] Ibid., pp. 142-145. [22] Ibid., p. 148.

[23] Great Britain, General Staff, Sound Ranging: Experiments to Determine Accuracy of Results (G.H.Q. Intelligence, n.p., April, 1917).

the total artillery task.[24,25]

The development of flash ranging as a technique was a natural product of these survey operations. It had been noted by artillery observers that, on many occasions, they could detect the flash of a gun firing but not see the piece itself. This happened because the muzzle blast, caused by burning propellent being expelled from the tube, extended upward some distance beyond the elevated weapon muzzle. Flash ranging required a system whereby three or more separated observing stations determined and reported to a central coordinating agency an accurate azimuth from their respective position to the point of flash. The technique of locating a point by intersection was well known and in common use among the survey personnel. It was a relatively logical and simple step to adapt these skills to the flash ranging task.[26]

Two of the early obstacles to an effective flash ranging system were: (1) lack of an observation instrument from which an accurate azimuth could be quickly and easily determined; (2) lack of communication system which tied all elements of the flash ranging group together; one that facilitated the work of the ranging central by helping discriminate against false intersections. False intersections would result from the various stations observing different but nearby flashes and mistaking them for the same gun burst. These problems were solved and flash ranging became an accepted target acquisition technique.[27] Both the British and the French armies were deploying flash ranging groups throughout their battle zones before 1917.

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[24]Herr, pp. 49-51.

[25]U.S., War Department, Manual for the Artillery . . .

[26]Innes, p. 21.

[27]Ibid., pp. 59-60.

Unobserved fire techniques--Let us consider the total military situation as it has been developed to date. By the end of 1916 the conflict had settled down to that of position and trench warfare, and the artillery preparation had become commonplace to any attack made by either side. The preparation had become extremely long--one extending several days was not unusual.[28] In executing these preparations, accurate target lists and effective counter battery fire were important. These factors gave impetus to the development and use of such target acquisition techniques as flash and sound ranging.

A serious drawback of these long, drawn out preparations was the attendant loss of surprise when the infantry attack finally jumped off. An examination of the factors dictating such an extensive time length reveals observer firing adjustment to be the single most important one; that is, the requirement for an observer to adjust the fire on each target. The observers employed were either ground, balloon, or air. As we have seen, means were now available to locate enemy targets, to include enemy artillery, by means other than visual observation. Target lists, such as we know today, were prepared, depicting all known information. If these targets could be fired directly, without the need for observer adjustment, the time involved could be drastically reduced and the measure of surprise correspondingly increased.[29,30] These factors helped shape the perfection and the adoption of unobserved fire techniques.

The French understood the general effects of atmospheric

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[28]Herr, pp. 78-79.

[29]Innes, pp. 23-31.

[30]Herr, pp. 81-82; 131-133.

conditions on artillery projectile flight at the start of the war; however, the detailed data needed for an effective unobserved fire technique had yet to be tabulated. By 1917 the French had completed the necessary tests and accumulated the data required. They published the necessary instructions and established the requisite meteorological stations to make effective unobserved fire a reality.[31] An examination of the American Expeditionary Forces' translation of the French document is interesting. Procedures and instructions relative to the elements that comprise modern artillery employment are all present, even though the terminology and exact technical solutions offered may have differed. There are sections concerning dispersion, interior ballistics, exterior ballistics, meteorological effects, registrations, transfers, calibration, topographic operations, probabilities, orienting lines, orienting angles, registration points, and many others.[32] As previously noted, fire planning had already become a highly developed art in the early years of the war.

Before 1917 drew to a close, unobserved fire had occupied center ring. It remained for the great battles of 1918 to demonstrate its utility and force its acceptance on the artillery arm of all nations. In retrospect, the ability to locate unseen batteries by means of flash ranging and sound ranging must have contributed to the need for, and thus the development of, unobserved fire techniques. Once perfected, it returned this support in full measure. The product that the flash spotters and sound rangers could provide was now in full

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[31] U.S., American Expeditionary Forces France, Artillery Firing, trans. from the French edition of November 19, 1917 (France: American Expeditionary Forces, March, 1918).

[32] Ibid.

demand.

The Problem of Coordination

At war's start—There was no special organization existing within the French military structure in 1914 to coordinate the processing and distribution of information concerning artillery targets and hostile battery locations. This was considered an organic function of the "second bureau" of the French army, their general staff section akin to our G2, intelligence. As the war took on its special character in 1915-1916, the importance attached to artillery targeting and hostile battery location increased. The introduction of new and varied techniques, such as sound ranging, flash ranging, aerial observation and aerial photography, added a new dimension to the artillery targeting task. To fully exploit the capabilities inherent in each of these diverse methods, it was essential that their efforts be coordinated and that the product of their work be closely analyzed and cross-checked. The magnitude of this task put a severe strain on the normal operation of the "second bureau."[33]

Artillery Information Service established—The solution chosen by the French army was to establish a special section or service in the two higher commands of the French artillery, the army corps and the army. These sections relieved the "second bureau" of the responsibility for the processing of artillery target information and for coordinating the work of the agencies involved in its production. The Artillery Information Service, as these sections were collectively labeled, continued to work closely with and receive information from the regular intelligence staff.

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[33]U.S., War Department, Manual for the Artillery . . ., p. 167.

The flash ranging and sound ranging sections were attached to the Artillery Information Service for operational control. The aeronautic elements were not attached since they had other functions in addition to locating targets of importance to the artillery; however, they did work very closely with the Artillery Information Service in those areas of mutual concern. Very detailed procedures were established to insure the efficient and timely utilization of the aeronautic capabilities in the target acquisition/counter battery field.

The Artillery Information Service, with its separate sections at corps and army level, was well established in the French army before the United States entered the conflict in April, 1917.[34]

Conclusions

The allied experiences of 1914-1917 had a tremendous impact on the doctrine and tactics of the field artillery. In many areas, pre-war French military thinking had been proven wrong. The lessons of the early battles were quickly learned and policies updated to correspond with the existing situation. The increased use of long range, heavy artillery aggravated a target acquisition gap which had been spawned by the pre-war acceptance of the indirect fire technique. The problem generated solutions. Among the solutions oriented exclusively on the counter battery aspect of target acquisition were sound ranging and flash ranging. The feasibility of these two methods was accepted and their implementation approved by both the French and British armies before the United States entered the conflict.

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[34] Ibid., pp. 167-169.

An extremely significant French technical development regarding field artillery was the perfection of effective, unobserved fire techniques in 1917. It appears that target acquisition advances gave impetus to this development. Once perfected, the unobserved fire capability increased the demand for improved target acquisition methods. The modernization of the field artillery, well advanced before the war began, bore full fruit in these early years of conflict.

CHAPTER III

U.S. ARTILLERY AND WORLD WAR I: A CONCEPT IS BORN

Over View

The early World War I artillery target acquisition and counter battery problems and achievements of the French were analyzed in some detail in Chapter II. The relationship of the French developments to the United States artillery will be shown as we examine the United States Army's involvement in the war.

The United States joined the Allied cause with a declaration of war against the Central Powers in April, 1917. Despite the fact that some measures had been taken almost one year earlier to ready the country's military force for such an eventuality, the immediate problem facing the United States Army was great. Within the various branches of the army, the artillery faced the most difficult task. At the heart of the problem was the requirement to create a great numer of units in an extremely short period of time, without the requisite mobilization base. The position of the artillery in this respect was the most critical, and was further complicated by an almost total lack of appropriate materiel upon which to train.

During this period of great stress the French made contributions which were vital to the problem solution. As we examine the magnitude of the United States artillery problem and the nature of

French assistance, the inevitability of dominant French influence in most areas of United States artillery organization and doctrine should become obvious. This influence extended to the artillery target acquisition field.

Artillery Force—Weapons and Personnel

Expansion Required

Genesis—By an act of Congress the field artillery had been established as a separate branch of the service in January, 1907. At the time the Congressional authorization act was passed, the United States Army field artillery totaled thirty batteries—all separate units without a single battalion level or higher organization. The provisions of the act increased the number of batteries to thirty-six and organized them into six regiments of six batteries each. The regimental organization still did not include a headquarters battery. The total strength authorized in the six regiments was 246 officers and 5,470 enlisted.[1]

With few exceptions the organization and strength of the field artillery remained static until passage of the National Defense Act in June, 1916. This legislation, enacted in the shadows of approaching conflict, provided for the increase of the field artillery from six to twenty-one regiments and for the organization of a headquarters battery in each. The expansion was, however, to be spread over a five year period with three new regiments being organized, equipped, and trained each year. The United States declaration of war ten months later found

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[1]U.S., War Department, Office of the Chief of Field Artillery, Report of the Chief of Field Artillery to the Secretary of War, Annual Reports, War Department, Fiscal Year Ended June 30, 1919 (Washington: Government Printing Office, 1919), pp. 16-17.

the army with nine field artillery regiments, the number provided for by the first expansion increment.[2]

This modest 1916-1917 increase had caused some personnel problems. The trained officers, non-commissioned officers, and other enlisted men were divided among the old and new regiments to provide a solid base throughout. The shortage of qualified officers was considered critical enough that cadets graduating from the Military Academy and being assigned to the field artillery in 1916 were immediately commissioned first lieutenants. At the time, field artillery strength comprised only 6.7% of the entire United States army force.[3]

Demands of war—The immediate demands of war completely dwarfed the moderate expansion provided for by the 1916 act. A step by step analysis of this expansion is not necessary. It is sufficient to examine the force structure as it existed at the time the armistice was signed some nineteen months later to gain an appreciation for the problems faced. In November, 1918, the field artillery mustered 502,215 troops, 23,967 of whom were commissioned officers. This equates to a more than fifty fold increase when compared with the 8,645 field artillery strength at the outbreak of the war. Within the officer ranks the differential was much greater as only 275 officers in the United States Army were considered qualified in the field artillery arm at war's start. By the time the armistice was signed, the field artillery constituted 13.7% of the entire United States army force. The infantry, with a less demanding technical training task, struggled through a twenty fold increase during this same period as their proportionate

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[2] Ibid.

[3] Ibid., pp. 17-18.

share of the force structure shrank.[4]

Allied experiences in the war to date had demonstrated the need for somewhat different artillery organizational lines. It was decided that organic to each division would be an artillery brigade of three regiments; one regiment of 6-inch or 155mm howitzers, and a trench mortar battery; and two regiments of 3-inch or 75mm guns. In September, 1917, the War Department directed the immediate activation and training of forty-two divisions. To provide the divisional artillery organic to such a force required 126 regiments of field artillery—not to mention any heavy artillery brigades to be assigned as corps and army artillery. This force level was planned as an interim goal to support a limited 1918 offensive, with a force of ninety divisions programmed for 1919.[5]

The task in retrospect—The full implications of the cited expansion are difficult to comprehend at this time. Among the many factors complicating the task and militating against the successful resolution of such an undertaking were the following:

1. the lack of modern artillery materiel to train and equip such a force.[6]

2. the lack of significant numbers of qualified personnel upon which to base the mobilization effort (above, pp. 39-40).

3. the lack of an adequate school system to instruct officers and/or enlisted in basic artillery skills.[7]

4. the lack of adequate artillery training camps or areas.[8]

5. the lack of a central coordinating agency to direct and

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[4] Ibid., pp. 22-24. [5] Ibid., p. 32. [6] Ibid., pp. 148-164.

[7] Ibid., pp. 71-78. [8] Ibid., pp. 114-128.

control artillery efforts.[9]

6. the assignment of field artillery officers to non-artillery duties throughout the mushrooming national military establishment.[10]

7. a requirement to provide, immediately, three regiments of field artillery to accompany a token American expeditionary force to France.[11]

Viewed in its totality, the situation existing within the artillery arm of the United States army during the early months of the war can be depicted as chaotic. The artillery faced an almost super-human task, to be accomplished with few resources.

Expansion Lived

Roadblocks to success—It appears that the entire United States field artillery mobilization program was jeopardized by critical shortages in two vital areas: (1) qualified instructor personnel; (2) materiel upon which to train.

The materiel on hand in the United States at the start of the conflict was as shown in Table I below.

The guns depicted in Table I, if pooled and reissued in accordance with the then current tables of organization, would have equipped about twenty-five regiments of light artillery using 3-inch guns and 3.8-inch guns and howitzers; about nine regiments of medium artillery, by using 4.7-inch and 6-inch howitzers and 4.7-inch guns; and four and

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[9] Ibid., p. 19.

[10] Ibid., pp. 16-20.

[11] This force was dispatched in July, 1917, and represented about 15% of the trained field artillery personnel at that time. The action was opposed by BG Joseph Kuhn, the Chief of the War College Division, U. S. Army; he warned against such a drain of trained personnel who were critical to our artillery expansion effort.

one-half regiments of mountain artillery. This would provide the divisional artillery for less than twelve divisions as then constituted. It should be recalled that the artillery was faced with the immediate task of providing necessary support for forty-two divisions. Additionally, the materiel cited was for the most part nondescript, obsolete, and in poor repair—not battle worthy when viewed aside the more modern artillery developed by the continental powers.

TABLE I

Artillery Weapons on Hand in the United States
At the Start of World War I[12]

Type Weapon	Number
2.95-inch mountain gun	107
3-inch gun	574
3.8-inch guns and howitzers	40
4.7-inch guns	55
4.7-inch howitzer	112
6-inch howitzer	42
total	930

The personnel problems of the artillery were examined in pages 38-40. The critical shortage of qualified United States artillery officers affected instructor availability. Artillery officers were required to fill many positions in the rapidly expanding artillery arm, leaving few available to meet the mushrooming artillery instructor needs.

