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This study analyzes the organizational approaches to the topographical intelligence needs which evolved in the major Federal armies during the war. Research reveals that a topographical problem existed in 1861 which had significant impact on Federal operations early in the war. The primary cause of inadequate military maps was the focus of the Corps of Topographical Engineers from 1816 to 1860. National leaders, as well as many Army generals and the military engineers themselves, supported strong emphasis on civil works and internal improvement.

The nature of the war placed a premium on the North's need for maps. The geographic size of the theater and strategies of opposing commanders were key factors in determining the necessary degree of map detail. Three distinct approaches to the map problem emerged. In the East where large-scale maps were most important, little was accomplished by the Army of the Potomac as engineers were horded on the army-level staff and employed without functional distinction. This approach was consistent with precedence and pre-war doctrine.

In the West, Grant decentralized his meager engineer assets in the Army of the Tennessee. His directives fostered centralized control and engineer focus on map work during critical phases of his campaigns with favorable results. Only the Army of the Cumberland developed a formal topographical organization extending from army to brigade level. Its system, with specialization as the cornerstone, was clearly superior to those of the other armies. Ironically, the formal merger of the two engineer corps in 1863 masked the system and reasons for its origin and success, many of which transcend the American Civil War.

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TOPOGRAPHICAL INTELLIGENCE AND THE AMERICAN CIVIL WAR, by Major Daniel D. Nettesheim, USA, 101 pages.

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ABBREVIATIONS

AR = Annual Report

ASP = American State Papers

CE = Chief of Engineers

MA = Military Affairs

OR = Official Records of the War of Rebellion

SW = Secretary of War

TB = Topographical Bureau

CHAPTER 1

"WE HAD NO MILITARY MAPS OF ANY VALUE"

---MAJOR GENERAL GEORGE B. McCLELLAN
COMMANDER
ARMY OF THE POTOMAC, 1862

Federal regiments confidently moved down the dusty roads from Washington to Bull Run under the hot July sun. Their commander, Brigadier General Irwin McDowell, knew his troops were unprepared for battle. They were poorly trained and equipped and many had terms of enlistment that would end in a few weeks. However, Northern public opinion in the summer of 1861 demanded action. Forced to move, McDowell reasoned that if he kept his plan simple and attacked an exposed Confederate flank, the inexperience of opposing forces would be to his advantage.

His original plan was to make the flanking attack with his left. The concept was based on available maps and information concerning roads leading to the Confederate position behind Bull Run. As his lead elements pushed toward the river, reconnaissance reports flowed into army headquarters. Contrary to the initial topographical intelligence, the approach roads on the left were too narrow and indirect to accomodate a force of sufficient size. McDowell confimed these reports by making a personal reconnaissance.[1]

On the eve of battle, the commander revised his concept; the flanking movement and main attack would be made by the right wing of the army. Even after the adjustment, inaccurate maps and total

ignorance of the road networks and topography continued to plague him. His major problem was planning how to cross Bull Run in the sector selected for the attack. "Midway between the stone bridge and Sudley Springs the maps indicated another ford which was said to be good."[2] However, there was no knowledge of the roads leading to the ford, except for a vague report about a road branching off the Warrentown Turnpike toward it. Enemy pickets prevented two engineer reconnaissance parties from locating the road. "McDowell was therfore left with the knowledge that a way to the fords did exist; but exactly where it was no one could say. The lack of adequate road maps made it necessary for him to draw up his plan without definite information."[3]

The problem persisted beyond the planning phase to the actual execution of the battle. Without dependable maps, units slowly groped toward the fords leading to the Confederate flank. Inexperience coupled with inexact knowledge of the roads resulted in delay of hours before the main attack began. By noon the situation became critical and McDowell committed his reserve brigades to reinforce the attack, ordering the commanders to double time their regiments to the front. Even units with guides erroneously took routes which doubled their travel distance and cost precious time. Compounding the map problem was the blistering heat which reduced brigades to less than half their strength as soldiers dropped along the roadside in sufficient numbers to account for several regiments before the reserve units even crossed Bull Run.[4]

The exact impact of the map deficiency on the outcome of the

battle is difficult to assess. Its contributory role in the Union defeat, however, is supported by the fact that the Confederate brigades that turned the tide of battle were brought from the Shenandoah Valley by train and appeared at the decisive point on the field within hours of their arrival. Victory hinged on hours gained and hours wasted.

The fact that the Federal commander operated as a virtual blindman on the outskirts of his capital during the battle underscores the lack of topographical intelligence readily available at the outbreak of the war. Based on the evidence of the first major clash of the war, however, it is premature to conclude that sufficient topographical data did not exist in the Topographical Bureau. The alternate hypothesis, and one which parallels the primary reason for McDowell's army being poorly trained, organized, and equipped, is that while the data existed, the impatience of the North precluded allowing sufficient time to compile it into adequate campaign maps. Examination of the first week of the Peninsula campaign tests this hypothesis.

The disaster at Bull Run undermined the "On to Richmond" clamor as most Northerners accepted the fact that it would take time to properly organize and train an army before the offensive could be renewed. Major General George B. McClellan assumed command of the Army of the Potomac and began an eight month reorganization of the Union army. In anticipation of the army's movement toward Richmond, he ordered the compilation of all available information on the Virginia Peninsula between the York and

James rivers into campaign maps. Sources were limited and the topographical engineers based their map on a 1781 British plan of the siege of Yorktown and an 1818 survey of portions of the lower Peninsula. The result was a vague, small-scale representation which outlined only major features.

Prior to the outset of the campaign, McClellan received a more detailed map from Major General John E. Wool, the commander at Fort Monroe, Virginia. The map was prepared by Wool's topographical engineer, Lieutenant Colonel Thomas J. Cram, who relied heavily on information from contrabands, prisoners, and local residents to fill in the unknown details of the enemy-occupied Peninsula.[5]

By early April 1862, McClellan had moved almost 60,000 troops by sea to the Peninsula where his scouts discovered a Confederate force located at Yorktown. While preparing plans for his advance, he depended on the map provided by Wool since it was the most recent. The documents upon which McClellan's topographers had based their work were fifty to one hundred years old. In addition, McClellan mistook the more extensive detail of the Wool map as an indication of its accuracy.

McClellan planned to fix the Confederates in Yorktown with a frontal attack by the Third Corps, while the Fourth Corps bypassed Yorktown and cut the garrison's escape route to Richmond. The plan was strengthened by the location of the Warwick River which flowed parallel to the Peninsula well south of Yorktown, thus providing natural flank protection for the Fourth Corps' movement.

Federal regiments pressed forward meeting little initial resistence. As planned, the Third Corps pinned the Confederate force in Yorktown and McClellan awaited word from Brigadier General Erasmus Keyes that his Fourth Corps was in position behind the Confederates. Keyes' report staggered the commanding general. The Warwick River was erroneously depicted on the map. It flowed across, not parallel to the Peninsula and its headwaters were within cannon range of Yorktown! The corps' presumed flank protection was in fact its road block as strong Confederate fortifications behind the river halted the Union advance along the entire line.[6]

The tactical implications of the erroneous map were compounded by its psychological impact on McClellan. Coupled with exaggerated reports of Confederate strength on the Peninsula, the setback undermined his confidence and convinced him to settle down to siege operations against Yorktown and its undermanned garrison. He made little effort to probe the defensive lines of the small enemy force. Instead his army spent a month in front of Yorktown awaiting siege guns while the Confederates rushed their main army from northern Virginia to the Peninsula to reinforce the small command holding the Warwick River line.

Again poor topographical intelligence contributed to a major Federal setback. Furthermore, the Peninsula campaign refutes the hypothesis that the primary Federal problem was insufficient time to compile existing information into campaign maps. The time was adequate, but the available topographical data was not.

In the Western theater of the war, maps from the Topographical

Bureau were initially nonexistent. Major General Henry Halleck, Grant's superior during the Fort Donelson campaign of February 1862, telegraphed "I have no maps other than the general ones in the bookstore."[7]

Despite the fact that Army topographical engineers had worked continuously for almost half a century prior to the outbreak of hostilities, the Topographical Bureau possessed an inadequate data base from which to compile useful military maps. The extent of the problem is reflected by the location of the initial campaigns near the national capital and a major Eastern seaboard region, both the scenes of earlier foreign invasions. From the standpoint of national defense, these areas were among the priority regions east of the Mississippi River. Why, then, were adequate military maps of the areas nonexistent in 1861? General McClellan blamed the pre-war staff and bureaus.