Comprehensive allied assistance—Considering the time it would

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[12] Ibid., p. 148.

require for the United States to produce weapons in sufficient quantity, France and Great Britain agreed to provide the American Expeditionary Forces with artillery armament, to include fire control equipment, until such time as the United States could supply its own. It was agreed that the regiments of light artillery were to be furnished the 75mm guns, the medium regiment the 155mm howitzer. Table I shows that the United States had none of these weapons in its inventory in April, 1917.[13]

In order to permit familiarization with the weapons the American artillery was to employ in Europe, it was necessary that the French and the British ship representative calibers to this country for training center use. This was done in the latter part of 1917 and early 1918. In the meantime the United States ordnance corps and American industry began a massive effort to produce modern artillery weapons domestically. Their efforts were concentrated on the 75mm, the 4.7-inch, and the 155mm guns; and 8-inch howitzer.[14]

It is interesting to note that when the armistice was signed on November 11, 1918, only twenty-four of the artillery pieces being used by American combat troops in the line had been manufactured in the United States after the war's start. These were 8-inch howitzers that were manufactured by an American company which had previously been engaged by the British government to produce weapons for them. The plans provided the company by the British were used to manufacture the twenty-four weapons cited.[15]

Allied assistance to the United States artillery did not end with materiel. The importance of equipment cannot be disputed; however,

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[13] Ibid., pp. 167-168, 176-177.

[14] Ibid., p. 152.

[15] Ibid., p. 177.

materiel, without the requisite know-how to put it to use, is of questionable value. The number of trained American artillery officers was small. In addition, experiences in the war had, as we have seen, produced significant changes in artillery doctrine and techniques. France aided the United States by sending Franch artillery officers in significant numbers to the United States to serve as instructors and liaison officers. They were stationed at artillery schools and training centers and at brigade firing centers throughout the country. French artillery officers from the rank of lieutenant to colonel served in such a capacity. The British also sent an artillery mission to the United States to visit all artillery training activities and to analyze, advise, and assist as necessary. Their program was, however, on a much more modest scale.[16]

Allied assistance to the American Expeditionary Force—The above discussion has focused on Allied assistance overall and as specifically provided in the continental United States. French support to American artillery units after their arrival overseas was on an even more comprehensive scale. Artillery units, upon debarkation, proceeded to an artillery training camp provided by the French army. After drawing their weapons and equipment, they underwent a training cycle to insure their proficiency with the new equipment and to further perfect their artillery skills. The brigade organization was kept intact during this training. Out of fourteen artillery training camps or areas available to the French army, six were allocated to the United States. Each of these six camps had a director of instruction with a staff of both

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[16] Ibid., pp. 164-165.

French and American personnel. When the first United States brigade was trained in France, the instructors were all French. By the time the armistice was signed, all of the instructors were American officers, except for one French liaison officer on each camp director's staff.[17]

Artillery Doctrine

Written Doctrinal Gap

In the light of wartime developments, United States artillery doctrine, as reflected in the official publications, was outdated by the time the country was drawn into the conflict. The substance of these, the 1916 Artillery Drill Regulations, was covered in Chapter I. The many lessons learned by our allies, to include those special requirements generated by position and trench warfare, and the great technical strides in the area of unobserved fire were yet to be incorporated into our official publications.

Obsolescence Recognized

It was accepted immediately that the organization and training of United States artillery personnel and units must incorporate the lessons learned to date, in order to equip them with the requisite skills to operate effectively in combat. Heavy reliance on French assistance compensated for the inadequacies of our published doctrine. The French mission was threefold: (1) alleviate a critical shortage in qualified American artillery instructors; (2) provide liaison between the American and French artillery; (3) insure that the latest

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[17] Ibid., pp. 168-169.

artillery tactics and techniques were incorporated into United States artillery training.[18]

French Doctrine Formalized

Unobserved fire techniques—In Chapter II we examined the path of the French military in the areas of topography, meteorologic determination, and unobserved fire; and in the establishment of an artillery information service. The techniques that they perfected in these areas and the resultant doctrine that evolved was promulgated by the French early in 1917. This is to be found in a confidential booklet, since declassified, entitled Manual De L'Officer Orienteur D'Artillerie. This document was translated by the United States Army War College, and an endorsement was added thereto labeling it War Department Document Number 684. By an order of the Secretary of War and Army General Order 062.11, 20 November, 1917, it was issued to the United States military establishment as Manual for the Artillery Orientation Officer. All officers were enjoined to exercise caution in its use so as not to reveal its contents to the press or any person not in the military or naval service of the United States.[19]

Artillery firing instructions, American Expeditionary Forces—After publishing the manual referred to above, the French immediately began the revision of their firing instructions. In November, 1917,

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[18] Ibid., p. 183.

[19] U.S., War Department, Manual for the Artillery Orientation Officer, Consisting of Extracts from "Manual De Officer Orienteur D'Artillerie," A French Official Manual Containing a Report of Conferences Held in the Army Centers of Instruction from November, 1916, to February, 1917; Trans. by Army War College (Washington: Government Printing Office, 1917).

they published a new manual entitled Instructions sur le Tir d'Artillerie, thereby stamping the new techniques as official French doctrine. The American Expeditionary Forces had translated this manual by 30 March, 1918. It was approved and published as their basic regulations for field artillery officers. It bore the title Artillery Firing, and a forward thereto stated that, by command of General Pershing, the methods and terminology therein were to be adopted as standard.[20]

United States War Department actions—Less than three months later, 12 June, 1918, the document referred to above was approved, without change, as official for the entire United States army. It was reissued as War Department Document Number 808; contained an introductory page acknowledging its French authorship; and, by order of the Secretary of War, was adopted as basic regulations in artillery firing. The War Department instructions did contain a note of caution which read as follows: "While a relatively large amount of the text is devoted to the complexities and refinements incident to position warfare, the rapid approximate methods of open warfare must not be neglected."[21] Nevertheless, by the middle of 1918, official United States artillery doctrine would be difficult, if not impossible, to differentiate from that of the French. The circumstances which dictated this fusion have been explained.

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[20]U.S., A.E.F. France, Artillery Firing, trans. from the French edition of Nov. 19, 1917 (France: A.E.F., March, 1918).

[21]U.S., War Department, Artillery Firing, Reprint of pamphlet trans. by A.E.F., France, War Plans Div., General Staff, War Department Document No. 808 (Washington: Government Printing Office, June, 1918), p. 3.

Target Acquisition/Counter Battery

General

World War I had a tremendous impact in the area of artillery target acquisition and counter battery. The very simple procedures employed prior to the "great war" were completely inadequate. The organization and techniques utilized by the American Expeditionary Forces will be examined in some detail. They are most significant to this thesis since the antecedent of today's Field Artillery Target Acquisition Battalion (FATAB) is to be found therein. There is very general information and broad policy guidance regarding target acquisition to be found in the artillery firing manuals; however, the details of the organization and the techniques developed were promulgated in separate American Expeditionary documents.

Agencies Employed—Their Missions and Capabilities

Artillery unit observation posts—There were three types of artillery unit observation posts used: (1) intelligence observation posts; (2) command observation posts; (3) firing observation posts.[22]

The intelligence posts were under the control of the S2 or G2. Their functions were as the name suggests. They were to report any and all information regarding the enemy and terrain. They were essentially reporting posts, an information gathering arm of the intelligence officer. An effort was made by the S2/G2 staff representative at the various command levels to coordinate their positioning so as to insure complete coverage of the enemy lines.

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[22] Ibid., p. 72.

The command observation posts were established by the artillery battalion, regiment or group, and brigade. These posts were established so as to afford, if possible, an extended view of the entire unit sector. The posts were intended to provide the commander or his designated representative a broad picture of the existing situation, to include a general indication of hostile activity, to facilitate the making of sound tactical fire direction decisions.[23] Given the World War I environment with its narrow brigade and division sectors and shallow attack objectives, this appears entirely feasible.

The firing observation posts were primarily battery stations. It was from a firing observation post that the battery commander conducted the fire of the battery. If it were necessary to augment his observation capability, one or more auxiliary posts were established at favorable locations. Personnel manning these auxiliary posts reported target and fall-of-shot information to the battery commander. The primary requirement in locating a firing observation posts was that the target be in view. Consequently, these posts were very near the front, generally in or immediately behind the first line of infantry, and they were cited as close as possible to the anticipated gun-target line. It was recognized that for heavy guns the radius of coverage would be such that often the entire zone of fire could not be covered by a single battery observation post. In this situation the instructions provided that the battalion or regiment should organize a firing observation system, the implication being that the conduct of fire for a single battery would be undertaken from one of several different posts, depending upon observation limitations. While this did not approach the

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[23] Ibid.

forward observer system as we understand it today, it was a first step in that direction.[24]

The observation posts referred to above were terrestrial and they were located as accurately as the situation permitted. The firing posts were established by survey as rapidly as possible. All three types were restricted by terrain, visibility conditions, and the limitations of the human eye, as aided by such optical instruments as binoculars and the observation telescope. Under ideal conditions such posts could provide effective target acquisition out to a maximum of five kilometers.

Artillery Liaison Officers--The artillery units of the division provided liaison officers to the infantry regiments which they supported. These officers were required to report back to their parent artillery headquarters' staff intelligence officer all information available to the infantry which would be of targeting value to the artillery.[25]

Air Service--The air service was an agency of the American Expeditionary Force whose control was centered at the corps and army level. The air service included balloon companies and air squadrons and could provide balloon observation, aerial observation, and aerial photography for the artillery. The air service personnel who performed missions for the artillery were given an orientation on artillery requirements. The air service was able to extend the line of visual observation deep into enemy territory, while the aerial photography capability proved a valuable supplement. The air service, as an entity, was under the

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[24] Ibid.

[25] U.S., A.E.F., The Artillery Information Service (G.H.Q., A.E.F., Aug., 1918), p. 17.

control of the G2 who allocated assets to the artillery as he saw fit.[26,27]

Flash and Sound Ranging Battalion--The Flash and Sound Ranging Battalion was an engineer unit pieced together by the American Expeditionary Forces. It was not a table of organization unit provided by the United States army force structure of the period. The battalion was a holding unit and provided administrative services for its principal operating elements, the flash ranging sections and the sound ranging sections. The sections operated on a semi-autonomous basis. Until September, 1918, the military service and the pay records of the section personnel were maintained by the section commander rather than by the battalion. This was changed at that time so as to provide the battalion greater control over its widely deployed elements. The first American sound ranging section began operating in early March, 1918, while the first flash section didn't go into action until the end of April. The year 1918 marks the initial appearance in a United States military force of an operational, battalion size unit whose primary mission was enemy artillery battery location.[28,29,30,31]

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[26] Ibid., pp. 4-6.

[27] COL Sunderland, Director of Instruction (n.n., n.p.), Observation of Fire, 1918 (est.), Bulletin No. 218-RI (n.p., n.n., n.d.), pp. 3-4.

[28] U.S., A.E.F., Procedure Followed by American S.R.S. in the Field (G-2-C, G.H.Q., A.E.F., 1918).

[29] U.S., A.E.F., Observation Section Flash Ranging (G-2-C, G.H.Q., A.E.F., 1918).

[30] C. B. Bazzoni, CPT, Engrs. U.S.A., Note on the Accuracy of Sound Ranging Locations (France: The Base Printing Plant, 29th Eng., U.S. Army, 1918).

[31] U.S., A.E.F., Accuracy of S.R.S. and F.R.S. Locations: Period Subsequent to St. Mihiel Offensive (G-2-C, G.H.Q., A.E.F., 1919).

Sound ranging section—A sound ranging section was authorized six officers and eighty enlisted men. The exact strength of the section varied with the nature and magnitude of the enemy activity in its sector. On an active front the full strength was necessary for effective operations. On a quiet front it was found that four officers and fifty-five to sixty enlisted men were adequate.[32]

The section was divided into five internal groupings as follows: (1) operations; (2) maintenance; (3) technical-apparatus, computing, and records; (4) subsistence, supplies, and records; and (5) liaison.[33]

The operations group manned the two sound ranging observation posts and provided the instrument men and photographers who operated the central sound recording machine.[34]

The computation and records group interpreted all film, located the guns in map coordinates, and reported all locations to the appropriate headquarters. It also prepared and transmitted the necessary written follow-up reports.[35]

The maintenance group was responsible for the laying and maintenance of wire lines, maintenance and repair of the central sound recording equipment, and for the care of the sound microphones.[36]

The functions of the subsistence, supplies, and military records group is self-explanatory.

The liaison group was responsible for the establishment of communication and liaison with the army, the corps, the division, and the

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[32]U.S., A.E.F., Procedure Followed by . . ., p. 3.

[33]Ibid., pp. 4-6.

[34]Ibid., pp. 6, 11, 21-24.

[35]Ibid., pp. 6, 10, 12-16.

[36]Ibid., pp. 6, 10-11, 16-21.

artillery headquarters in whose sectors they operated; and with the collection and coordination of information from the sound observation posts, the flash ranging section in the area, and the army meteorological station.[37]

The sound ranging section established and operated a sound ranging base consisting of six microphones, with the microphones emplaced from 1,200 to 1,700 meters apart and two to four kilometers to the rear of the front lines; two observation posts well forward of the line of microphones; and a single sound ranging central located in the rear of the microphone base.[38] It was not organized to conduct its own survey operations. Survey was to be performed by a separate engineer topographic unit.

The equipment adopted for use by the American Expeditionary Forces' sound ranging section was that perfected by the British army. The principles of all allied sound ranging were the same as developed initially by the French. The difference in the French and British equipment was one of mechanical design.[39]

The sound ranging sections were successful in locating enemy artillery weapons out to fifteen kilometers, under ideal conditions. Sound ranging was not affected by rain, fog, or darkness; however, it was susceptible to wind. A wind blowing from the sound base toward the sound source was particularly telling. It tended to raise the sound

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[37] Ibid., p. 7.

[38] C. H. Lanza, Sound Ranging, The General Service School (Fort Leavenworth: The General Service School Press, 1919), pp. 1-4.

[39] U.S., The General Service School, Ft. Leavenworth, Tactics and Technique: Artillery (Ft. Leavenworth: The General Service Schools Press, 1922), II, 88.

wave up over the microphone, thus effectively blocking reception. A wind blowing from the sound source toward the base was an asset.[40]

In addition to ranging on the sound wave generated by firing, the equipment was capable of detecting the shock wave caused by a shell burst. This enabled the sound ranging section to render assistance in the adjustment of friendly artillery fires. This capability was enhanced if the adjustment was being made on a target located by the sound ranging section.[41]

The sound ranging sections were assigned the following missions:

1. the location of enemy artillery batteries
2. general observation of the enemy sector
3. ranging of friendly batteries on special objectives.

Flash ranging section—A flash ranging section consisted of three or four officers and eighty enlisted men. It was capable of establishing and operating a flash base of three to five observation posts and a flash ranging central. It was designed to operate on a twenty-four hour basis. The section was responsible for laying and maintaining its own communications lines; however, as with the sound section, its own survey operations were to be performed by a separate engineer topographic unit or section.[42]

The general techniques and capabilities of the American flash ranging section were as developed by the French. It was possible to locate artillery batteries out to ten kilometers. Rather than inhibit

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[40]Bazzoni, pp. 3-22.

[41]U.S., A.E.F., Adjustment of Artillery Fire by Flash and Sound Ranging Sections (G-2-C, G.H.Q., A.E.F., 1918), pp. 9-12.

[42]U.S., A.E.F., Observation Section Flash . . ., p. 11.

operations, darkness was a distinct asset; however, fog, smoke, and rain did impair the capabilities of the flash rangers.[43]

The sections were given the following missions in order of priority:[44]

1. the accurate location of the enemy's guns.
2. reporting information concerning enemy battery activity.
3. reporting all other information relative to enemy activity.
4. ranging friendly artillery bursts—this included calibration, registration, and fire mission adjustments.

Although the flash rangers were corps of engineer personnel, it was required that the officers have attended a course of instruction in artillery firing techniques before being assigned duties with the flash section.[45]

Responsibilities

Target acquisition—Artillery target acquisition responsibility was divided in two different ways. The first breakout was between division, corps, and army, and it concerned the physical area upon which the headquarters would focus its main target gathering effort. The division was assigned the zone that extended from the front lines to a depth of two kilometers; the corps' primary zone started at two kilometers and extended to ten kilometers; and the army zone began at the

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[43] U.S., A.E.F., Accuracy of . . ., pp. 3-10.

[44] U.S., A.E.F., Observation Section Flash . . ., pp. 2-10.

[45] Ibid., p. 1.

ten kilometer line and extended to as great a depth as there were objectives suitable for the army artillery.[46]

The second breakout was target oriented. The responsibility for locating enemy artillery batteries was assigned to corps and army, with the corps having the primary role. This was in consonance with the area breakout since the great bulk of the enemy artillery positions were to be found in the two to ten kilometer zone.[47]

Counter battery responsibilities—The primary responsibility for counter battery work was given to the corps. This was a logical step—to assign a single headquarters the primary mission of locating enemy batteries and of taking appropriate action against them. It was a change from prewar doctrine which gave the counter battery task to the divisional artillery. It should be remembered that prewar counter battery operations were conducted at much closer ranges and were often direct fire exchanges.

Organization

General—The target acquisition and counter battery tasks had become quite complicated. Like the French before them, the American forces saw the need for a special organization to insure the efficient utilization of all resources in this field, and to preclude the dilution and dissipation of artillery capabilities which could result from unwarranted duplication of effort.

The Artillery Information Service (A.I.S.)—The American Expeditionary Forces established an A.I.S. that extended through all levels

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[46] U.S., A.E.F., The Artillery Information . . ., p. 14-16.

[47] Ibid., pp. 1-18.

of command from army headquarters down to artillery battalion. At corps and army level the personnel were assigned to A.I.S. duties on a full time basis. At divisional artillery (brigade) level and below the A.I.S. duties were assigned to the staff intelligence officer; thus he had a dual function—he was an agent of the A.I.S., and he was a link in the G2 chain.[48]

The A.I.S. of an artillery unit pertained only to the staff of that unit and had no direct control over the A.I.S. of subordinate units. Supervision and direction had to be exercised through the tactical commander concerned. In this respect it functioned as does any staff section; however, the directives governing its functioning at each level were very comprehensive and insured close coordination with minimum effort.[49]

The functions of the A.I.S., as an entity, were listed as follows:

> (1) In general, to furnish the artillery all necessary information in regard to the enemy, and to cooperate with other agencies in collecting, coordinating, and disseminating information.
> (2) To furnish artillery commanders complete information as to the organization, disposition, and activity of the enemy artillery.
> (3) To furnish the artillery promptly the information necessary for the execution of their missions, such as:
> Exact position of enemy batteries.
> Location of command posts, observation posts, visual signalling posts.
> Location of camps, dugouts, ammunition dumps.
> Trails and roads most used, with hours of heaviest traffic.
> For counter-batteries, the most active and effective of the enemy batteries, and the exact time when they can be most effectively attacked with destruction or neutralizing fire.
> (4) Responsibility for the transmission of information in any form to artillery units rests with the A.I.S.
> (5) Direct control of the flash ranging sections (F.R.S.) and the sound ranging sections (S.R.S.), regulation of their use by artillery units, the maintenance of communications with them, and the prompt handling of information thus obtained.

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[48] Ibid., pp. 1-3.

[49] Ibid., pp. 1-34.

(6) Adjustments of artillery fire by the F.R.S. and S.R.S.
(7) The A.I.S. works in close coordination with G2 in receiving, comparing, and forwarding information. Important information is communicated at once by telephone, daily bulletins are exchanged, and frequent conferences are held where all information received is discussed and verified. For this purpose, G2 sends to each army and corps A.I.S. an intelligence officer, whose function is to obtain all artillery information required by G2.[50]

The Chief of Artillery, A.E.F., was assigned the responsibility of training officers for the A.I.S.[51]

The most important link in the A.I.S. chain was the corps section. It was the central point for artillery information gathering. From the corps A.I.S. office artillery intelligence was disseminated to higher, lower, and adjacent headquarters. It was the corps that had operational control of the flash and the sound ranging sections located within its sector.[52]

The army A.I.S. conducted the necessary coordination between the corps. The army A.I.S. had what was termed "tactical control" of the flash and sound ranging sections. This meant that the army A.I.S. determined the general location for the sound and flash bases, so as to coordinate their positioning across the entire army front. If a corps boundary were changed, the flash or sound ranging section in the area of change did not move with the corps. The operational control would be shifted from one corps A.I.S. to the other as appropriate.[53]

At army level the officer in charge of the A.I.S., called the Artillery Information Officer (A.I.O.), was also the counter battery officer. In this capacity, under the direction of the army chief of artillery, he determined enemy batteries to be attacked by the army artillery, methods of fire, and ammunition expenditure. He directed

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[50] Ibid., pp. 1-2.

[51] Ibid., pp. 4-13.

[52] Ibid., p. 2.

[53] Ibid., pp. 14-15.

the counter battery firing of one corps in the zone of an adjacent corps.[54]

At corps level the counter battery organization was not as definite. The preferred system that evolved was to assign the corps counter battery responsibilities to the commander of the corps heavy artillery brigade. He was the individual who commanded the principal counter battery weapon assets. The second choice was to assign the duties of counter battery officer to the A.I.O. of the corps or to a member of his staff. The British used the latter system, the French the former. In the American army the corps' chief of artillery was given the option of designating the method to be used. In any case, a close relationship had to exist between the commander of the heavy artillery brigade and the artillery information officer of the corps. When the commander of the corps heavy artillery brigade was designated counter battery officer, the Artillery Information Service maintained an advance report center at the command post of the heavy artillery brigade. This insured that the latest and most complete information possible on the enemy artillery was available to the man responsible for taking action on the information. If the A.I.O. was designated the counter battery officer for the corps, it was necessary that he have the authority to direct the fires of the corps heavy artillery brigade as required to accomplish his mission.[55,56,57]

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[54] Ibid., pp. 2-3.

[55] Ibid., pp. 2-3.

[56] Dwight E. Aultman, BG, USA, Lecture Delivered on Counter-Battery Work to the Students, Army Center of Artillery Studies, Feb. 26, 1919, U.S. War Department, Office of the Chief of Staff, Information Bulletin No. 10, Published by Direction of Chief of Field Arty, April 26, 1919, pp. 5-11.

[57] U.S., War Department, Office of the Chief of Staff, The Corps Artillery Information Service, Information Bulletin No. 31, Published by Direction of Chief of Field Arty, Oct., 1920, pp. 7-12.

Conclusions

World War I found the United States artillery ill prepared for the roles and missions thrust upon it. Its mobilization goals were impossible to meet without outside assistance.

Allied assistance, particularly that provided by France, bridged the gap between United States artillery objectives and capabilities. The nature and magnitude of the French aid insured the French a dominant role in shaping United States artillery development during this period. Consequently, the United States artillery adopted with very little change the doctrine and techniques of the French artillery.

The above held true in the area of artillery target acquisition and counter battery organization. Techniques developed and utilized by the French and the British were assimilated by the American army. For the first time there is found in a United States military force a battalion size unit whose primary mission is the location of enemy artillery. This unit, the Engineer Flash and Sound Ranging Battalion, was not a TOE unit authorized by the United States War Department. The requirement for such a unit had not been foreseen, nor had the technical operations, employed by it, been perfected before the war began.

The flash and sound ranging sections of the battalion were placed under the tactical and operational control of the Artillery Information Service and they worked closely with artillery units down to battalion level in their day to day activities. Nevertheless, following the French and the British lead, the Flash and Sound Ranging Battalion was formed as a Corps of Engineer unit. It was felt at the time that the engineers possessed more of the technical skills required. It was recognized that the key personnel in the sections would have to be

knowledgeable in artillery techniques and doctrine and this was provided by an artillery orientation course.

It is to the Engineer Flash and Sound Ranging Battalion of World War I that today's Field Artillery Target Acquisition Battalion (FATAB) can trace its origin. A permanent artillery target acquisition problem, spawned by the indirect fire technique, nurtured by increased artillery ranges, and matured by the unobserved fire capability, had crystallized. Special measures were required to meet it. The concept of a special purpose, target acquisition unit had been born.

PART II

DEVELOPMENT AND CHANGE: WORLD WAR I TO PRESENT

CHAPTER IV

BETWEEN THE WORLD WARS

Artillery Doctrine and Tactics Examined

General

Before the war had ended, an examination of artillery employment techniques had already begun. A number of senior American artillery officers began protesting the great stress placed on the detailed computations of unobserved fire, map fire as it was most often called. It was the feeling of such officers that American artillerymen had become entranced with the scientific approach to artillery fire, that the rapid approximate methods of open warfare were being neglected. When the war ending offensives of 1918 produced some semblance of open warfare, this group called attention to artillery shortcomings to reinforce their arguments—situations in which the artillery failed to provide the close and continuous support desired for the rapidly advancing infantry line. Part of the blame rested on the American artillerymen who were unschooled or unskilled in supporting a war of movement. As we have seen, the great majority of the American artillerymen, both officer and enlisted, were neophytes, and the war of

positions, trenches, and limited objectives was all they knew.[1,2,3]

Formal Review

When the war ended a comprehensive examination of artillery doctrine, organization, and equipment was ordered. A committee of senior artillery officers serving with the American Expeditionary Forces (A.E.F.) France was established to conduct the review and report their findings and recommendations to the Chief of Field Artillery, United States Army. The board was headed by Brigadier General Andrew Hero. Its findings and recommendations were incorporated into a report submitted by the Chief of Field Artillery to the United States Secretary of War. This consolidated report served as a guiding document for post World War I artillery changes in the United States army.[4]

The recommendations included in the above report are numerous and encompassed most phases of artillery doctrine, organization, and equipment. Only those most pertinent to the evolution of the Field Artillery Target Acquisition Battalion (FATAB) are summarized below:

1. that the artillery be organized into divisional, corps, and general reserve units; that there be no organic army artillery.

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[1]U.S., War Department, Office of the Chief of Staff, Extract from Notes on Recent Military Operations (No. 3, G.H.Q., A.E.F.), Information Bulletin No. 2, Published by Direction of the Chief of Field Artillery, 1 January, 1919, pp. 1-5.

[2]U.S., War Department, Office of the Chief of Staff, Extracts from Information Bulletin No. 23, A.E.F., Information Bulletin No. 3, Published by Direction of the Chief of Field Artillery, 15 January, 1919, pp. 1-7.

[3]U.S., War Department, Office of the Chief of Staff, Artillery Support, Information Bulletin No. 5, Published by Direction of the Chief of Field Artillery, 11 February, 1919, pp. 1-5.

[4]U.S., War Department, Office of the Chief of Field Artillery, Report of the Chief of Field Artillery to the Secretary of War, 1919 (Washington: Government Printing Office, 1919), pp. 184-194.

2. that study and experimentation be energetically continued in all phases of artillery materiel and equipment, techniques, organization, and training so that our needs upon outbreak of war will have been determined and maintained in time of peace.

3. that the technical knowledge and training of field artillery officers be greatly increased in matters of theory and practice, with special bearing on the various phases of motor transport and the application of both pure and applied mathematics to the technical employment of field artillery. The foregoing to be accomplished without prejudice to the well known and long tried principles governing the employment of the arm in open warfare.

4. that the personnel of the Flash Ranging Service and the Sound Ranging Service be artillerymen and that those services be a part of the artillery organization.

5. that the Artillery Information Service (A.I.S.) be retained in time of peace as a part of our field artillery organization.[5]

Decision and Actions, 1922

General

By 1922, the initial sifting of World War I lessons had been completed and the United States army underwent a major reorganization. The artillery organization that resulted and the significant doctrinal decisions that affected the type FATAB are discussed below. The organization, as outlined, was to reflect the official wartime posture of the United States army.

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[5] Ibid.

Organization, Weapons, and Missions

Division artillery—An artillery brigade was to be organic to each division. Besides the headquarters and headquarters battery, the brigade was to consist of two regiments of light artillery (75mm gun) and an ammunition train. The primary mission of the divisional artillery was to provide close support to the infantry. It had to be sufficiently mobile to insure continuous support and not so numerous or of such a nature as to encumber the division. It was this consideration that led to the deletion of the 155mm howitzer regiment found in the World War I field organization. The 155mm howitzer was considered appropriate for division artillery in a stabilized situation but too cumbersome for open warfare. The 1922 policy provided that in stabilized zones 155mm howitzer units would be attached to the division artillery from the general reserve.[6]

Corps artillery—Corps artillery was to consist of a corps artillery headquarters and a corps artillery brigade. The corps artillery headquarters was a section of the corps staff. Its functions were to coordinate the operations of the corps artillery brigade and the divisional artillery, and to control the operations of any artillery reinforcements assigned to the corps.