> In the course of description of the operations preliminary to the siege of Yorktown, attention is necessarily directed to the erroneous maps in our possession, and on which certain orders were based. This was but a single instance among many. In fact, it may be broadly stated that we had no military maps of any value. This was one of our greatest difficulties, and always seriously interfered with our movements in the early part of the war. When in the presence of the enemy it was necessary to reconnoitre under fire, the accidents of the ground being entirely unknown to us. It was a peculiar feature of our staff departments before the war that no measures were taken to collect topographical information about our own or any neighboring country.[8]

McClellan's assessment is not that of an unbiased observer as his experience as commander of the Army of the Potomac fostered a personal prejudice against the Administration and the Army bureaus in Washington. However, McClellan, who had served as an Army

engineer officer prior to the war, correctly designated where to look in the pre-war environment for an explanation of the 1861 situation. Reasons for the apparent paradox between an active topographical engineer organization for fifty years and the inadequacy of military maps in 1861 are found in the direction given to the engineers by the Army staff, as well as by Congress and the Secretary of War, during the period between the War of 1812 and the Civil War.

1. Oliver Howard, Autobiography, 150; James Fry, "McDowell's Advance to Bull Run", Battles and Leaders of the Civil War, I, 178.
2. John Barnard's Peninsula campaign report, OR, II, 330.
3. R.H. Beatie, Road to Manassas, 133.
4. Howard, op. cit., 157.
5. Alexander Webb, The Peninsula, 50-56.
6. Ibid.
7. Henry Halleck to Don Carlos Buell, Feb. 13, 1862, OR, VII, 609.
8. George B. McClellan, McClellan's Own Story, 233.

CHAPTER 2

"AS MILITARY SURVEYS ARE NOT OF SO PRESSING URGENCY, THEY MAY BE DEFERRED"

---SECRETARY OF WAR JAMES BARBOUR, 1826

Congress first authorized topographical engineers in American armies during the War of 1812. The duties of the newly created branch, as outlined in the 1813 Army Regulations, included surveying, mapping, and reconnoitering in order to assist the commanding general. In addition, the topographical engineers were charged with recording the positions of the opposing armies during engagements.[1]

With the termination of hostilities, the question of whether or not topographical officers should be retained in the reduced military establishment arose. Majors John Anderson and Isacc Roberdeau, who had served as topographical officers during the war, addressed the issue of a peacetime topographical organization in their 1816 memoir and survey of the Lake Champlain frontier.

> Much of its utility would be thrown away if their functions commenced and ceased with immediate military action....The field notes and sketches are valuable, both from their accuracy and minuteness, and because, above all, they are the fruit of great toil, which toil must be renewed on the same subjects should any future war arise, if the knowledge now possessed is not profitably used. The undersigned do not hesitate to recommend... the completion of a military survey of the whole interior and exterior of the United States. This work, together with the duties necessarily arising out of the survey of the sea-coast, and the establishment of the boundary-line between the United

> States and the British Provinces in Canada, can be executed with the best effect by a Corps of Topographical Engineers, under the immediate direction of the Chief of the Engineer Corps.[2]

While the officers' support of a permanent topographical corps was expected, the thrust of their argument is noteworthy. They attempted to justify the corps' peacetime existence by emphasizing the importance of its wartime mission. For a brief period following the war such a position was tenable. However, political realities of the peacetime environment precluded a sustained justification of the corps on this basis, no matter how critical accurate military surveys and maps of the country would be in future wars.

On April 24, 1816 Congress authorized ten topographical engineers, five for each Army division.[3] However, more pressing considerations of national defense soon overshadowed the idea of a military survey of the entire country. The War of 1812 had strongly influenced American perception of the need for coastal fortifications, prompting Congress in its first session after the war to allocate $830,000 for these forts.[4] As a result, the efforts of the topographical engineers for the next decade were focused on construction surveys and plans for the coastal fortifications. The officers were removed from the Army divisions and placed under the direction of the newly created Board of Engineers for Fortifications as the Topographical Bureau became a part of the Engineer Department. Distribution of the 1822 topographical engineer workload was typical of this period. Twelve of the fourteen active projects dealt directly with coastal areas as surveys of the coastline and examinations of navigation channels supplemented the fortification surveys.[5]

During this same period, government and military leaders were laying the groundwork for a major shift in topographical engineer employment. In 1819, Secretary of War John C. Calhoun provided support for Speaker of the House Henry Clay in his campaign for internal improvement programs.

> A judicious system of roads and canals, constructed for the convenience of commerce, and the transportation of the mail only, without any reference to military operations is itself the most efficient means for 'the most complete defence of the United States'....The propriety of employing the Army on works of public utility cannot be doubted.[6]

Calhoun further argued that national opposition to standing armies necessitated such a program. The only way a population could be effectively mobilized at threatened points along a vast coastal and interior frontier was by a good transportation network. The following year, Quartermaster General of the Army Thomas S. Jesup broadened the argument by providing a transition between fort construction and internal improvements. He explained to Calhoun that France, the military "model" of the post-Napoleonic period, could afford to concentrate its military engineers on construction and repair of its fortifications because its "armor", to include roads, canals, bridges, depots, and surveys of the interior was complete. Since internal improvements in the United States were in their infancy, however, the current error prevailing in the Army staff "which may be productive of the greatest injury to the service" should be corrected by expanding the size and the role of the military engineer organization.[7] In 1821, Brigadier General Simon Bernard, head of the Board of Engineers for Fortifications, capped the argument in his report on fortifications to

the House of Representatives. He pointed out that forts were merely one "base" in an integrated defense system; equally important were the other three "bases": a navy, an army/militia, and a developed transportation and communications system.[8]

Advocates of a national program of internal improvement welcomed the support as their movement gained momentum. In addition to providing further justification, the Army had addressed the pragmatic problem of skilled human resources to implement the program. "West Point stood nearly alone in the years before the Civil War as a source of formally trained engineers in America."[9] Military engineers represented an organized force with a near monopoly on the requisite expertise to execute such a program. National defense considerations of internal improvement supplied the link to utilizing Army resources.

The General Survey Act of April 30, 1824 marked a promounced shift in the work of the topographical engineers. This act to procure the necessary surveys, plans, and estimates for the construction of roads and canals specifically authorized the employment of military engineer officers and charged the Secretary of War with its implementation.[10] Secretary Calhoun placed all topographical officers that could be spared from the coastal surveys under the Board for Internal Improvements and supplemented them with non-engineer officers temporarily detailed to topographical engineer work.[11]

While the act allowed topographical officers to begin focusing their efforts on the country's interior regions, it did not improve the probability of conducting detailed military surveys of the country. Instead, it changed topographical emphasis from surveys

of the coast and its forts to civil surveys for contruction purposes.

The workload grew rapidly. Requests for the establishment of a separate corps of topographical engineers and a significant increase in the number of topographical engineers accompanied the annual reports of the Secretary of War from 1824 to 1838. In 1825, the Chief Engineer, Major General Alexander Macomb estimated that the surveys for internal improvement presently contemplated by the government "would afford constant employment, for many years" even if immediate steps were taken "to treble the number of topographical engineers now in service."[12] In 1829, typical of the years following the Act of 1824, the annual surveys of the topographical officers increased to thirty-six. With the exception of two, all surveys were of a civil engineering nature for the purpose of future construction. The two military surveys were of a portion of Maine and the Pensacola, Florida area.[13] With this enormous workload, it is doubtful that much military surveying or mapping could have been accomplished even if the number of topographical engineers had been drastically increased.