The corps artillery brigade was completely motorized and consisted of a brigade headquarters, three regiments of 155mm howitzers, one regiment of 155mm guns, one observation (flash) battalion, and an ammunition train.[7]

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[6]U.S., War Department, The General Service Schools, Tactics and Technique Artillery (Fort Leavenworth: The General Service Schools Press, 1922), I, 8-9.

[7]Ibid., p. 10.

The missions of the corps artillery were (1) counter battery; (2) destructive and neutralizing fires; (3) assisting the division artilleries; (4) assisting the neighboring corps.[8]

The assignment of counter battery responsibilities to the corps was a continuation of the practice originating in World War I. The major consideration in this decision had little to do with artillery weapon range capabilities or limitations in the corps and division. It should be recalled that the principal World War I corps artillery weapon was the 155mm howitzer, and that the division artillery then included a regiment of the same. Rather, it was a question of orientation. In World War I, it was considered imperative that the divisional artillery focus its entire effort on rendering close support to the infantry. It was considered undesirable to detract from this close support mission by assigning the division responsibilities in the counter battery field. The validity of this decision was endorsed by post war reviews. Post war allocation of type weapons and units to the division and the corps artillery brigades was an extension of this basic premise.

Army artillery—The 1922 reorganization provided an army artillery headquarters and an ammunition train. During war operations, artillery units were to be assigned to an army from the General Headquarters (GHQ) reserve artillery for use as army artillery, or for reassignment to corps.[9] Army artillery composition was to be tailored to meet the situation existing in the particular army zone or sector.

The missions of the army artillery were to be (1) long range fire of all kinds; (2) ássisting corps artillery; (3) fire reserve.[10]

GHQ reserve artillery—The GHQ reserve artillery was planned on

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[8] Ibid., II, 55. [9] Ibid., I, 11. [10] Ibid., II, 56.

the basis of a theater army force containing six subordinate armies. The GHQ reserve artillery for a theater force was to include the following:

1. Six brigades of light artillery (75mm guns).
2. Six brigades of mixed medium and heavy artillery (155mm guns, 240mm howitzers, 6-inch guns).
3. One regiment of trench mortars.
4. One regiment of 12-inch guns (railroad).
5. One regiment of 16-inch guns (railroad).
6. Sound ranging service of a headquarters and ten sound ranging companies.[11]

The GHQ reserve artillery, as such, had no tactical function. It was to relieve the tactical units of many routine duties of administration and training while providing a headquarters to distribute and redistribute artillery in accordance with the overall battle requirement.[12]

Target Acquisition

The artillery target acquisition techniques and responsibilities as reflected in the 1922 army doctrine were essentially that which had evolved during World War I. Reconnaissance, ground observation posts, artillery liaison officers, areial and balloon observation, aerial photography, sound ranging, and flash ranging were the principal means to be employed. Coordination of effort and correlation of data were to be effected by an Artillery Information Service extending through all levels of command.[13]

Observation (Flash) Battalion

As a result of the 1922 army reorganization, there appeared in

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[11] Ibid., I, 11. [12] Ibid. [13] Ibid., pp. 262-270.

the troop list of each corps artillery an Observation (Flash) Battalion. This battalion consisted of a headquarters and headquarters detachment (War Department Table of Organization 154) and two flash batteries (T/O 155). The authorized strength of the battalion was 225 officers and enlisted.[14]

The missions assigned the unit were the same as that given the World War I engineer flash section, with the location of hostile artillery being of primary importance.

At the time it was felt that a flash base could be installed in one-half day. Within that time frame, the flash section was considered useful for artillery target acquisition purposes under either open warfare or stabilized warfare conditions.[15]

Sound Ranging Service

The 1922 reorganization completely separated the flash and sound ranging sections. As part of the GHQ reserve artillery was to be found the sound ranging service headquarters and ten sound ranging companies. The companies were to be organized in accordance with War Department Organization Table 559W, providing a total of ninety-one officers and enlisted men per company.[16]

Based on World War I experiences, it was felt, in 1922, that a sound ranging section would require two days to establish an effective

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[14]U.S., War Department, The General Service Schools, Reference Data (Fort Leavenworth: The General Service Schools Press, 1925), pp. 8, 12.

[15]U.S., War Department, The General Service Schools, Tactics . . ., II, 88-89.

[16]U.S., War Department, The General Service Schools, Reference Data, p. 10.

base. During conditions of open warfare, this long installation time would preclude the sound ranging unit performing any effective artillery target acquisition function. Consequently, the 1922 decision placed the sound ranging capability in the GHQ artillery reserve so that it could be employed where it would be effective—in the stabilized zones or sectors of the front.[17]

The missions to be assigned the artillery sound ranging companies were the same as had evolved for the World War I engineer sound ranging sections.

Test Unit Established

Almost concurrently with the publication of the wartime organization discussed above, the War Department activated on 7 August, 1922 the First Observation (Flash) Battery with station at Fort Bragg, North Carolina. This battery was directed to work with the field artillery board at Fort Bragg to test equipment, concepts, and organization for flash and sound ranging. The testing was to extend into the areas of flash and sound ranging topographic control and meteorological requirements. A special battery organization which included both a flash and a sound platoon was organized for test purposes. The First Observation Battery served at Fort Bragg in this same capacity from August, 1922, until May, 1939.[18] Test results during this period contributed to the

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[17] U.S., War Department, The General Service Schools, Tactics . . ., II, 90-92.

[18] "History of 1st Field Artillery Observation Battalion, May 1922-June 1945" (Field Artillery School Library, Fort Sill, Okla.), p. 1. (Mimeographed).

numerous organization changes that occurred in the flash and sound ranging field, while the basic equipment and techniques of World War I were perfected and improved.

Developments, Tests, Evaluation and Change: 1922-1941

Synopsis

The field artillery organization established in 1922 remained essentially the same at all levels of command until 1930. In that year a regiment of 155mm howitzers was added to the division artillery brigade, thus providing the infantry division with the same organic artillery it was provided in World War I.[19] The decision to return a 155mm howitzer regiment to the division artillery brigade was made in light of mobility improvements effected in the interim years. The 1930 155mm regiment was completely motorized to insure its ability to provide close and continuous support to the infantry division in a fast moving situation.[20] This change did not affect the overall missions of the division and corps artilleries as proclaimed in 1922.

In 1930, a significant change was made in the Observation (Flash) Battalion organic to the corps artillery. This unit was reorganized with a headquarters and headquarters battery and two observation batteries, each observation battery containing one flash and one sound ranging platoon. The unit was redesignated as an Observation (Flash and Sound) Battalion with a total war strength of 430 officers and enlisted men. This 1930 change did not affect the sound ranging

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[19] U.S., War Department, The General Service Schools, Reference Data, 1930 (Fort Leavenworth: The Command and General Staff School Press, 1930), p. 13.

[20] Ibid.

companies assigned to the general reserve artillery. They were still authorized in the same configuration.[21]

In 1931 the sound ranging service and the separate sound ranging companies were eliminated. The Observation (Flash and Sound) Battalion was redesignated the Field Artillery Flash and Sound Battalion, with the internal organization and strength remaining the same as provided in 1930. One flash and sound battalion was authorized for each corps artillery and one battalion was authorized for each heavy artillery brigade of the general reserve artillery.[22,23,24] There were a total of six heavy artillery brigades authorized in the GHQ general reserve, the basis being one per field army. The United States entered and fought World War II with this same 1931 flash and sound battalion density; that is, one per corps plus one additional battalion for each army.

Considering the earlier 1922 decision, why was the sound ranging capability placed in the corps artillery in 1930? The primary reason was a great reduction in base installation time. The testing completed subsequent to 1922 demonstrated that a sound ranging platoon, if provided organic surveying sections, could establish a base in from

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[21] Ibid., pp. 8, 18, 20.

[22] U.S., War Department, The General Service Schools, Reference Data, 1932 (Fort Leavenworth: The Command and General Staff School Press, 1932), pp. 8, 18, 21.

[23] The Field Artillery School, Organization of the Field Artillery, Army Extension Courses Special Text No. 88 (Fort Sill: Printing Plant, The Field Artillery School, 1931), pp. 125-129.

[24] U.S., War Department, Sound and Flash Battalion: TR 430-130 (Washington: U.S. Government Printing Office, 1932), p. 3.

five to ten hours. This was accomplished by performing the maximum number of operations concurrently, and having all essential elements directly responsive to the platoon commander. Given the same conditions, the installation time for a flash base was determined to be four to six hours.[25]

The missions assigned the flash and sound battalion in 1930-31 were (1) location and determination of caliber of enemy artillery; (2) adjustment of friendly artillery.[26] The headquarters and headquarters battery (T/O 154W) was a small control and support unit authorized only sixty-nine officers and enlisted men. The observation battery was organized as shown in Table II (T/O 155W).

TABLE II

The Observation Battery, 1930-1939[27,28]

Element	Strengths		
	Officer	Enlisted	Aggregate
Headquarters	2	12	14
Flash Platoon	2	59	61
Operations Section	(1)	(35)	
Topographical Section	(1)	(24)	
Sound Platoon	2	43	45
Operations Section	(1)	(19)	
Topographical Section	(1)	(24)	
Communications Platoon	1	49	50
Maintenance Section	0	13	13
Total strengths	7	176	183

[25]The Field Artillery School, Tactical Employment of Field Artillery, Army Extension Courses Special Text No. 98 (Fort Sill: Printing Plant, the Field Artillery School, 1931), pp. 66-67.

[26]U.S., War Department, TR 430-130 . . ., p. 2.

[27]The Field Artillery School, Organization of . . ., p. 126.

[28]U.S., War Department, TR 430-130 . . ., p. 3.

By 1932 the first comprehensive document concerning sound and flash ranging was compiled and published by the United States War Department. This was Training Regulation 430-130, 10 September, 1932. It contained detailed data and instructions on all phases, both tactical and technical, of sound and flash battalion operations.

No further significant changes in organization occurred until 1939. In that year the sound and flash battalion was reorganized and redesignated the observation battalion. The observation battalions carried in the GHQ reserve artillery were removed from the heavy artillery brigades and placed directly under the GHQ artillery officer. The authorization of one observation battalion per corps artillery remained unchanged. The 1939 reorganization did not affect the observation battery; however, it did increase significantly the size and importance of the headquarters and headquarters battery of the battalion. It added to this element a topographic platoon, a communications platoon, and a meteorological section. The battalion topographic platoon was responsible for carrying survey control forward to connect with the observation battery surveys, and for tying the observation battalion surveys into the field artillery firing unit control. It was further charged with making available to other field artillery units the coordinates of topographic control points the observation battalion had employed or established.[29]

The meteorological section was responsible for the determination and dissemination of the data required by the sound ranging platoons to

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[29]U.S., War Department, The Observation Battalion, FM 6-120 (Washington: U.S. Government Printing Office, 1939), pp. 2-3.

compensate for non-standard weather conditions. Heretofore this data had been provided from sources outside the battalion.[30]

There were a number of minor changes in field artillery organization, target acquisition, and counter battery capabilities and doctrine, as reflected in our 1939-1940 Field Manuals. They reflected improvements in communication, aerial observation and forward ground observer techniques, tactical mobility, and equipment design.[31,32,33] There were no really fundamental changes beyond what has been outlined above.

Conclusions

World War I experience was the motivating force behind the 1922 United States army reorganization. There was some recognition of the fact that World War I experiences were biased since a condition of stabilized warfare had predominated almost throughout. It was appreciated that such a condition may or may not occur in the future should the United States find it necessary to take up arms again. Nevertheless, the 1922 army reorganization was accomplished in the shadows of World War I and the lessons of that war were paramount in the minds of the decision makers.

The field artillery target acquisition problems of World War I were accepted as a permanent part of the military scene. The solutions

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[30] Ibid.

[31] U.S., War Department, Field Artillery Field Manual, Organization and Drill, FM 6-5 (Washington: U.S. Government Printing Office, 1939).

[32] U.S., War Department, Field Artillery . . ., FM 6-20.

[33] U.S., War Department, Field Artillery Field Manual, Firing, FM 6-40 (Washington: U.S. Government Printing Office, 1939).

devised amid the stresses of combat were reexamined in the quiet of peace. The attempt to compensate for visual observation, artillery target acquisition limitations by the use of sound and flash ranging techniques during World War I was considered sufficiently successful to warrant their permanent acceptance by the United States army. Flash and sound ranging capabilities were provided for in the artillery force structure adopted in 1922 while concept, equipment, and organizational testing began in earnest at Fort Bragg, North Carolina. As a result of the test and development program carried out from 1922 to 1939 by the Field Artillery Board and the First Observation Battery, numerous organizational changes occurred in the flash and sound ranging fields. The final product of these changes was the Field Artillery Observation Battalion with a headquarters and headquarters battery and two observation batteries, each observation battery having a separate sound and flash platoon. Topographic sections were made organic to each platoon in order to reduce base installation time. The meteorological message needed for accurate sound ranging was produced in the headquarters and headquarters battery. One observation battalion was organic to the corps artillery while one additional battalion was to be provided per field army.

On the eve of World War II, counter battery remained the primary responsibility of the corps artillery. It was provided an observation battalion as its only organic target acquisition element.

CHAPTER V

WORLD WAR II AND ITS IMPACT ON FATAB DEVELOPMENT: 1940-1950

At War's Start

When the United States declared war in 1941, the field artillery observation battalion organization and mission remained as established by the 1939 change. The mission was stated as follows: (1) location and determination of caliber of enemy artillery; (2) adjustment of friendly artillery; and (3) collection of information.[1]

The battalion, consisting of a headquarters and headquarters battery and two observation batteries, was organic to corps artillery, and it represented that headquarter's only organic means of hostile battery location. It was envisioned that the two observation batteries would be adequate in most cases to provide complete coverage of the corps zone or sector with both flash and sound bases. Flash and sound ranging have always been considered complementary techniques, one not being a satisfactory substitute for the other. United States military doctrine of the period assumed a normal corps front to be 7,000 to

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[1]U.S., War Department, The Observation Battalion, FM 6-120 (Washington: U.S. Government Printing Office, 1939), p. 2.

15,000 yards with a mean of about 10,000.[2,3] If the larger frontage existed or was exceeded, it was recognized that the one observation battalion could not provide the optimum coverage desired for the entire corps. In such cases assistance would be provided the corps from an observation battalion to be taken out of the general reserve and assigned to army artillery. The army artillery would further attach portions of its observation battalion to those corps artilleries requiring augmentation. The 10,000 yard planning figure for a corps front represented twice the normal frontage assigned the corps in World War I. It was arrived at by United States military planners of the 1930's after considering the mobility improvements effected by motor transport and armored vehicles.

The 1939 reorganization of the headquarters and headquarters battery of the observation battalion had added a meteorological section and a topographical platoon. As previously noted, the purpose of the meteorological section was to provide wind, air temperature, and air density information required by the sound platoons of the battalion. The topographic platoon was provided to tie the observation battalion survey into the survey control used by the firing battalions of the field artillery so that meaningful targeting information could be passed to them. Thus when World War II began, the functions of both special purpose elements of the headquarters and headquarters battery, topographical and meteorological, were internal to the operations of the observation battalion.

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[2] Ibid., p. 47.

[3] U.S., War Department, European Theater, "The Field Artillery Observation Battalion," report of the General Board, study no. 62, artillery section, 4 April, 1946, p. 15.

Wartime Change

Very soon after the United States had entered World War II, further change and expansion of the headquarters battery of the observation battalion took place. The battalion was organized under Table of Organization 6-75, 1 April, 1942. This provided an expanded topographical platoon of four survey teams for the headquarters battery and a moderate increase in that unit's meteorological section. A significant increase in the observation battalion's mission occurred; it was now listed as follows:

1. location of enemy artillery [same except "determination of caliber" deleted from 1939 mission].
2. adjustment of friendly artillery [same].
3. collection of information [same].
4. calibration, comparative, of friendly artillery [added].
5. metro data to friendly artillery [added].
6. coordination of survey [added].[4,5]

Calibration of firendly artillery was an accepted capability of the observation battery, particularly the flash ranging elements, since their inception. It had been listed as a mission of the flash ranging sections of World War I. It was heretofore excluded as a stated mission of the post-World War I observation battalion. The feeling had been that calibration, to include observation of rounds, was within the capabilities of the field artillery firing battalion or its higher headquarters. The observation battalion should assist as needed, providing it did not interfere with higher priority missions. Instructions governing calibration techniques were to be found in TR 430-130, 10 September, 1932 and in FM 6-120, 1939.

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[4]U.S., War Department, Field Artillery Observation Battalion, TO 6-75 (U.S. Government Printing Office, 1 April, 1942).

[5]U.S., War Department, The Observation Battalion, Change 1, FM 6-120 (Washington: U.S. Government Printing Office, 10 December, 1943), p. 1.

By 1942 the United States field artillery had developed comprehensive fire direction procedures, procedures which permitted the massing of fires from widely separated firing batteries or battalions. To increase the accuracy and effectiveness of the massed fire capability, it was necessary that comparative calibration data be available so that artillery tubes could be grouped properly and individual piece and/or unit corrections determined.[6,7] The added importance of comparative calibration data by 1942 influenced the decision to elevate "calibration" to one of the primary missions of the observation battalion.

The decision to add "metro data to friendly artillery" appears perfectly logical. In 1939 the observation battalion was provided the capability of producing its own required sound ranging metro messages. The equipment provided and the technique utilized was much the same as that used by the division artillery headquarters to produce its visual artillery metro message. Since the accuracy of the metro message will decrease as the firing unit distance from the met station increases, maximum utilization of all available stations is desirable. The observation battalion was thus charged with providing metro data to friendly artillery. At the same time the division artillery was to provide metro messages to observation battalion sound ranging platoons, if the division metro station was located closest to the sound base.[8]

The coordination of survey operations was an important task.

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[6]U.S., War Department, Field Artillery Field Manual, Firing, FM 6-40 (Washington: U.S. Government Printing Office, 1939).

[7]U.S., War Department, Field Artillery Field Manual, Firing, FM 6-40 (Washington: U.S. Government Printing Office, 1942).

[8]U.S., War Department, European Theater, "The Field . . .," pp. 11-12.

The assignment of this mission to the observation battalion in 1942 filled a serious gap that had existed at the corps artillery level during the early months of the war.

Army topographic engineer units were charged with the production and updating of maps pertaining to the theater of operations. They produced large-scale battle maps for field artillery fire-control and other combat purposes. In 1939 there appeared in the new tables of organization of the corps, the engineer topographic company. The purpose of the company was to bridge the gap between the map-making activities of the engineer topographical battalion (army) and the survey work of the field artillery. The corps topographic company assisted the work of the army topographic battalion in the area of immediate interest to its own corps. Another mission involved the establishment of survey control points. Starting with the most suitable control points of the army net, the corps company was to establish a denser net in the area of the corps as required by corps troops. The net was to include points in the vicinity of artillery position areas.

It was essential that the topographic information be furnished to the various field artillery units and echelons in a timely manner and that close coordination exist between the field artillery and the corps engineer topographic company. During the early months of the war, there was no single artillery element designated to accomplish this coordination. The observation battalion, with an internal survey requirement that spanned the entire corps zone and with a mission that already required close cooperation with all of the artillery with the corps, was the logical choice. As early as 1940 an article had appeared in the

Field Artillery Journal recommending such a mission for the observation battalion; the experiences of war forced a decision.[9,10,11]

The observation battalion mission change provided a coordination agency for artillery survey and a single point of contact for the engineer topographic work. The 1942 T/O change provided the headquarters battery of the observation battalion an organic topographic platoon of four survey teams. The platoon was used to carry control forward from the control point or points established by the engineer company to each corps and division artillery brigade or battalion area. The observation battalion established a survey information center where all artillery units with the corps could go to obtain current survey data. Although the field manual on observation battalion operations which was in effect during most of World War II did not specify that such a center be established, the practice arose very early in the European Theater and was adhered to by all observation battalions.[12]

In May, 1945, the War Department published a new FM 6-120 making the survey information center standard doctrine. The observation battalion commander was designated the corps artillery survey officer. In his role as the corps artillery survey officer, he was charged with the following tasks:

a. Plans the corps artillery survey.
b. Coordinates the survey of the observation battalion with

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[9]Giraffe, "Engineer and Field Artillery Survey," Field Artillery Journal, XXX (July-August, 1940), pp. 277-278.

[10]W. C. Hall (LTC, CE), "Engineer Survey with Reference to Artillery," Field Artillery Journal, XXXIII (1943), pp. 495-497.

[11]U.S., War Department, European Theater, "The Field . . .," p. 10.

[12]Ibid.

other artillery units with the corps.

c. Maintains liaison with the topographic engineer unit operating with the corps, and obtains control data available to and provided by the engineer unit.

d. Establishes a survey information center for gathering and disseminating survey information.[13]

The new manual made official a procedure which had arisen early in World War II and which was standard practice among all observation battalions throughout the war.

The fluidness of many early World War II battlefields provided the impetus for a modified technique of flash and sound ranging. It was determined early in the war that on many occasions the tactical situation did not permit the establishment of a standard four or six post flash base. In such a situation the flash platoon could achieve a limited capability with just two posts. This gave rise to so called "short-base" flash ranging. Doctrine for short-base flash ranging was perfected in the early years of the war and was published in Change 1 to FM 6-120 on 10 December, 1943.[14]

Sound ranging was subjected to the same time pressures as was flash. Base installation time was often excessive when measured against requirements. As a result, techniques were developed for a more rapid sound ranging installation. The methods devised sacrificed accuracy for speed. Bases were map spotted initially and the sound base would range on the registration point(s) during the artillery registration. Positions of enemy guns could then be approximately determined in relation to the known point. As time permitted, the required survey would be conducted and normal sound ranging methods resumed. Using the above

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[13]U.S., War Department, Field Artillery Observation Battalion, FM 6-120 (Washington: U.S. Government Printing Office, 1945), pp. 13, 26-57.

[14]U.S., War Department, Change 1, FM 6-120, pp. 3-26.

technique, the rapid installation could be made in ½ to 1½ hours on favorable terrain. After an enemy gun had fired, two to three minutes were required to make a sound plot and send the fire mission to an artillery FDC.[15]

Additional techniques were developed to improve the accuracy of map inspection—calibrated wire being one of them. A wire of selected base length was stretched between microphones to assist in their hasty positioning.[16]

The "shot-in" base was a technique developed for use when satisfactory maps or photomaps were not available, or when rugged or heavily wooded terrain made other survey methods difficult or impossible. By this method relative locations of the microphones were obtained from sound ranging determination of the distances and direction from each of two known shot points to each microphone.[17]

The above techniques represented adaptations or modification of standard flash and sound ranging methods. They were forced by World War II battlefield conditions and did not reflect any change in basic concepts or organizational structure of the observation battery. The observation battery, mission and organization, remained substantially the same through World War II as it had been established in 1932. The most significant change affecting the observation battery and the accepted doctrine of its employment concerned the attachment of observation batteries to the infantry division. Pre-war doctrine did not reflect such a concept. The commitment of one or more divisions of the corps on widely separated portions of its front presented the corps observation battalion with a serious problem. Attachment of an

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[15] Ibid., p. 28. [16] Ibid., pp. 27-45. [17] Ibid., p. 46.

observation battery to the division was one solution used.

In May, 1945, just before the war in Europe ended, War Department Field Manual, FM 6-120: Field Artillery Observation Battalion was published. This manual incorporated the hasty installation doctrine and expanded missions of the unit as was promulgated in the 1943 Change 1 to FM 6-120, 1939. The chapter concerning employment of the battalion contained a section on decentralized operations, wherein it acknowledged the feasibility of attaching an observation battery to a division for limited periods. The 1945 manual changed the second element of the battalion mission to read "adjustment and registration [italics mine] of friendly artillery."[18] The addition of "registration" reflected the increased importance placed on registrations by the United States Artillery during World War II.

Post-War Review, Conclusions, and Recommendations

General

The Pacific Theater experiences played a minor role in observation battalion development following World War II. Shortly after the United States had entered World War II, the decision was made to give the European Theater priority on available military assets. This decision was reflected in the observation battalion deployment schedules. War Department records show that by October, 1944 there were fourteen observation battalions assigned to the European and North African Theaters of Operation versus one in the Central Pacific-Burma-China Command and one in the South West Pacific Area Command. When the war had ended

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[18]U.S., War Department, Field Artillery Observation . . ., FM 6-120, p. 1.

in Europe, twenty observation battalions were being employed there. In the Pacific the number had reached four by August, 1945, with five more on the way to the Pacific from Europe. However, the war ended before these additional battalions were available on the ground.[19,20,21]

Pacific Theater

The limited availability of observation battalions in the Pacific Theater influenced the manner in which they were employed. War Department records indicate that at no time during the war was there more than one observation battalion per two United States army corps.[22]

Before complete observation batteries and battalions were available for deployment to the Pacific, separate sound ranging platoons were used to some extent. When the batteries and battalions arrived, the separate sound platoons were incorporated into the standard observation unit structure.

There is no record of a single observation battalion employment study ever having been conducted for the World War II Pacific Theater.[23] However, certain conclusions can be drawn from an examination

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[19]U.S., War Department, Operations Division, Troop Deployment: 1 October 1944 (Washington: U.S. Government Printing Office, October, 1944), pp. 126-127.

[20]U.S., War Department, Operations Division, Troop Deployment: 1 June 1945 (Washington: U.S. Government Printing Office, June, 1945), pp. 93 and 123.

[21]U.S., War Department, Operations Division, Troop Deployment: 1 August 1945 (Washington: U.S. Government Printing Office, August, 1945), p. 150.

[22]Ibid.

[23]U.S. Army Combat Developments Command Artillery Agency, "Annex B, Historical Analysis (U) to Report of Results of Observation Battalion Target Acquisition Operations--World War II and Korea (U)," 1964, p. B-6.

of available operational, historical, and after-action reports and records from the individual campaigns. These are as follows:[24,25,26,27,28,29,30]

1. Sound ranging was used extensively and was effective in locating enemy artillery in the Pacific theater.

2. Flash ranging, the utility of which was at first suspect, gained in usage and importance during the last year of the war in the Pacific.

3. The corps artillery survey mission in the Pacific island campaigns was as important as, but of a lesser magnitude than, the artillery survey in a large land mass campaign. This mission could be

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[24]Historical Report, Headquarters, X Corps Artillery, 19 January, 1945, Subject: "Historical Report for Leyte Campaign" (File No. R 12138, Fort Leavenworth, Kansas, Library).

[25]Report, Headquarters, 1st Provisional Field Artillery Group, X Amphibious Corps, 8 May, 1945, Subject: "Special Action Report, Iwo Jima Campaign; Corps Artillery Officer's Report" (File No. C-9591-F, Fort Leavenworth, Kansas, Library).

[26]Historical Account, Headquarters, X Corps Artillery, n.d., Subject: "Historical Account, 17 April 1945-30 June 1945" (File No. N-13178, Fort Leavenworth, Kansas, Library).

[27]Report, Headquarters, I Corps Artillery, n.d., Subject: "Luzon Campaign: (File No. R-13102, Fort Leavenworth, Kansas, Library).

[28]Historical Report, Headquarters, XIV Corps Artillery, 15 June, 1945, Subject: "Luzon Campaign" (File No. R-12484, Fort Leavenworth, Kansas, Library).

[29]Letter, Headquarters, Army Ground Forces, 6 July, 1945, Subject: "SOP's of Corps Artillery in Pacific Area" (File No. R-10297, Fort Leavenworth, Kansas, Library. Includes SOP's from I, X, XIV, and XXIV Corps Artilleries).

[30]U.S., War Department, Operations Division, "Operations Division Information Bulletin, XXIV Corps Artillery Operations on Saipan," Vol. III, No. 3 (Washington: U.S. Government Printing Office, 23 September, 1944), pp. 2-3.

performed satisfactorily by the observation battalion survey elements or by a survey platton from the engineer topographic company.

4. The normal artillery meteorological data was required in the Pacific theater. This could be satisfactorily provided by either the meteorological section of the observation battalion or by a special meteorological detachment assigned to the corps artillery headquarters.