During this period, the prosperity and future of the topographical engineers was firmly tied to internal development. In 1826, Secretary of War James Barbour acknowledged the military function of topographical engineers as including not only surveys of fortifications and the coast, but also military surveys of the Mexican and Canadian borders and the entire Indian country. However, "as they are not of so pressing urgency, they may be deferred as to allow a considerable portion of the officers of the proposed corps of topographical engineers to be disposable for objects of

internal improvement."[14] Barbour also opposed a proposal which might have released topographical engineers for military mapping. He successfully argued that a corps of civil engineers for the purpose of taking over all internal improvement projects should not be created. The topographical engineers should continue with the work since in the military, "responsibility resulting from the tenure of office...presents a guarantee of a greater fidelity in the discharge of their duties."[15] Absence of a military threat undermined emphasis on engineer function connected with war preparation. Thus, the issue of using military engineers was reduced to political considerations and philosophies, Jeffersonian concepts of applying military technical skills to civil need versus Jacksonian reluctance to commit the federal government to internal improvements. The debate continued, but had little impact on the topographical engineers' continued employment on internal improvement.

Responsibility for the topographical engineers' direction was not restricted to program advocates among top civilian and military leaders. The ten topographical officers strongly supported the position and in 1827 combined to write a joint letter to the House Committee on Military Affairs. They requested that the bill to increase the Corps of Engineers and create an expanded Corps of Topographical Engineers be divided into two bills. In their opinion, the bill had been unsuccessful for two years because of national opposition to engineers of fortifications. Topographical engineers, however, had an obvious peacetime function which reduced opposition to their needed expansion.[16] The bill was not divided. The Chief Engineer, who directed both engineer organizations, did not want to prune a major political appeal from the bill and leave

the Corps of Engineers' case isolated. The correspondence, however, indicates that the direction of the topographical engineers was not forced on them against their will. They perceived it as an opportunity to support their future growth, importance, and prestige in a peacetime environment, even at the cost of their fellow military engineers.

Related to the issue of internal improvements and the political arguments concerning the use of military assets was the question of how much useful military information could be derived from construction surveys. In an 1831 communication to the House, Secretary of War John Eaton attempted to assure the Representatives that the topographical engineers were not neglecting their military function as a result of the concentration on internal improvement. His argument focused on the dual benefits from the projects. This message again reveals an awareness that topographical engineers should have been compiling maps and data for future wars. "Recently, its operations have been confined to what may be considered civil purposes --- to the surveying of practicable routes for roads and canals, and to the opening and improving of the navigation of our streams, bays, harbors, and inlets."[17] The duty, however, was not entirely civil since "the information thus obtained may be serviceably used hereafter in military operations."[18] Eaton's assertion was a rationalization used by advocates of internal improvements especially in the less favorable Jacksonian period. The argument's validity is questionable. Certainly some information of military value was gained from the surveys; but were the results of the two types of surveys basically the same? This point can

best be evaluated by examining a specific survey and report.

In December 1828, the project engineer presented his report on an examination for a national road from Washington, D.C. to upper New York State. The general map covered a fifty-mile wide region between the two points. The only features depicted were major towns, turnpikes, and rivers. The one inch to five mile scale (1:317,000) was too small to represent much of the valuable information from a military point of view. Local roads, towns, and streams were not shown. No vegetation or elevation was depicted as the accompanying report concentrated on technical considerations of the proposed construction. Rock sources were listed and types of timber in various sections analyzed. Rather than a general study of hill formations throughout the area, the team concentrated on time-consuming studies of exact grades at critical points along the fifty foot-wide route it proposed for the road.[19] In short, the entire reconnaissance was for the specific purpose of proposing a route and planning its construction. The studies made were necessary for this end. Using the same resources, but changing the objective to a military reconnaissance of the area, would have resulted in a significantly different map and report. The scale used would have been at least one inch to one mile (1:53,000) since anything smaller would have been of little value except in general campaign planning. Elevation features throughout the entire area would have been noted, with comments on relative heights of adjacent features. Details on local road nets, streams, and vegetation patterns (especially woods) would have been included. Thus, the actual map and report provided some

military information. But changing the purpose of the survey would have resulted in maps and topographical information much more useful to a commander campaigning in the area. Internal improvement surveys and military surveys were not interchangeable; the carryover utility of one to the other was severely limited.

In June 1831, the topographical engineers and the Bureau were separated from the Engineer Department, and placed directly under the Secretary of War. The authorized strength, however, remained fixed at ten officers. While continuing to recommend an increase in manpower, Secretary Lewis Cass stressed the benefits of the improved organization as well as the importance and neglect of military surveys.

> A minute knowledge of the features of a country is essential to any plan of military operations, and this knowledge should be gathered in a season of leisure and deposited in our archives. In Europe it is considered one of the most important elements of military science, and upon its contributions have often depended the efforts of a whole campaign. All the surveys made by the topographical corps are returned to the depot in this department, where they can be detached or combined, as it may become necessary to exhibit views more or less general. These surveys dissect the county in all directions....This work was actually commenced (in the US), but was abandoned before much progress had been made.[20]

Cass continued by recommending a military survey of the country with priority on the frontiers "demanded by considerations of national interest."[21]

Lieutenant Colonel James Kearney, in the first annual report of the Topographical Bureau in 1832, emphasized a dual benefit from future surveys by his officers. Realizing the limited military value of construction surveys, he reversed the traditional argument and hailed the civil benefits derived from military surveys.

"The survey of a country for military purposes furnishes also a good geographical map."[22] While Kearney stressed military surveys, he was careful not to alienate political supporters who backed the topographical engineers solely because of their civil utility. "From the character of the duties of such a corps, it may be seen with what facility and advantage it may have its attention, when necessary, turned to objects purely civil."[23]

Apparent in the Cass and Kearney reports was their belief that a systematic approach to military mapping should be adopted. The internal improvement surveys were made where the need arose. What little military information these surveys contained had to be connected by detailed surveys of the extensive regions between adjacent projects. Only then could the necessary maps be compiled. Kearney, however, did not argue for the military surveys as a replacement for internal improvement surveys. Instead, he contended they could both be accomplished. With a large force of officers, this might have been the case. With the existing strength, civil surveys continued to receive priority as all twenty-one projects in 1832 focused on internal improvement.[24]

While the surveys were of limited military value, the Bureau's incoming military information was further reduced by organizational problems. Much inefficiency was noted in obtaining these surveys. In his report on 1835 topographical operations, Lieutenant Colonel John J. Abert complained that the ten topographical officers had to be spread thinly. The thirteen civil engineers who assisted them were expensive to maintain and created a civilian-soldier problem. Neither component felt compelled to take orders from

the other. The thirty non-engineer officers temporarily detailed to the Bureau also presented difficulties. The practice had continued since 1824 as a compromise for not increasing topographical engineer strength. Many of the detailed officers were replaced annually, just as they became familiar with the basic procedures of the Bureau and surveying in general. West Point had prepared them for surveying, but much of the preparation had been lost during assignments with their own branches. Also some officers were just not interested in engineering.[25] Another factor hampering the planning of topographical operations was the fact that detailed officers were subject to immediate recall to their regiments. Early in 1836, all but a few of the thirty detailed officers were recalled for the Seminole hostilities.[26] In his 1836 annual report, Abert stated that there was nothing to say on the subject of needed topographical expansion that had not been said in the previous decade of annual reports and communications. The detailed facts of his annual report by themselves proved "the utter inability of the bureau to execute the duties assigned to it under the various laws of Congress without further aid."[27]

A Senate request in 1837 revealed another weakness in the Topographical Bureau's ability to support future military operations. Even military surveys had limited utility if they could not be compiled into maps and reproduced in quantity. The Senate proposed that all of the internal improvement surveys, maps, and drawings be formally printed in indexed volumes. Lieutenant Colonel Abert reported on the practicability of the proposal. He found that less than half of the surveys had ever been printed,

and these only existed in a few Congressional documents. All were now out of print and could not be obtained. The only remedy was to prepare the entire collection in manuscript form from the original sketches of the topographical officers. This was far beyond the capability of the Bureau since a portion of these original sketches filled twelve imperfectly-bound volumes and the unbound material filled four more volumes. Abert's "solution" was to list the printed reports and the Congressional volume in which each could be found, in addition to providing a list of the reports which had never been printed.[28] The Bureau's inability simply to display the information on hand in original form casts serious doubt on its ability to perform the more complex wartime task of consolidating surveys and memoirs into campaign maps. Thus, emphasis on internal improvements hampered military mapping in another way. The construction surveys were ends in themselves which fully committed all topographical resources, leaving no reserve to systematically compile the surveys limited military information into maps.