5. Because of the shortage of observation battalions in the Pacific, it was common practice for a single observation battery to be attached to a corps or division artillery for a particular operation.

6. The preferred method of observation unit employment was to have all observation batteries under centralized battalion control.

7. Without exception, commanders in the Pacific theater recommended that an observation battalion be assigned to each corps artillery as soon as possible.[31]

European Theater

As soon as the war had ended in Europe a general board was established by Headquarters, European Theater of Operations to prepare a factual analysis of the strategy, tactics, and administration employed by the United States Forces in the European Theater. One of the missions assigned the general board was to prepare a report on the employment of the Field Artillery Observation Battalion and to submit recommendations regarding the future organization and employment of this unit. In the course of its study the board consulted numerous observation battalion commanders, War Department Observers Reports, and

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[31]The War Department deployment schedules would have provided this before the end of 1945, had the war with Japan continued that long.

observation battalion after action reports. The findings and recommendations of the general board were submitted to the United States War Department and became the primary basis for the immediate post-World War II change of the observation battalion.[32]

Findings and Discussion

The board concluded that centralized control of the observation battalion at corps artillery was more effective than employment under decentralized control with the field artillery group or division artillery.[33]

The value of the observation battalion was greater under stabilized conditions and decreased as the fluidity of the battlefield increased.[34] This was predictable since World War I experience had demonstrated the same thing.

Sound ranging was effective in locating enemy artillery; however, the value of sound ranging was enhanced by comparing sound locations with aerial photographs. There was a need for improved sound ranging equipment.[35]

Flash ranging was not effective in locating German artillery. It was valuable in artillery registrations and in providing general battlefield intelligence to the corps artillery. There was a need for an improved observing instrument and flash ranging switchboard.[36] Flash ranging was only one-tenth as successful as sound ranging in

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[32]U.S., War Department, European Theater, "The Field . . ."

[33]U.S., War Department, European Theater, "The Field . . .," p. 15.

[34]Ibid. [35]Ibid., p. 16. [36]Ibid.

locating German artillery. There were several factors which limited flash ranging effectiveness in Europe: (1) the terrain was such that frequently only one observation post could observe a particular flash; (2) the German artillery used an excellent flashless powder; and (3) poor visibility often interfered with visual methods of observation. Despite its severe limitations in locating enemy artillery, the board considered the flash ranging capability a distinct asset, which made vital contributions to the overall success of artillery employment.[37]

The survey sections of the observation battalion were successful in establishing the required survey control for the artillery.[38] The survey information center was one of the most valuable innovations of the war and was established by all observation battalions in the European Theater.[39]

The observation battalion meteorological equipment was unsatisfactory. It was only through the cooperation of the antiaircraft artillery, the air corps mobile weather detachments, and the observation battalion that a satisfactory met message was produced. The Meteorological Set, SCR-658 arrived too late to be tested in combat. It appeared satisfactory except in the time required for observing.[40]

It had been demonstrated that radar could be used to locate mortar projectiles, observe for registrations, and for general battlefield intelligence.[41] These conclusions were based on tests run with the SCR-584 anti-aircraft radar.[42]

The board further concluded that three observation batteries

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[37] Ibid., pp. 8-10. [38] Ibid., p. 16. [39] Ibid., p. 10.
[40] Ibid., p. 17. [41] Ibid. [42] Ibid., p. 14.

per battalion were needed during combat in the European Theater.[43] Corps fronts were frequently 30,000 to 40,000 yards wide. Two observation batteries could not provide the coverage desired. The army observation battalions were not available to supplement the corps units until September, 1944.[44]

Board Recommendations

The following were among the recommendations submitted by the board:

> 50. Mission. That the missions assigned to the field artillery observation battalions in Field Manual 6-120, May 1945, should not be modified.
>
> 51. Employment. That the principles of tactical employment of the field artillery observation battalion described in Field Manual 6-120, May 1945, should not be modified.
>
> 52. Organization.
>
> a. That the field artillery observation battalion should be reorganized with three observation batteries per battalion.
>
> b. That one field artillery observation battalion should be reorganized on an experimental basis with a radar platoon in each observation battery.
>
> c. . . .
>
> d. That personnel and equipment to establish a meteorological radio net . . . be added to the headquarters battery of the field artillery observation battalion.[45]

Decision and Change

The major recommendations of the board were accepted in total. In November, 1948, new tables of organization and equipment were published for the observation battalion. The battalion was reorganized with a headquarters and headquarters battery and three observation batteries. Added to the observation battery was a radar platoon of two radar sections. The equipment authorized was the SCR-584 radar set which had a very limited counter artillery capability. The new headquarters battery organization included a survey information center as a

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[43] Ibid., p. 17. [44] Ibid., p. 2. [45] Ibid., pp. 17-18.

subordinate element of the topographic platoon. With the above exceptions the organization, mission, and principles of tactical employment remained essentially the same.[46,47,48]

Test and development work continued after the war to perfect an improved counter battery radar and to improve the range and operating characteristics of the sound and flash ranging equipment. The doctrine set forth in FM 6-120, Field Artillery Observation Battalion, May, 1945, remained official United States army doctrine for the employment of the unit until July, 1951, a year after the Korean War had started.

Conclusions

World War II provided a severe test for the artillery observation battalion. United States army concepts regarding width of the corps zone proved erroneous. Actual widths were often two or three times that envisioned by the pre-war planners. This expanded the task of the corps observation battalion beyond its capabilities. As a result, post war reviews recommended that the number of observation batteries in the battalion be increased to three. This recommendation was implemented in 1948.

Fire direction techniques which permitted the massing of widely separated batteries and battalions of artillery were perfected and used extensively during World War II. The unobserved fire technique first

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[46]U.S., Department of the Army, Field Artillery Observation Battalion, T/O&E 6-75 (Washington, D.C., 16 November, 1948).

[47]U.S., Department of the Army, Headquarters and Headquarters Battery, Field Artillery Observation Battalion, T/O&E 6-76 (Washington, D.C., 16 November, 1948).

[48]U.S., Department of the Army, Field Artillery Observation Battery, T/O&E 6-77 (Washington, D.C., 16 November, 1948).

developed during World War I continued to be used extensively in World War II. The battlefield was very fluid making the production and timely distribution of detailed battle maps difficult. All of the above combined to increase the importance of artillery calibration, registrations, meteorological data, and field survey work. Consequently, the observation battalion's functions and missions were expanded to include responsibilities in the above four areas.

World War II experiences supported the concept of employing the observation battalion in a centralized role under the control of the corps artillery to the maximum extent possible. At times the situation dictated the attachment of observation batteries to the division. The counter battery contributions of the battalion and batteries were diminished when employed in a decentralized role since the value of all bits of enemy battery information was enhanced when correlated with information from other sources. It was determined that decentralized control of the observation battalion elements should be limited to those situations absolutely requiring it, and then for only the minimum feasible time.

There was no significant increase in the range capabilities of artillery weapons over those of World War I. Consequently, the target acquisition depth requirement remained relatively static over the intervening years.

The special techniques used by the observation battery to locate enemy artillery during World War II were the same as those developed during World War I—flash ranging and sound ranging. Although the quality of the observing instruments improved somewhat, the flash

platoon hostile artillery location effectiveness was reduced in World War II by adverse terrain and by the development of efficient flashless powder. However, the mission of the flash platoon was expanded to include increased activities in the calibration and registration of friendly artillery.

The most significant changes in World War II observation battalion organization and functions occurred in the headquarters and headquarters battery. There the new meteorological and survey responsibilities of the unit were centered.

Near the end of the war it was discovered that radar could be used to locate and track mortar and artillery projectiles in flight. Radar sets available were designed to perform antiaircraft functions and had limited application in the artillery target acquisition field. The feasibility of producing an artillery target acquisition radar was demonstrated, however, and research work was initiated by the end of World War II. The decision was made to add a radar platoon to each field artillery observation battery. The 1948 TOE for the observation battery reflected this decision.

CHAPTER VI

FROM KOREA TO THE PRESENT

Korean War

The mission of the observation battalion through the Korean conflict remained the same as that which had evolved by the end of World War II. The battalion organization was as provided by the 1948 Table of Organization and Equipment, and, as such, it provided the first combat test of radar in a hostile battery locating role.

During the first nine months of the war, the battle front shifted rapidly North and South, up and down the entire length of the Korean peninsula. By the time an observation battalion was deployed to Korea in early 1951, the battlefield had become somewhat stabilized and remained so until the war had ended. This provided ideal conditions for effective target acquisition operations—a situation somewhat peculiar to that conflict and different from World War II.[1,2,3]

From early 1951 until the end of 1952 there was only one

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[1]U.S., Department of the Army, The Field Artillery Observation Battalion and Batteries, FM 6-120 (Washington: U.S. Government Printing Office, July, 1951).

[2]U.S. Army Combat Developments Command Artillery Agency, "Annex B, Historical Analysis (U) to Report of Results of Observation Battalion Target Acquisition Operations--World War II and Korea (U)," 1967, p. B-11-1.

[3]U.S., Department of the Army, Field Artillery Observation Battalion, T/O&E 6-75 (Washington: U.S. Government Printing Office, 16 November, 1948).

artillery observation battalion in the entire 8th Army. Rather than support a single corps, as United States doctrine provided, the battalion was spread across the 8th Army front with no more than one battery per corps sector. By the end of 1952 a second observation battalion arrived. A plan to deploy a third battalion to Korea in early 1953 was cancelled because negotiations, then under way with the enemy, indicated that an armistice was imminent. Consequently, there was never more than two observation battalions available to provde support to three U.S. and two Korean army corps.[4]

In order to provide some measure of target acquisition coverage for all corps, it became normal practice for each observation battery to operate at least two sound bases and an expanded flash base of six observation posts.[5] The additional equipment and personnel required to operate the expanded bases were made available by special augmentation above that provided by TOE. Most of the personnel augmentation was in the form of Korean soldiers, Koreans assigned to United States Army (KATUSA).

There was only one permanent change in observation battalion organization as a direct result of Korean War experiences. This occurred in the observation batteries. It should be recalled that since the 1932 organization of an observation battery containing both a sound and a flash platoon, a survey element had been organic to each platoon. This structure, which was maintained through World War II and which survived the post-World War II reviews, was changed during the

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[4]The John Hopkins University, Operations Research Office, Artillery Target Acquisition in Korea, 1953, Technical Memorandum ORD-T-299 (Chevy Chase, Md.: The John Hopkins University, July, 1955), pp. 26-27.

[5]Ibid.

Korean War. The survey sections of two parties each were removed from the flash and sound platoons and consolidated at battery level to form a survey platoon under the command of a separate battery survey officer. This change, which was adopted by field units as a result of war experiences, was made official by a new TOE published shortly before the war came to an end.[6]

There were several factors in the Korean War situation which influenced the decision to form a battery survey platoon. The battle had become somewhat static before the first year of the war had ended. In the stabilized situation that existed, there was a minimum requirement to establish new flash or sound bases. Consequently, the survey personnel of the flash and sound platoons were available to meet artillery survey needs that existed outside the platoon and battery. Secondly, the means available to satisfy these outside needs were reduced by the very nature of observation battalion deployment. With the observation battalion spread over two or more corps areas, the ability of the topographic platoon of the headquarters battery to meet its commitments was strained. In those cases where an observation battery was in support of a coprs, the observation battery survey personnel had to assume all or portions of the observation battalion survey mission. The battery's ability to cope with such an expanded mission was enhanced when all survey elements were centralized in a single platoon at battery level. In practice the centralization worked well. The battery survey platoon was able to meet its priority mission of providing timely survey support to its internal elements, while still retaining some

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[6]U.S., Department of the Army, Field Artillery Observation Battery, T/O&E 6-577 (Washington: U.S. Government Printing Office, 15 June, 1953).

capability to meet outside survey commitments imposed by its particular situation and mission. In effect, this change increased the flexibility of the field artillery observation battery without degrading its capabilities in any way. A change, forced by the necessities of a particular wartime situation, was accepted and made permanent.

The radar equipment available when the Korean War opened left something to be desired. It wasn't until the closing months of the war that the AN/MPQ-10 radar, designed and built for the counterbattery role, became available. In the meantime the observation units were equipped with types of antiaircraft radar sets which had been modified to give them some counterbattery capability.[7,8] The AN/MPQ-10 radar was capable of locating enemy artillery weapons out to about twelve kilometers, depending upon the size of projectile and radar beams relationship to the projectile flight path. Its range capability was somewhat less than that of sound ranging. It supplemented sound and flash but did not extend the range capability of the observation battery.

Korean War Review

Before the Korean War had ended a comprehensive study was initiated to determine the accuracy, timeliness, and completeness of the artillery target acquisition systems in use in Korea. The study was conducted by the John Hopkins University, Operations Research Office,

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[7]U.S., Department of the Army, Field Artillery Observation Battery, T/O&E 6-577 (Washington: U.S. Government Printing Office, 16 November, 1958), p. 18.

[8]U.S., Department of the Army, Field Artillery Observation Battery, T/O&E 6-577 (Washington: U.S. Government Printing Office, 15 June, 1953), p. 19.

under contract to the Department of the Army.[9] Since the results of this study had some influence on the future shaping of the field artillery target acquisition battalion, study results will be summarized below.

Accuracy, timeliness, and completeness were studied and determined for each target acquisition method being employed. The study was conducted during the spring and early summer of 1953, a time when the lines had been stabilized for nearly two years and artillery target acquisition methods had become highly refined and complex. The entire battlefield had been photographed and subjected to photointerpretation analysis.[10]

The conclusions reached by the study group are as follows:

Accuracy

1. PI, with a CEP of 35 yd, is the most accurate of the target acquisition systems.
2. Sound, radar, air, and ground observation [includes flash] have roughly equal CEPs--170, 175, 160, and 140 respectively.

Timeliness

3. The median delays between the detection of an incoming round and the receipt at corps artillery headquarters of the hostile battery location were 7 min for shell reports, 10 min for radar and flash, and 20 min for sound ranging.
4. The median delay was 13 min between receipt of the hostile battery location at corps artillery headquarters and return fire by US artillery.
5. The median delay was 4 days [italics mine] between a routine photo mission and receipt of the complete evaluation of all artillery targets at corps artillery headquarters.
6. A median delay of 27 hr was found between POW capture and transmission of routine reports of hostile battery locations to corps artillery headquarters when the prisoner was interrogated at division; for corps interrogation the median delay was 78 hr.