The Seminole hostilities in 1836 underscored the need for detailed military maps. Operations were constantly hampered by inadequate maps as field commanders complained bitterly. Though transmitted a quarter of a century before McClellan's Peninsula campaign, the objections voiced could have substituted directly for those of the first commander of the Army of the Potomac.

> The commander of the army of the south says, emphatically, in a late communication to the adjutant general: "Had the topographical engineers been employed in their appropriate duties in Florida only one year of the sixteen since we obtained possession of the country, from two to three millions of dollars

> might have been saved in the expenditures of the war." The ignorance of the topography of the country here complained of exists with regard to other important regions of our country, which will, probably, sooner or later, become the theatres of war; and I earnestly hope the department will have it in its power to redeem this defect by confining the members of the corps to their appropriate duties, of examining and surveying the country, for the purposes of national improvements and national defence, and superintending the erection of national works.[29]

Military operations in Florida clearly established the need for military surveys and maps of a region prior to commencing military operations. Commanders there had little doubt as to the topographical officers' "appropriate duties". Secretary of War Joel Poinsett's concluding plea to rectify the situation, however, merely clouded the issue with the traditional argument, dual missions and the interchangeability of the two types of survey. An important fact was overlooked; national improvement suveys had been conducted in Florida during the decade before the war, yet they added little to the general topographical knowledge of the region which could be used to conduct military campaigns.

In 1838, the Corps of Topographical Engineers was finally expanded to an authorized strength of thirty-six. Civil engineers and non-engineer officers were no longer authorized for use by the Bureau.[30] The workload, however, grew faster than the Corps as "all works of a civil character directed by the United States" were transfered to the topographical engineers.[31] In the first year, fifty-four projects were transfered from the Corps of Engineers.[32] As earlier with internal improvement, this expanded civil workload was not thrust upon the Topographical Bureau against the will of its officers. Several years earlier Colonel Abert had

recommended the action.[33] With internal improvement waning, the topographical engineers pragmatically shifted their efforts to civil projects which again secured broad political support for the Corps.

As a result of the Seminole War, military and geographical surveys received higher priority. Unfortunately for future Civil War generals, the emphasis was on the frontiers now extending beyond the Mississippi River. Six officers were detailed to conduct a military survey of Florida. The other military surveys begun in 1839 focused on the area west of the Mississippi River and north of the Missouri River.[34]

In his annual Topographical Bureau report for 1842 Colonel Abert requested funds for a military survey of the Maryland peninsula.

> The military reconnaissance of the peninsula of Maryland south of the road from this city (Washington) to Annapolis, has been but partially completed, it being necessary to order the officer who was engaged upon it to other duties. This is, however, an important duty intimately connected with the defences of this city, and should be attended to at an early date....A great extent of surveys of this kind have yet to be made, in order to place the Department in possession of those facts which would form the basis of its operations in times of war, and which can never be so well collected as during periods when completely free from apprehension of war. I hope, therefore, that the small estimate which will be submitted, for further prosecution of these military reconnaissances and surveys will meet your approbation.[35]

While he warned that numerous military surveys were necessary, Abert had to beg for a meager appropriation to advance work on the top priority military survey in the East.

The following year Abert focused on why existing surveys of the coastline and coastal fortifications were not adequate military

maps in the East. "The kinds of investigation now desirable, are those general military reconnaissances embracing the circuit in which an enemy may land, and by surprise or rapid movement, lay a city under contribution."[36] Why were the existing maps and civil surveys inadequate for this purpose? They merely provided an outline of the territory which had to be extended to a much larger scale to accurately depict "the topography, and indicate the roads, fords, ferries, bridges, and general character of the watercourses, which with a report embracing the requisite military reasoning and considerations, would possess a general in command with matter highly essential to whatever military operations he might direct."[37] Besides highlighting the deficiencies of existing maps and surveys, Abert's report clearly outlines the criteria for an adequate military map in the mid-1800's.

In the same report Abert advised that similar military surveys should be conducted around principal cities. The limited nature of this recommendation probably stemmed from several factors. Cognizant of the lack of support for the priority military survey near the nation's capital, Abert realized the most he could hope for was the eventual approval to map areas near several major cities. The other factor, actually described in hypothetical terms in Abert's report, was the impact of the War of 1812 in a contemporary situation. The only need for such detailed information was if war broke out and an enemy force landed on the Atlantic Coast. The enemy's probable objectives would be American seaboard cities with thrusts more than a few miles inland highly doubtful. Hence, the gross military inadequacies of general maps of regions east

of the Mississippi River were tolerable.

Military surveys of the settled regions between the time of Abert's report and the Civil War were limited to the Maryland peninsula, New York City, New Bedford, and Torugas, Florida.[38] In addition, 658 miles of Northeastern border were surveyed and mapped for "military features".[39]

The increased workload of the Corps of Topographical Engineers and the rapid westward expansion contributed to the low priority of Eastern military surveys. The transfer of all national civil works to the Bureau was followed in 1843 by the establishment of an officer board to conduct a coastal survey. The board consisted of four topographical officers.[40] In 1846 and 1847, over half the topographical officers served with the armies in Texas and Mexico.[41] Following the war, military departments were established in Oregon, California, Texas, and New Mexico and the Bureau was required to furnish topographical officers to all of the new departments.[42] In 1849, the Bureau was charged with conducting lighthouse surveys, and in 1852 with supervising their subsequent construction. Throughout this entire period the Bureau also conducted Great Lakes' surveys and the Western river improvement work.[43]

In his 1850 report, Colonel Abert requested an expansion of the Corps from thirty-six to fifty-two officers. He cited the major projects of the Bureau, in addition to some peripheral tasks which drained manpower. The Department of the Treasury had been authorized to use topographical officers to construct marine hospitals. The Commissioner of Indian Affairs was granted use of

some officers and the Department of the Interior was pressing the coastal survey board to increase the number of topographical officers on the board.[44] The Corps was not expanded, but again its workload was. In 1853, the Secretary of War was authorized "to employ such portion of the Corps of Topographical Engineers...to make such explorations and surveys as he may deem advisable, to ascertain the most practical and economical route for a railroad from the Mississippi River to the Pacific Ocean".[45]

The 1860 employment of topographical engineers was typical of the decade preceding the Civil War. Eleven served with Western military departments; eight on lighthouse duty; six on Western exploration surveys, primarily for the railroads; four on river improvements; four on coastal surveys; three instructed at West Point; and two served in the Bureau in Washington.[46]

While the mammoth civil workload and the rapid westward expansion during the two decades before the war might be enough to explain the lack of detailed Eastern military maps, two other factors contributed. One was the enormous amount of time and effort required to compile sufficiently detailed military maps and the accompanying memoirs. The other factor was the existence of state and county maps.

The Northeast border survey is an example of a detailed military survey. The survey was conducted to establish the boundary and depict the military features along the line. The project took eight years to complete with an average annual employment of five topographical officers.[47] They compiled a general map of the entire border (scale: one inch to ten miles or 1:634,000), a

thirty-map series of the entire border in detail (scale: two inches to one mile or 1:32,000), and fourteen maps of specific features requiring minute detail (scale: twelve inches to one mile or 1:5,000). The length of boundary surveyed was 658 miles at an average width of two miles on each side of the line.[48] Thus, the area surveyed and mapped was about 2650 square miles, or about 330 square miles each year. The total land area of states admitted to the Union by 1850 was over 1,500,000 square miles.[49] Terrain affected the speed of a survey; but disregarding this factor, a rough estimate can be made for the time required for a detailed military survey of the entire United States in 1850. Using five officers each year, the survey would have taken 4500 years. Even employing the entire Corps would have only reduced this figure to about 650 years. Certainly less detailed surveys would have reduced the required time significantly. The comparison, however, puts the task in perspective.

The Northeast border project also furnishes an example of the time-consuming effort to merely compile the detailed maps after all the data had been collected. In 1848, the only copies of the border survey maps were destroyed in a fire. Fortunately the surveyor's field-books, in which the topography was noted, escaped the conflagration. Compiling maps of the topography and military features from original notes consumed most of the restoration time. With the original field books and notes already complete, it still took two topographical officers four years to reconstruct the maps.[50]

Appeals for detailed military surveys were often unconvincing

because many people failed to appreciate the need for topographical knowledge in conducting military campaigns. In addition, many of those who did understand the need felt that state and county maps were sufficiently detailed to serve the purpose.[51] Closer examination refutes this argument.

Prior to 1840 the only systematic surveys conducted were in Pennsylvania and Virginia. In 1816, the Pennsylvania legislature authorized the surveyor general to contract with deputy surveyors to survey the counties (scale: one inch to two and a half miles or 1:157,000). In 1822, the surveys were compiled as a state map (scale: one inch to five miles or 1:314,000). Virginia passed similar legislation in 1816 and compiled a state map (scale: one inch to five miles or 1:314,000) in 1826. The map was engraved and published by Harry S. Tanner of Philadelphia. The scales of both state maps were too small for inclusion of much detail. Unfortunately, most county surveys remained in manuscript form in state archives or in official records in county court houses. Between 1841 and 1860, counties in the Northeast, the Midwest, and a few along the Mississippi River were surveyed. During the decade before the Civil War, there was a demand for publication of county maps. This demand, however, was restricted to the affluent rural areas of the Northeast and Ohio.[52]

Thus, only a limited portion of the settled United States was encompassed by state and county maps. While the small scale of the state maps omitted much detail, most county maps were single-copy manuscripts without a standardized storage location. These inadequacies were not the only shortcomings of the maps.

The accuracy of many was questionable. The surveyor got his initial information from county courthouse maps, if any were on file. He then made a rough "survey" of county roads using an odometer to measure distance and a magnetic compass for direction. Compared to a trigonometic survey using instruments, this method was only a gross estimate. On the outline, he sketched the approximate local road network, and from "personal observation" added the landscape.[53] This normal procedure resulted in considerable inaccuracy. In addition, some surveyors were unscrupulous and compounded inaccuracies geometrically. Since they were paid by the amount of area "surveyed", they used shortcut methods. Some completed the map of an entire township in less than three days by dispensing with the magnetic compass and odometer, which were themselves only approximation techniques. The surveyor merely guessed general directions and estimated distances by buggy speed. The entire "survey" was conducted without leaving the buggy.[54]

Thus, an examination of the pre-Civil War period reveals the inaccuracy of General McClellan's accusation that the Army Staff had taken no measures prior to the war to collect any topographical information about the country. In his charge that the Bureau could provide no military maps of value, however, he appears to have been generally correct. During the first decade of their existence, topographical officers concentrated on surveys of fortifications.. Starting in the mid-1820's, their emphasis shifted to surveys for internal improvements. The priority of this work was supported by topographical officers, as well as Army leadership in general. During this early period, there was an awareness of a need for

military surveys, but no feeling of urgency. Quite inaccurately, the internal improvement surveys were depicted as doubling as military surveys. Topographical officers perceived a weakness in this argument, but were unwilling to call for an end to civil surveys. Instead, they linked the future growth of their Corps to its civil function. The Bureau's non-military survey work expanded at a faster rate than the Bureau's human resources. Commanders' reports during the Seminole War revealed the Bureau's inability to perform its function of providing adequate military maps. The only area benefiting from the resulting rise in military surveys were Florida, a few major coastal cities, and regions west of the Mississippi River. Western expansion further limited the probability of extensive military surveys east of the Mississippi.

In the final analysis, however, McClellan's assessment of the topographical effort in the pre-war years parallels Emory Upton's argument for the existence of a large Regular Army in 1861. He refused to consider the political environment of the peacetime military establishment. Insistence by Army leaders and military engineers that military surveys take priority over the corp's civil surveys may have had several unfavorable trade-offs. A moderate impact might have been less military influence in selecting internal improvement routes, many of which benefited Civil War generals. A more likely result of intransigence would have been a nonexistent Topographical Corps in 1861. It is doubtful that the effort would have added one mile to pre-war military surveys.

1. 1813 Army Regulations, ASP,MA, I, 431.

2. Historical Papers Relating to the Corps of Engineers, 37-39.

3. Henry Beers, "A History of the Topographical Engineers, 1813-1863", The Military Engineer (June 1942), 287.

4. James Barbour to House of Representatives, Jan. 16, 1826, ASP, MA, III, 184.

5. AR of SW for 1822, ASP, MA, II, 184.

6. John C. Calhoun letter to Henry Clay, Jan. 7, 1819, The Papers of John C. Calhoun, III, 461-473.

7. Thomas S. Jesup letter to John C. Calhoun, Mar. 31, 1820, Ibid., IV, 745-747.

8. Simon Bernard, ASP, MA, II, 305.

9. William Goetzmann, Army Exploration in the American West 1803-1863, 14.

10. Section 2, Act of Apr. 30, 1824, Legislative History of the General Staff, 500-501.

11. AR of SW for 1824, ASP, MA, II, 700.

12. AR of SW for 1825, ASP, MA, III, 140.

13. AR of SW for 1829, ASP, MA, IV, 169.

14. James Barbour to House of Representatives, Apr. 12, 1826, ASP, MA, III, 278.

15. Ibid.

16. Letter to House Committee on Military Affairs, Jan. 2, 1827, ASP, MA, III, 493.

17. John Eaton to House of Representatives, "Report on the Importance of Topographical Engineers", Jan. 21, 1831, ASP, MA, IV, 631.

18. Ibid.

19. Report from the engineer appointed to examine the route for a National Road from the City of Washington to the Northwestern frontier of the State of New York, Dec. 29, 1828.

20. AR of SW for 1831, ASP, MA, IV, 710-711.

21. Ibid.

22. AR of TB for 1832, ASP, MA, V, 63-64.

23. Ibid.

24. Ibid.

25. John Abert to House of Representatives, "Report on an Increase of the Number of Officers and Organization of the Topographical Engineers," Jan. 12, 1836, ASP, MA, VI, 8.

26. John Abert to Senate, June 21, 1836, ASP, MA, VI, 795.

27. Ar of TB for 1836, ASP, MA, VI, 912.

28. John Abert letter to Senate, Jan. 21, 1837, published in Army and Navy Chronicle, May 4, 1837.

29. AR of SW for 1837, ASP, MA, VII, 574.

30. Act of July 5, 1838, Legislative History of the General Staff, 502.

31. AR of TB for 1838, in AR of SW for 1838.

32. AR of CE for 1839, in AR of SW for 1839.

33. AR of TB for 1835, in AR of SW for 1835.

34. AR of TB for 1839, in AR of SW for 1839.

35. AR of TB for 1842, in AR of SW for 1842.

36. AR of TB for 1843, in AR of SW for 1843.

37. Ibid.

38. AR of TB for 1847, AR of SW for 1847.

39. AR of TB for 1852, AR of SW for 1852.

40. Act of March 3, 1843, Legislative History of the General Staff, 503.

41. AR of TB for 1847, AR of SW for 1847.

42. AR of TB for 1848, AR of SW for 1848.

43. Acts of March 3, 1849 and August 31, 1852, Legislative History, 505.

44. AR of TB for 1850, AR of SW for 1850.

45. Act of March 3, 1853, Legislative History, 506.

46. AR of TB for 1860, AR of SW for 1860.

47. AR of TB for 1840, AR of SW for 1840.

48. AR of TB for 1850, AR of SW for 1850.

49. American History Atlas, 19-40.

50. AR of TB for 1849-1852, AR of SW for 1849-1852.

51. Acting Chief Engineer Colonel Nathaniel Michler's report of Grant's 1864 campaign in Virginia, OR, XXXVI, pt. 1, 293.

52. Richard Stephenson, Land Ownership Maps, 7-15.

53. Ibid., 16-17.

54. Ibid.

CHAPTER 3

"THE CHIEF OF MY CORPS, INSTEAD OF HAVING ANY DEFINITE IDEA OF HOW AND WHERE I SHOULD BE USED, SEEMED TO BE HALF DAZED."

---LIEUTENANT JAMES WILSON, TE, 1861

The asymmetry of opposing sides in the Civil War placed a premium on Northern topographical intelligence. The South could win by merely retaining its own territory; the North could not. As a result, Union armies would have to wage an offensive war and operate primarily in enemy territory. They depended totally on the limited information they possessed at the outset of the war. Corrections and amplification of original maps had to wait until Federal armies pushed forward and physically occupied the contested regions.