Completeness

7. Sound ranging located approximately 1 out of every 25 hostile batteries active during a given day; radar located 1 out of

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[9] The John Hopkins University, Operations Research Office, Artillery . . ., p. 1.

[10] Ibid., pp. 1-2.

every 100; and flash, 1 out of 500.

8. In terms of the number of incoming rounds, sound ranging located 1 hostile battery position for every 100 rounds fired into its sector; radar 1 battery per 400 rounds; and flash, 1 battery per 500 rounds.[11]

Cold War

Target Acquisition Interest

In the years following the Korean armistice, United States military developments were influenced by the tense international situation. In the background, and oftentimes influencing the direction of events, was the growing arsenal of nuclear weapons possessed by the United States and the Soviet Union. An aspect of nuclear weapon development that was of particular concern to the target acquisition battalion was warhead adaptation to tactical field weapon systems, to include nuclear artillery. The target acquisition and counterbattery task had to be viewed in a different light. Target acquisition and counterbattery effectiveness standards, determined adequate for the conventional battlefield, would not suffice in an active nuclear environment. The timeliness and completeness standards of artillery target acquisition had to be re-examined.

During the 1950's, surface to surface missile and rocket systems were perfected and added to the arsenal of artillery weapons available to the division, corps, and army commanders. These systems had a greatly expanded range capability. They presented the respective commanders a deeper target acquisition problem if they were to use these new artillery weapons effectively themselves and neutralize those of the enemy.

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[11] Ibid., pp. 2-3.

The above developments set the stage for an intense interest in artillery target acquisition during the past decade. Attention was focused on the capabilities and limitations of the artillery target acquisition battalion, since it occupied a key role. World War II and Korean War studies concerning artillery traget acquisition means and effectiveness received increased attention.[12,13]

FATAB Changes

Although there were new artillery observation battalion TOE published in 1955 and 1956, the basic organization and the mission of the battalion and its subordinate elements remained the same. The changes were relatively minor personnel and equipment modifications.[14,15,16]

In 1961 a significant change in the organization and the mission of the unit did occur. It was redesignated the Field Artillery Target Acquisition Battalion (FATAB), a name it retains to date. Its mission was expanded from six principal elements to eight. The new missions were defined as follows:

1. Provide general target acquisition. [change from "location of hostile artillery" and "collection of information"]

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[12] Ibid., pp. 1-133.

[13] U.S. Army Combat Developments Command Artillery Agency, Report of Results of Observation Battalion Target Acquisition Operations--World War II and Korea (U) (Fort Sill, Oklahoma, 1964).

[14] U.S., Department of the Army, Field Artillery Observation Battalion, T/O&E 6-575 (Washington: U.S. Government Printing Office, 15 June, 1953).

[15] U.S., Department of the Army, Field Artillery Observation Battalion, TOE 6-575R (Washington: U.S. Government Printing Office, 18 March, 1955).

[16] U.S., Department of the Army, Field Artillery Observation Battalion, TOE 6-575C (Washington: U.S. Government Printing Office, 26 January, 1956).

2. Registration and adjustment of friendly artillery. [same]
3. Provide ballistic meteorological (MET) data. [same]
4. Provide wind data for determination of fallout predictions. [new]
5. Conduct and coordinate corps artillery survey operations. [same]
6. Perform comparative calibration of artillery weapons. [same]
7. Verify the location of nuclear bursts fired by friendly forces. [new]
8. Provide its component of corps communication, observation, and fire support coordination system. [new][17,18]

Mission elements number four and seven above reflect the increased attention given to nuclear weapon employment doctrine by the United States Army. The two roles assigned the FATAB were logical and took into consideration the unit's normal tactical dispostion and its inherent capabilities. Element number eight merely recognized and reduced to a written mission statement that which had existed in fact. The FATAB and its predecessors represented a direct chain of communications that stemmed from the friendly front lines to corps artillery. With its numerous observation posts and other agencies, FATAB could provide the prime means for coordinated observation within the zone of action of the corps.[19]

The 1961 TOE also directed changes and additions to the FATAB organization. Considering first the headquarters battery, the principal change was the addition of a drone platoon. The drone platoon was to provide the corps artillery commander with an organic means of

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[17]U.S., Department of the Army, Field Artillery Target Acquisition Battalion, TOE 6-575D (Washington: U.S. Government Printing Office, 31 January, 1961.

[18]U.S., Department of the Army, The Field Artillery Target Acquisition Battalion and Batteries, FM 6-120 (Washington: U.S. Government Printing Office, March, 1962), pp. 4-6.

[19]Ibid., p. 6.

locating artillery targets by means of day and night aerial photography throughout his area of influence.[20] As has been noted, the depth of this area was increasing with the increase in range of the artillery missiles and rockets being made available to him. It was felt that the range capabilities of the drone system could compensate for the limited range of the sound, flash, and radar ranging techniques. Another factor which must have influenced the decision to add such a system can be identified in the post-Korean War target acquisition studies.[21] These studies showed that photo interpretation (PI) was the most accurate and complete method of target location and that the value of sound, flash, and radar ranging was greatly enhanced when combined with PI. However, the value of PI was reduced considerably as an artillery target acquisition technique because of the long delay time between mission request and availability of results. As has been noted, the Korean War study showed four days to be the median time. The drone system provided a means of obtaining very rapid photoimagery of a suspect target area. As such it could prove a valuable supplement to flash, sound, and radar ranging, while extending the coverage capability of the FATAB to the desired depth.

In addition to the drone platoon, a change of minor significance in the headquarters and headquarters battery concerned the survey platoon. Here we find that two tellurometer survey sections were provided in lieu of two previously standard survey sections. As a result, the platoon was organized with two survey sections and two tellurometer survey sections; however, the survey mission remained the same.

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[20] Ibid., p. 49.

[21] The John Hopkins University, Operations Research Office, Artillery . . .

The meteorological element of the headquarters battery was increased to two sections. The additional section was provided to enable the battalion to meet its expanded meteorological mission, that of determining wind data for nuclear fallout prediction.

To the target acquisition battery was added, in 1961, a seven man processing section. This section was to supervise and coordinate the tactical operations of the battery.[22] The section would prove particularly valuable when the battery was to be employed in a decentralized role. If a battery were to be given a separate mission, the processing section of the battery could be co-located with the supported artillery operations center, thus permitting rapid and timely reaction to target intelligence.[23] World War II after action reports indicated, and the European Theater general board had concluded, that the observation battalion elements were less effective when decentralized. The establishment of a processing section in each battery was an attempt to improve the overall capability of the target acquisition battery to operate independently, if the situation demanded it.

The survey platoon of the target acquisition battery was reduced, in 1961, from four survey sections to two survey sections and one tellurometer survey section—a total of three. The personnel reduction reflected the increased capabilities of tellurometer survey equipment and did not indicate a reduction in the battery survey platoon requirements or capabilities.

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[22]U.S., Department of the Army, The Field Artillery Target Aquisition Battalion and Batteries, pp. 17-20.

[23]U.S., Department of the Army, Field Artillery Target Acquisition, FM 6-121 (Washington: U.S. Government Printing Office, October, 1962), p. 10.

There were no further changes in FATAB organization until 1965. In that year the number of survey sections or parties organic to the battalion were again reduced. The headquarters battery survey platoon was reduced to two sections while each target acquisition battery platoon retained three. The reduction was possible because of improved survey equipment and did not reflect any reduction in the FATAB survey mission.[24, 25]

Since the 1965 TOE was published, a decision was made to eliminate the drone platoon from the FATAB. The aviation battalion of the corps and division were provided army aircraft equipped for aerial photography. They could perform the same mission more efficiently. In addition, improvements were made in the Air Force reconnaissance means which reduced significantly the time lag between mission request and delivery of the desired photo coverage. The December, 1966, draft of a new FM 6-120 reflects this drone deletion. However, other than eliminating the drone platoon and a further modification of the numbers and types of survey sections in the headquarters and target acquisition batteries, there are no proposed changes in the missions, organization, and employment doctrine of the FATAB.[26]

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[24]U.S., Department of the Army, Headquarters and Headquarters Battery, Field Artillery Target Acquisition Battalion, TOE 6-576E (Washington: U.S. Government Printing Office, 19 February, 1965).

[25]U.S., Department of the Army, Field Artillery Target Acquisition Battery, TOE 6-577E (Washington: U.S. Government Printing Office, 19 February, 1965).

[26]United States Army Combat Developments Command, The Field Artillery Target Acquisition Battalion and Batteries, FM 6-120 (Initial Draft Manuscript, Fort Leavenworth, Kansas, Library, December, 1966).

Vietnam War

The FATAB organization and mission that has evolved to date reflects artillery target acquisition problems and experiences faced in two world wars and in a limited conventional war (Korea). To a lesser extent, it reflects projected requirements for this type unit on a nuclear battlefield.

There is little requirement for the FATAB in a low intensity insurgent war such as Vietnam. This is true as long as the enemy does not introduce standard artillery weapons of his own. Until he does, a primary reason for FATAB's existence, the location of enemy artillery, is not present in such an environment. The remaining missions of the FATAB can be performed more efficiently by other units. Engineer topographic companies and special meteorological detachments can be used as was done in World War II in the Pacific (See chapter V).

At such time as the enemy chooses to introduce standard artillery tube weapons, the nature of the conflict will have changed. It will no longer be an insurgent war of low level intensity. Consequently, the Vietnamese War, as such, has had no effect on FATAB development.

FATAB Today

Mission and Capabilities

The eight principal missions of the FATAB today are the same as established in 1961. The missions cover a broad spectrum of interests. Within the battalion, location of counterbattery targets is currently performed by sound, flash, and radar.

Sound ranging equipment available today has a maximum range capability of about 20,000 meters, depending upon the intensity of the

sound. It can achieve location accuracies of 50 to 100 meters.[27]

Flash ranging effectiveness and capabilities are extremely variable, depending upon terrain and weather conditions. Under ideal conditions with the best observing instruments available, the maximum range capability of the flash base could approach that of sound. Normally it is somewhat less.[28]

The radar platoon is currently equipped with the AN/MPQ-10A counterbattery radar. The maximum range capability of this radar is approximately 18,000 meters against rockets and heavy artillery; against medium artillery the range effectiveness is reduced to 9,000 meters; against light artillery the distance is only 8,000 meters.[29]

When considering depth of coverage from the FEBA into enemy territory, the above distances must be reduced since the sound, flash, and radar bases will not be located on the FEBA. They will be located some distance to the rear, 2-3 kilometers being about average.

Employment Doctrine

The normal method of employment of the battalion is considered to be general support of artillery with the corps with the target acquisition batteries retained under battalion control. In this role the capability of the FATAB to provide effective target acquisition, survey, and meteorological support of the artillery with the corps is maximized. Tactical situations may dictate decentralization, wherein a battery may be attached to a division artillery or a field artillery group. The target acquisition battery can perform all of the missions of the

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[27] Ibid., pp. 2-1, 2-2. [28] Ibid., p. 2-2.

[29] Ibid., pp. 5-5 to 5-8.

battalion except the determination of meteorological data and the collection, evaluation, and dissemination of survey information. Normally, the target acquisition batteries will be placed in the attached role only for specific missions or operations.[30]

A target acquisition battery as organized can provide complete sound, flash, and radar coverage on a front of 10,000 meters.[31]

The FATAB is but one element in a vast, coordinated target acquisition complex. This target acquisition complex extends through all military echelons and includes forward observers, observation posts, air observation, flash ranging, countermortar radars, counterbattery radars, ground surveillance radars, sound ranging, visual airborne target location systems, airborne cameras, airborne radar, and airborne infrared. In addition target location information can be exploited from shelling reports, mortar reports, reconnaissance patrols, long-range patrols, combat patrols, prisoners of war, line crossers, agents, ELINT, COMINT, ASA, special forces, and stay-behind forces.[32]

A FATAB employment and/or deployment decision made today must reflect an understanding of this total target acquisition complex and an appreciation for how the FATAB can most effectively contribute to the overall goal—the timely detection, identification, and accurate three-dimensional location of a target in sufficient detail to permit effective attack.

Conclusions

The Korean War provided the first combat test for radar in a

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[30] Ibid., pp. 2-3 to 2-5. [31] Ibid., pp. 2-4.

[32] U.S., Department of the Army, Field Artillery Target Acquisition, FM 6-121 . . ., pp. 2-8, 20-34.

counterbattery role. Results were acceptable and radar ranging joined flash and sound as an artillery target acquisition battery method of locating enemy artillery. It represented the first new method perfected since the flash and sound developments of World War I.

In the decade following the Korean War, the artillery target acquisition problem underwent a revolutionary change. The change was precipitated by two developments: (1) the perfection of long range artillery rockets and missiles—thus extending greatly the depth of the target acquisition problem; and (2) the development of tactical nuclear weapons to include "atomic artillery"—requiring a revision in timeliness and completeness standards for an effective target acquisition and counterbattery program.

The FATAB became the focal point of several artillery target acquisition studies, and its limitations in an active nuclear and/or missile and rocket environment were immediately apparent. In 1961 a drone platoon was added to the battalion in an attempt to compensate for the target acquisition limitations, particularly range, of flash, sound, and radar. The drone platoon was subsequently abandoned as its functions could be more effectively performed by agencies outisde the FATAB.

Today the FATAB, while still the principal agency for obtaining counterbattery targets in the corps zone, is only one element in a vast artillery target acquisition complex extending through all levels of command. Alone, its value in an active nuclear and missile environment would be severely limited. The value of the FATAB is enhanced when it is properly meshed with the remaining target acquisition agencies found in the division, corps, and army zone.

The FATAB organization that has evolved today is quite flexible. While the battalion is better suited to be employed in a centralized role under control of the corps artillery commander, it can be fragmented, with target acquisition batteries attached to an artillery group or division artillery.

The current organization of the target acquisition battery is better designed for decentralized operations than its World War II and Korean War predecessors.