A related problem for the North at the start of the war was a lack of knowledgeable guides. Again, since most of the campaigns would be conducted in the South, the Confederacy enjoyed a significant advantage in terms of loyal guides familiar with local topography, road nets, and even trails. Certainly the North had some people familiar with various parts of the South, but its limitations in this area acted as a double-edged sword. Absence of guides increased the importance of maps for the North and at the same time limited a critical source of information necessary to provide or verify the basic data.

Despite major drawbacks, the North had several advantages at

the outset of the war. Its existing Topographical Bureau possessed surveys of the coastline, detailed civil-construction surveys of some specific routes, large-scale military maps of areas near a few Eastern cities, and general small-scale maps of some areas east of the Mississippi River. As demonstrated earlier in the Bureau's history, this asset was largely offset by the modest utility of the source data in preparing adequate military maps as well as the Bureau's limited ability to assemble raw data into maps.

Demands on the Bureau early in the war underscored another deficiency, an inability to provide maps which had been previously printed. The problem stemmed from the practice of obtaining engraved copies of original surveys by contract, without securing government ownership of the plates. The policy, necessitated by Congressional fund limitations in the peacetime environment, came back to haunt the Bureau in 1861. Planners of operations around Charleston, South Carolina required maps of the coastline and fortifications which had been engraved years earlier. A fruitless search of Bureau files prompted an extensive search throughout the North for the engraver. Fortunately, he was located and still possessed the original plates. The government purchased the plates and finally printed the necessary copies. The report of the incident concluded, however, that it was unknown whether the plates of many other valuable surveys had been destroyed or not.[1]

Similarly, the plates for the most detailed topographical map of Washington, D.C. were owned by Mr. David McClelland. McClelland offered to sell the valuable copper plates to the government at

the reasonable market price of $20,000. Secretary of War Edwin Stanton rejected the offer and ordered the plates confiscated by the government.[2] While the decision succeeded in the short-term objective of obtaining maps of Washington, D.C., it certainly did not inspire engravers with other valuable plates to come forward voluntarily. Thus, an already-limited and inefficient Bureau operation was further hampered.

In addition to the advantage of having an existing Bureau, the North had another asset, the allegiance of most of the military engineers. Of the forty-five topographical engineers in 1861, only seven resigned to join the Confederacy, of which five were new second lieutenants. Similarly, only eight of the forty-eight Corps of Engineer officers went South.[3]

The high retention of engineer officers was probably the result of a superior secondary education system in the North. An examination of West Point classes during the decade before the war reveals a strong correlation between assignment to the military engineer corps and the USMA class standing of the individual. In the last eleven pre-war classes (1850-1860), all eleven top graduates, ten of the second graduates, and six of the third graduates were commissioned as military engineers. Four of the five years in which the third graduate was not commissioned as an engineer, the top two graduates chose the only engineer commissions available. The correlation between high class standing and an engineer commission interfaces with another strong relationship, that between high class standing and the individual's state of birth being in the North. Except for the classes of 1857 and 1858, classes in

the pre-war decade averaged only one Southerner among the top six graduates. The result of these two relations was that over seventy-five percent of the engineers from the eleven classes were Northerners.[4]

The premium on topographical officers was compounded by the absence of any topographical NCO's or enlisted men. In 1858, Colonel Abert had recommended that a topographical company be organized. Authorization came in 1861, but the project fell through when few recruits were found and the recruiting officers were reassigned.[5]

As in the case of the Bureau, the benefit the North derived from its human resource advantage, in terms of improving topographical intelligence, was not as striking as it appeared. Of the thirty-eight topographical officers who did not join the South, one died, one remained on extended sick leave, one resigned for civil employment, four retired, and eleven accepted volunteer commissions, thereby reducing the number of officers on active topographical duty to twenty.[6] Volunteer commissions represented an attractive alternative to a topographical officer, immediate volunteer rank of lieutenant colonel or colonel and enhanced opportunity to be breveted as a general in the Regular Army. At a time when the promotion of officers in technical branches was relatively slow, some officers accepted topographical assignments as an interim job while waiting for volunteer positions to open. Major Andrew Humphreys, for example, was one of the few to receive an immediate brevet colonelcy as a topographical officer when he was assigned as the chief topographical engineer for the newly organized Army of the Potomac. Still he pressed for a volunteer commission and a combat command realizing that it was the only

sustainable path to the top. The War Department kept Humphreys in the topographical harness by shelving his request and holding out the carrot of going directly to division-level command after some topographical service.[7]

Lieutenant Gouverneur Warren, a young topographical engineer teaching at West Point when war broke out, took the initiative by getting himself elected colonel of the 5th New York Volunteer Regiment. After the War Department denied his request for a leave of absence from the Regular Army, Warren went to Washington in April 1861 to plead his case in person. Again he was turned down by the Topographical Bureau which wanted him to remain at West Point as an instructor. Warren's political contacts, however, overrode the decision when Professor Henry Davis, a prominent New York citizen, discussed the matter with his friend, the Secretary of War. The following week the Bureau granted Warren a leave of absence from the West Point faculty, but only "for the remainder of the school year" (until September).[8] Like the North in general, the Bureau assumed the war would last only a few months, and the fewer disruptions to routine operations the better.

After the fall of Fort Sumter, Captain George G. Meade bombarded the Bureau with requests for "active service". Unlike Warren, he merely wanted an engineer assignment in a potential theater of war, not a volunteer commission. Denials prompted Meade to go to Washington to argue his case in person, but the result was the same and he returned to Detroit to conduct Great Lakes' surveys and construct lighthouses. Following the Bull Run fiasco, Meade anticipated reassignment orders. Receiving no

word from Washington, he decided to resign and accept the volunteer colonelcy offered by Michigan Governor Austin Blair. However, in late August, McClellan's demands for officers to command brigades in his expanding army prodded the War Department which gave Meade a leave of absence from his branch and appointed him brigadier general of volunteers.[9]

Lieutenant James Wilson's reassignment highlights another deficiency which precluded mobilizing topographical assets. Wilson reported to the Topographical Bureau from the Pacific Department in late August, 1861. He expected his new assignment to be waiting.

> The chief of my corps, a patriotic, loyal gentleman, was superannuated, and instead of having any definite idea of how and where I should be used, he seemed to be half dazed and told me to look about a few days and make up my mind as to where I should like to serve. It was both disappointing and discouraging.[10]

The experiences of the four officers combine to put 1861 Topographical Bureau operations in perspective. The short-war mind set dictated a policy of delay and obstruction when dealing with requests for leaves of absence or reassignments to theaters of war. Routine administration and daily bureaucratic matters drove the system. The ripples caused by the war could be ignored since they would soon dissipate leaving the "boat" in calm water again. When Bull Run punctured the short-war bubble, more distressing realizations emerged from behind the Bureau's facade. No preliminary plans for wartime use of the topographical engineers had even begun. Human resources had been lost because of the earlier obstructionist policy. Demands were overwhelming, but worst of all, Topographical Bureau leadership was nonexistent. Instead of systematically sorting out demands and resources and establishing

priorities, the Bureau took the ostrich approach of allowing officers to fend for themselves. Thus topographical priorities were set by the relative appeal of assignments to the individual officers. Certainly the South had many problems and deficiencies in the area of topographical intelligence; but the North, which was forced to rely more heavily on existing maps and human resources to correct inadequacies, largely negated its own initial advantages.

1. AR of TB for 1861, AR of SW for 1861.
2. James Rhoads, "Civil War Maps and Mapping", Military Engineer (Jan. - Feb., 1957), 39-40.
3. George Ness, "Engineers of the Civil War", Military Engineer (May - June, 1952), 187.
4. George Cullum, Biographical Register, II.
5. AR of TB 1858, AR of SW for 1858. Richard Wood, Stephen Harriman Long, Army Engineer, Explorer, Inventor, 257.
6. Ness, op. cit.
7. Harold Round, "A.A. Humphreys", Civil War Times Illustrated.
8. Emerson Taylor, Gouverneur Kemble Warren, 48-49.
9. George G. Meade, The Life and Letters of General George Gordon Meade, I, 215-217.
10. James Wilson, Under the Old Flag, I, 58.

CHAPTER 4

"EVERYONE KEPT HIS OBSERVATIONS TO HIMSELF, NOT FROM ILLWILL, BUT BECAUSE IT WAS NOBODY'S SPECIAL DUTY TO DO THIS GENERAL WORK"

---PRINCE OF JOINVILLE
FRENCH OBSERVER
ARMY OF THE POTOMAC, 1862

After the Union defeat at Bull Run in July 1861, Confederate forces occupied the land south of the Potomac River. Northern generals, hungry for topographical information about Virginia, found official channels unable to meet their needs. Commanders, like Brigadier General Phillip Kearney of the First New Jersey Brigade, partially overcame the shortcoming through civilian contacts. Mr. Charles Scranton of Oxford Furnace, New Jersey offered welcomed assistance.

> I had the pleasure to forward to Major Whipple, TE, the 2nd sketch of the country west of Bull Run on last Friday, and to send this week Monday my neighbor Wm Burd for twelve years a resident of that section. I shall try to have 3 or 4 true men ready to act as guides in any forward movement that may be made by and bye.[1]

Maps were only one aspect of topographical intelligence. Alternate means such as guides also served the important military ends of land navigation and operational planning.

The Bureau of Topographical Engineers attempted to correct some of the problems noted in the First Bull Run campaign by updating its original map of northeastern Virginia. The engineers

enlarged the scale to one inch to two miles (1:128,000) and corrected road, town, river, and railroad locations. They added hills (depicted with hatchures), fields, and forests as well as spot elevations for eighty five points. The map was a mosaic based on many sources: six earlier maps (including a state map, an aqueduct survey, an estate map, and a railway route map), ten reconnaissances by topographical engineers and volunteer officers, and ten "informations furnished" by senior officers who had fought at Bull Run. Especially noteworthy was the variance of the detail, which within a ten-mile radius of Washington was extensive, but became almost nonexistent beyond this radius. Even with this safeguard, the topographical engineers qualified their work with a caution General McDowell could have used months earlier at Bull Run. "Woods and hills are nowhere noted except upon specific information supposed to be reliable."[2] The first campaign had taught an important lesson which was remembered to varying degrees throughout the war: when indirect sources are used, warn the users of the product.

After advancing on Bull Run in the spring of 1862 and discovering that the Confederates had abandoned their positions, General McClellan moved his army to the Peninsula where he encountered the initial setback at Yorktown discussed earlier. His immediate concern was to rectify the deplorable map situation which limited his ability to plan movements and issue orders. General McClellan envisioned an easy solution hoping to find correct local maps as his army captured towns on the Peninsula. However, if such maps existed, they were removed by the retreating Confederates or destroyed by the inhabitants.[3]

Forced to rely on his own topographical resources, General McClellan soon felt the pinch of the War Department's engineer priorities. The top priority for topographical engineers was to survey and construct the Washington defenses.[4] Thus, the severe shortage of engineer officers in general was further compounded for the field armies. The reason so many engineers were needed in Washington stemmed from another pre-war problem.

> Ignorance at the time of our officers, of all arms and grades, with regard to the military topography of the environs of our cities....Officers of the Army who spent much of their lives in Washington or New York found themselves more ignorant concerning the military features of the surrounding country than they were of that of Paris, to which military history and its fortifications had attracted some attention.[5]

By the end of 1862, engineers had surveyed the entire Washington area and constructed fifty-three forts and twenty-two batteries.[6] The field armies bore the cost of this rapid build-up.

For a month General McClellan operated with only the three topographical engineers. To augment them he ordered Brigadier General Warren, who commanded an infantry brigade, to personally help with the map work.[7] This additional duty removed General Warren from his brigade for several weeks, underscoring the importance the commanding general placed on maps.

In early May, the siege of Yorktown ended and the campaign became fluid again as the Army of the Potomac pushed up the Peninsula. Unwilling to accept the unresponsiveness of the bureau system to the needs of the field armies, McClellan pleaded with Secretary of War Stanton.

> We have absolutely no information in detail of the country in our front and we are obliged to grope

> our way. I would respectfully and earnestly urge that Chief of Topographical Engineers be directed to lend me eight or ten officers junior to General Humphreys (Army of the Potomac's Chief Topographical Engineer) to move with this army until we have reached Richmond.[8]

The request succeeded in obtaining more engineers, though their arrivals were spaced over the remainder of the campaign. At various times General Humphreys directed four topographical officers, four civil engineers, three non-engineer officers, two coastal surveyors, and one draftsman, all of which he retained at army level.[9]

Existing doctrine on the employment of the topographical engineer staff was outlined in the 1861 Army Regulations.

> Corps of Engineers and Topographical Engineers: The duties of these corps usually relate to the construction of permanent and field fortifications; works for the attack and defense of places; for the passage of rivers; for the movements and operations of the armies in the field; and such reconnaissances and surveys as may be required for these objectives, or for any other duty which may be assigned to them.[10]

Basically the guidance reflects the employment of engineer officers during the Mexican War. Ten engineers, of which four were topographical officers, adequately supported each of the small American armies.[11] Since the armies averaged only five to ten thousand men, or roughly the size of a Civil War division, engineer officers could be used interchangeably as the need arose. There was no need for an organized map center with designated engineers to collect, compile, and distribute information when the armies were so small that the reconnaissance of a single route or narrow front often sufficed for the entire army. The Army of the Potomac, however, now over one hundred thousand strong, was ten to twenty

times larger than a Mexican War army. The fact that the doctrine and historical precedence made no distinction between the employment of the two types of engineer corps is significant.

McClellan's utilization of his engineers was consistent with doctrine but left General Humphreys with a topographical staff in theory only. In reality he had little say about when and how his staff was used. At times his engineers augmented the staff of McClellan's chief engineer, Brigadier General John Barnard. Barnard temporarily attached them to corps headquarters or had them supervise volunteer engineer companies constructing bridges and fortifications. Since Civil War staffs contained no intelligence officers, McClellan also used his engineers to gather information on the enemy. The value of such reconnaissances relied on immediate transmission of the information, resulting in little available time to record topographical information. A final impediment to the map effort was an inherent and self-perpetuating problem. As the topographers gained knowledge of the unknown terrain for their maps, much of their time was consumed as guides to units passing through the sector.

While McClellan took special pride in his employment of engineers and the fact that it was "impossible to draw a distinct line of demarcation between the duties of the two corps of engineers,"[12] a French observer with the army drew another conclusion from their indiscriminate use. The Prince of Joinville felt that McClellan had the means to correct the initial absence of topographical information, yet was totally unsuccessful. Ironically, the Prince identified the cause as faulty organization, the one

aspect of McClellan's ability that most historians highlight as his strong point.

> The want of a General Staff was not less severly felt in obtaining and transmitting the information necessary at the moment of an impending action. No one knew the country; the maps were so defective that they were useless. Little was known about the fortified battle-field on which the army was about to be engaged. Yet this battlefield had been seen and reconnoitered the day before by the troops which had taken part in Stoneman's skirmish. Enough was surely known of it for us to combine a plan of attack and assign to every commander his own part in the work. No, this was not so. Every one kept his observations to himself, not from illwill, but because it was nobody's special duty to do this general work. It was a defect in the organization, and with the best elements in the world an army which is not organized cannot expect great success. It is fortunate if it escapes great disaster.[13]

Commanders used the maps almost exclusively for planning and movements. With strong reliance on engineers, they based tactical decisions and placements on direct observation of the gound. Photography enabled rapid dissemination of topographical intelligence when the topographers were able to focus on their primary work as was the case during major moves.

> Topographical officers, moved through the woods with an escort of cavalry, reconnoitering the country and sketching by the eye and the compass provisional maps, which were photographed at headquarters for the use of the Generals. The next day, with the help of these maps, the army would get into motion.[14]

The army staff seldom distributed maps below brigade level. When the army remained in place for an extended period, the provisional maps were corrected and updated in greater detail.