CHAPTER VII

SUMMARY AND CONCLUSIONS

Summary

A revolution in artillery weaponry and techniques of employment took place in the last decades of the nineteenth century and during the early years of the twentieth. The effective ranges of mobile field artillery weapons were increased from 3,000 yards in 1880 to more than 15,000 yards by the end of World War I.

For centuries preceding this revolution, artillery had been a direct fire weapon; artillery firing was artillery located for counter-battery neutralization or destruction. The short range, direct fire artillery duel was a regular part of most large military battles.

Improvements in explosives and ammunition design permitted ranges in excess of that which could be exploited by the direct fire technique. The French 75mm gun, the forerunner of modern artillery weapons, was introduced about the turn of the century. The design of the French weapon facilitated indirect fire techniques and fanned interest in this type of artillery fire in the years preceding World War I. However, World War I opened with the adversaries having little or no appreciation for the artillery target acquisition problem that would be generated by the long range and indirect fire capabilities of modern artillery materiel.

The counterbattery problems of the French were compounded by the German decision to emphasize medium and heavy field artillery

deployment. The French had difficulties locating such German artillery, which would fire from defiladed positions several kilometers to the rear of the front lines.

To help solve their counterbattery problems, the allies developed the techniques of flash ranging and sound ranging during the first two years of World War I. Flash ranging was an outgrowth of survey methods and its perfection was a by-product of the increased importance given to field survey operations and battle map production throughout the war. The concept of sound ranging is credited to a French professor serving with their army at the front. Soon after its feasibility was demonstrated, the British accepted the concept and conducted sound ranging developmental work of their own; however, basic credit for allied sound ranging development goes to the French.

France and Britain accepted flash and sound ranging as hostile battery locating techniques and had deployed such units throughout their sectors before the United States had entered World War I. Both nations had assigned the flash and sound ranging functions to their corps of engineer troops, even though the product of their work was of principal concern to the artillery. In the French and British armies, counterbattery responsibilities had become centered in the army corps and operational control of the flash and sound rangers was generally assigned to that echelon.

Another giant step in the modernization of artillery took place in 1916. In that year the French completed the experimentation and documentation required for effective unobserved fire. Prior to then, all field artillery fire, except harrassing, area-type fire, had to be observed and adjusted onto the desired target. This requirement led to

long artillery preparations and reduced the value of long range artillery and the indirect fire technique. The development of an effective unobserved fire capability permitted the full exploitation of both. The unobserved fire capability did, however, aggravate the artillery target acquisition problem and it gave increased importance to such hostile artillery locating methods as flash and sound.

The United States entered World War I in April, 1917, with its artillery arm ill prepared to assume the combat role demanded of it. There was a critical shortage of trained officer and enlisted personnel and of modern artillery materiel. United States artillery doctrine was obsolete in the light of World War I developments and experiences. It would not have been possible for the United States artillery arm to meet its commitments in 1917 without outside assistance.

Indispensable assistance was provided by France. French officers helped relieve a critical American artillery instructor shortage at camps and schools throughout the United States and with the American Expeditionary Forces in Europe. American units were completely equipped with French and British weapons upon arrival in Europe. French weapons were sent to training camps in the United States. French liaison officers provided the latest information on battlefield artillery experiences and developments. French artillery manuals were translated into English and issued to American officers as official United States doctrine.

Considering the nature of French assistance, it is obvious that United States artillery practices in World War I were patterned after those of the French. This was true in the areas of target acquisition and counterbattery. The American artillery accepted the flash and

sound ranging techniques and formed an Engineer Flash and Sound Ranging Battalion. It is to this World War I engineer unit that the present FATAB traces its origin. The principal components of the Engineer Flash and Sound Ranging Battalion were the sound and the flash sections which operated somewhat autonomously under the operational control of the Artillery Information Service (A.I.S.). The battalion was retained under army control and coordinated the positioning of the flash and sound bases across the entire army sector. The A.I.S. of the corps, in whose sector a particular flash or sound base was positioned, assumed operational control for that base. The missions assigned to the flash and sound sections of World War I were (1) location of hostile artillery; (2) reporting of other battlefield and targeting information; and (3) ranging of friendly artillery, to include registrations and calibration.

A comprehensive review of artillery employment in World War I preceded and influenced the United States Army artillery structure which evolved from the 1922 army reorganization. The artillery target acquisition problem was recognized and accepted as a permanent outgrowth of World War I artillery modernization. Flash and sound ranging were accepted as artillery target acquisition methods, and the responsibility for the establishment of such units was transferred from the corps of engineers to the field artillery. It was concluded that the effectiveness of flash and sound ranging was minimized during periods of movement and maximized by a war of positions.

The initial appearance of such units in the artillery force structure found flash and sound sections completely separated. The sound ranging capability was found in separate sound ranging companies to be assigned to the theater general reserve artillery headquarters.

They were to be further assigned or attached to army artillery for deployment in the more stabilized sectors of the front lines. A relatively slow reaction time for the movement and the establishment of a sound base was the rationale behind the 1922 decision. The flash ranging capability was to be located in an Observation (Flash) Battalion to be found in each corps artillery. The techniques in use in 1922 permitted a much more rapid installation of a flash base as compared to sound and warranted the deployment of flash sections over all portions of the theater front.

The missions assigned the artillery flash battalion and the sound companies of 1922 were the same as had evolved for the engineer flash and sound sections, respectively, of World War I.

The World War I practice of assigning the primary counterbattery responsibility to corps artillery was accepted and made a permanent element of United States military doctrine. This decision influenced the assignment and deployment doctrine for flash and sound ranging.

Concurrent with the authorization of observation (flash) battalions and sound ranging companies for wartime employment, the United States Army activated an observation test battery which contained both a sound and flash element. This battery was directed to work with the field artillery board at Fort Bragg, North Carolina, to test and perfect improved sound and flash equipment and operational techniques.

As a result of the work of the artillery board and the observation test battery, a significant change in flash and sound organization occurred in 1930. The two functions were combined and an Observation (Flash and Sound) Battalion was formed. The battalion was organized with a headquarters battery and two observation batteries, each obser-

vation battery having a flash and a sound ranging platoon. The battalions were authorized on the basis of one per corps artillery brigade and one per field army heavy artillery brigade. Improvements in base installation techniques had reduced significantly the reaction time for both sound and flash. Survey sections were made organic to each flash and sound platoon. Thus in 1930 we first found an artillery battalion organized to perform both the flash and sound ranging functions. Its primary mission was location of hostile artillery. Adjustment of friendly artillery and the reporting of general battlefield information were secondary missions.

The next change in the observation battalion organization took place in 1939. The headquarters battery of the battalion, which heretofore had only minor operational and administrative functions, was greatly expanded. A topographic platoon, a communications platoon, and a meteorological section were added. The battalion assumed the responsibility for producing its own sound ranging meteorological messages and for tying the observation battery surveys into common corps artillery survey control. In 1939 these responsibilities did not extend to providing meteorological messages to elements outside the battalion, nor to the establishment of survey control specifically for other artillery units.

World War II provided the first combat test for the artillery observation battalion, and war experiences had their effect on the unit's mission and organization growth. The increased width of a corps front, precipitated by improved ground force mobility, rendered the two-observation-battery battalion inadequate to provide the complete coverage desired. As a result, the number of observation batteries in

each battalion was increased to three following the war.

World War II saw the continued perfection of fire direction techniques which permitted the massing of fires from widely separated artillery batteries and battalions. Unobserved fire techniques were elevated to an importance reaching that of observed fire in many circumstances. The battlefield was often very fluid, making the production and timely distribution of detailed battle maps difficult. Thus the importance of (1) artillery calibration, (2) registrations, (3) meteorological data, and (4) field survey work increased. The observation battalion, by virtue of its deployment across the entire corps front and the nature of its internal functions, was well suited to assume increased responsibilities in the above four areas. Consequently, its missions and functions were expanded significantly. The headquarters battery was assigned survey and meteorological responsibilities that extended to all of the artillery with the corps. The role of the observation batteries in calibration and registration of friendly artillery was increased.

Hasty methods of flash and sound ranging were developed early in the war. These techniques, which sacrificed accuracy for speed, were a product of the mobility of World War II battlefields. They permitted the sound and flash platoons to make some contribution to artillery target acquisition even under extremely fluid battlefield conditions.

World War II experiences showed the observation battalion to be more effective when employed in a centralized role under corps artillery headquarters. The observation battery could, however, be effectively employed in a decentralized role under control of a division

artillery or artillery group commander, if the situation so demanded. It was determined that such decentralization should be for limited periods and for specific missions if the usefullness of the observation battalion were to be maximized.

Although it was discovered near the conclusion of World War II that radar could be used to locate hostile artillery positions, it was not perfected in sufficient time to be used as a World War II field artillery target acquisition technique. Sound and flash ranging, developed during World War I, were the only special hostile battery locating techniques used by the observation battalion in World War II. When combined with air and ground observation and photo interpretation results, they were moderately successful in providing the hostile battery information needed by the United States artillery commanders.

The adaptation of radar to the counterbattery task was carried forward immediately following World War II. The 1948 TOE change, which gave the observation battalion a third observation battery, also added a radar platoon to each lettered battery. The Korean War provided the first combat test of radar in a counterbattery role. Radar ranging methods and doctrine were tested and improved as a result of Korean War experiences.

The mission and organization of the observation battalion and batteries did not change significantly as a result of the Korean War. However, as a result of Korean War deployment requirements, a further evaluation of the observation battalion in a decentralized role was gained. Some changes in the internal organization of the lettered batteries were effected to improve their capability in such a role.

Detailed studies were conducted during the latter stage of the

Korean War to determine artillery target acquisition effectiveness. Statistical data was derived from these studies to assist in the determination of the (1) accuracy, (2) timeliness, and (3) completeness of the various artillery target acquisition techniques used in Korea. Among the techniques evaluated were sound, flash, and radar ranging. The results of these studies, which demonstrated the limitations and the capabilities of these techniques, had a bearing on observation battalion developments following the Korean War.

Two factors have colored target acquisition, and thus FATAB, thinking in the past decade—(1) the development of long range artillery missiles and rockets, and (2) the adaptation of nuclear warheads to artillery missiles and "atomic artillery." The previously acceptable "timeliness" and "completeness" standards for artillery target acquisition are, in a nuclear environment, totally inadequate. The range capabilities of modern artillery rockets and missiles completely dwarf the detection ranges of the currently available sound, flash, and radar equipment.

Modifications have been made, since 1960, in the mission of the FATAB to fit it to the nuclear age. The basic mission that evolved in World War II is still there. To it has been added a fallout prediction meteorological message requirement, and a requirement to verify the location of nuclear bursts fired by friendly forces.

Also in 1961, an attempt was made to improve the overall capability of the FATAB by adding a drone platoon to the headquarters battery. This platoon, with its photo imagery (PI) capability, was to compensate for the range limitations of sound, flash, and counterbattery radar. In addition, past experiences had shown that flash, sound, and

radar ranging results were enhanced when combined with PI techniques. Methods of getting PI information, used during the Korean War, were too slow for artillery target acquisition in the nuclear age. The FATAB drone platoon was an attempt to reduce this time to acceptable limits. The drone platoon has since been dropped from the FATAB organization and its functions are performed by other agencies found outside the FATAB.

Conclusions

The FATAB organization and mission that has evolved to date reflects artillery target acquisition problems and experiences faced in two World Wars and in a limited conventional war (Korea). To a lesser extent, it reflects projected requirements for this type unit on a nuclear battlefield.

There is little requirement for a FATAB in a low level insurgent war such as Vietnam. Until the enemy introduces conventional artillery weapon formations, a primary reason for FATAB's existence, the location of enemy artillery, is not present in such an environment. The remaining missions of the FATAB can be performed more efficiently by other units. Consequently the Vietnamese War has had little or no effect on the FATAB.

Today the FATAB, while still the principal agency for obtaining counterbattery targets in the corps zone, is only one element in a vast artillery target acquisition complex extending throughout all levels of command. Alone, its value in an active nuclear and missile environment would be severely limited. The value of the FATAB is enhanced when it is properly meshed with the remaining target acquisition agencies found in the division, corps, and army zone.

The FATAB organization that has evolved today is quite flexible. The battalion is best suited to be employed in a centralized role under control of the corps artillery commander. It can be fragmented with target acquisition batteries attached to an artillery group or division artillery. The current organization of the target acquisition battery is better designed for decentralized operations than its World War II and Korean War predecessors. There is no one "correct" way to deploy the FATAB. The situation will dictate the decision. The flexibility of the FATAB is a significant asset when viewed aside the wide variations to be found in the potential battlefields of this era.

The maximum range capability of the currently available sound, flash, and radar equipment is a severe limitation of the FATAB. The modest increase in range achieved with these techniques since their initial introduction has not kept pace with recent breakthroughs in artillery missiles, rockets, and long range cannon. The inherent limitations of flash and sound foreshadows little liklihood of significant increases in the range capabilities of such methods. The area most susceptible for range exploitation would appear to be counterbattery radar.

The FATAB has wide responsibilities and broad artillery missions, no longer confined to the field of hostile artillery location as was true at the time of its origin. Over the years the FATAB mission was expanded to include calibration and registration adjustment of friendly artillery; general target acquisition responsibilities; coordination and conduct of survey operations for artillery with the corps; artillery meteorology; nuclear burst reporting; and providing communication, observation, and fire support coordination assistance to the

corps.

The FATAB cannot provide the artillery target acquisition service that would be desired in an active nuclear environment; nor can any other agency, unit, or service in existence today. Its value and worth should not be measured against the nuclear standard. Until some significant target acquisition breakthrough occurs, the current FATAB concept appears sound. The military considerations and the battlefield experiences which have shaped its growth and molded its employment doctrine are still valid today. There is a limit to the extent that a single unit's mission and functions can be expanded and diversified without affecting its efficiency. Should a technological breakthrough occur which would permit the immediate long range detection and location of an active missile or rocket site, it may be desirable to organize a new unit to assume such a task. The present focus of the FATAB should be maintained for the foreseeable future, and at least as long as tube artillery weapons and conventional artillery ammunition retain a useful battlefield role.

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