To compile maps of regions behind enemy lines, topographers relied on information from civilians, prisoners, and contrabands. While the civilians were uncooperative, "the deserters and Negroes

generally told us much more than they knew in order to secure a welcome, and as we had no maps and no knowledge of localities, it was impossible to make anything of their stories and to reconcile the often contradictory stories."[15] The Federal army's balloon, although weather dependent, provided an alternate means of seeing behind enemy lines. Lieutenant George Custer, a recent West Point graduate, frequently performed the observations from the balloon because of his accurate memory and proficiency in map drawing, one of his stronger subjects at the Academy.[16] Whereas a volunteer officer's familiarity with maps depended entirely on the individual's background, West Point graduates were intimately experienced in map drawing and reading after almost six hundred hours of map work at the Academy.[17]

Unreliable sources coupled with the piecemeal commitment of engineers to topographical work resulted in continued problems. Unit commanders became skeptical of all maps as reflected by the indorsement of Brigadier General Fitz Porter, commander of Fifth Corps, on a reconnaissance map by army engineers to his front. "Respectfully forwarded for the information of the commanding general. There is another road leading from Old Church to Hanover Courthouse; at least so says the map."[18] Other commanders, like Brigadier General John Newton, a brigade commander in the Sixth Corps, rejected the maps as useless. "I became satisfied that the map of the locality furnished us was entirely incorrect in a military point of view."[19]

Some of the problems associated with topographical intelligence and land navigation resulted from the swampy, wooded terrain of

the Peninsula and were not unique to the Federals. Confederate commanders operating within ten miles of Richmond at times confused the road nets and required guides.[20]

Topographically, the campaign ended for the Federals as it had begun, on a low note. Humphreys became ill shortly after the battle of Malvern Hill, during which he personally positioned many infantry and artillery units. As a result, the final campaign map contained no data on vegetation patterns, soil conditions, road types, or general geography. Humphreys could not update it later because as soon as he recuperated, he received his reward for remaining in the topographical position, appointment as major general of volunteers and command of a division.[21]

Federal armies in the Eastern theater of the war continued to be plagued by inadequate topographical information throughout the remainder of 1862. Major General John Pope, commander of the newly created Army of Virginia, directed a division commander to cross the Rapidan River. Lack of detail on maps at army headquarters, however, precluded Pope from clarifying his order. All he could add was, "You had best therefore, get all information concerning the fords and crossing places in the neighborhood."[22]

Major General McDowell, now commanding a corps in Pope's army, was fortunate to have an engineer, Major D.C. Houston, on his staff. Anticipating orders to move, McDowell directed Houston to construct a map of the area. Houston's map included bank conditions of the rivers as well as a classification of roads as either dirt or macadamized. Since all of the data could not be obtained directly, Houston's footnote warned that the location of

fords was provided by a Negro whom "I had not time to examine as thoroughly as I desired."[23] As on the Peninsula, accurate information often depended more on an engineer's ability as an interrogator than on his topographical skill.

Colonel Daniel Leasure, a brigade commander in the Ninth Corps during Pope's Second Bull Run campaign, recalled the embarassment of his topographical lesson, the importance of good maps even when guides were available.

> We were halted towards midnight by an aide from General Pope who informed us that we were on the wrong road. I told him I had been solely moving according to the instruction of the guide who had been sent to me, and turning to appeal to the guide (a crippled native), I found he had quietly slipped from his horse and vanished into the night.[24]

Colonel Leasure's experience during the battle reinforced a tendency seen on the Peninsula, the hesitancy of commanders to depend on maps in dangerous tactical situations where potential map errors could be catastrophic. With contact imminent, Colonel Leasure had to change his front and reposition the brigade. So as to eliminate any chance of error, the commander climbed a hill with an aide, pointed to a large tree in the distance, and told him to swing the brigade right flank around until it rested on the tree.[25]

After Pope's defeat, McClellan commanded the army and further integrated the two engineer corps under Colonel James Duane, his chief engineer. Again during the Antietam campaign engineer assets were generally retained at army level in the Army of the Potomac.[26] Subordinate commanders, like Brigadier General George Gordon, compensated as best they could. His division

needed a map, so one morning at breakfast he told the only member of his staff he could spare, his judge advocate, to get a compass and make a map of the area using his horse's pace to measure distances.[27] Besides the inadequacy of existing maps, the incident reflects subordinate commanders' desire for maps.

McClellan's inaction following Antietam prompted Major General Ambrose Burnside's appointment as commander of the Army of the Potomac. He reorganized the army by pairing corps into grand divisions and specifically assigned at least one topographical officer to each grand division. The army got its fourth chief topographical engineer in as many months when McClellan took ten key staff officers, including Colonel Duane, with him to Trenton, New Jersey to begin work on after-action reports as the Army of the Potomac moved south. Burnside used his chief topographical engineer, Cpt. R.S. Williamson, as a functional staff officer and expected him to work through his counterparts on subordinate staffs. For movements, the commanding general issued directives outlining the broad concept of an operation and took "it for granted that grand division topographical engineers had been informed by Bowen (on Williamson's staff) of the routes to be pursued by their columns."[28] While Burnside's tenure was short and infamous, he was the first army commander in the Eastern theater to coordinate a topographical organization which extended below the army-level staff.

In the Western theater of the war, initial topographical information was nonexistent even at army level. In February 1862

after the fall of Fort Henry, Brigadier General U.S. Grant did not allow the absence of maps to delay his attack on Fort Donelson. He merely aimed his staff and part of a regiment of cavalry in the general direction of the fort and pushed forward. "I met, as I expected, no opposition in making the reconnaissance and, besides learning the topography of the country on the way and around Fort Donelson, found that there were two roads available for marching".[29] Since Grant had only one military engineer, Colonel James McPherson, assigned to his army, the doctrinal issue of interchangeability of engineers was purely academic.[30] McPherson found two volunteer assistants, one of whom he sent with the army's lead element to sketch maps for Grant while the second worked with McPherson on other pressing engineer matters. Prior to the army's move toward Shiloh, McPherson had a gunboat anchor off shore while one of his assistants sketched a map of the proposed landing site for Grant. After engagements, McPherson was responsible for sketching a map of the battlefield depicting positions of the opposing forces as part of the official report.

Since no effort was made to provide maps to subordinate commanders, if they wanted one they had to procure it themselves. Some like Brigadier General William Sherman, a division commander at Shiloh, sketched their own maps. The only depictions on Sherman's map were a few streams and roads (some erroneously depicted) along with Federal troop locations. The map had no scale and showed no woods, hills, or other terrain features. Yet when the advance elements of Major General Don Carlos Buell's reinforcing army requested a map of the area for their commander, Sherman's

map, the best available, was provided to them.[31]

In June 1862 after capturing Corinth, Mississippi Union armies in the West dispersed to occupy the conquered territory. Captain Horace Fisher, an aide-de-camp on a division staff in Buell's army, had an engineering background which consisted of reading one book on general military engineering. The experience made him the most qualified staff officer in the corps to fulfill the corps commander's request for a topographical map of southern Tennessee.[32] The quality of these early maps in the West was low by Eastern army standards, but they sufficed.

Inadequate maps and the resulting land navigation problems directly affected the individual soldier. It was the infantryman who had no horse to carry him over the unnecessary miles. Like soldiers througout history, however, the Civil War veteran eased the experience with a joke as he forged another link in his chain of comradeship with his fellow soldiers. Captain James Sligh, commanding a company in Buell's army, remembered a move the brigade made one morning. After marching for over three miles, one of his men noticed a road that led directly from their camp less than half a mile away. "We have travelled so much out of the way lately, that the boys calls it going the Grand Rounds."[33]

Confederate General Baxton Bragg's invasion of Kentucky in the fall of 1862 proved embarrassing for Federal engineers. They possessed no precise map of the region between Covington and Newport, Kentucky, even though the area had been surveyed and mapped in June 1861. One copy of the map had been sent to General Buell's headquarters and the other to the Topographical Bureau in

Washington.[34] Heavy demands of the war aggravated map accounting procedures in the Bureau. Field commanders only increased this aggravation by discarding maps and sketches of an area in which they did not anticipate operating.

A major change in the fortunes of the topographical effort in the West occured when Major General William Rosecrans assumed command of the Army of the Cumberland in October 1862. He not only appreciated the limitations but also the strengths of the existing general maps.

> I instituted the plan of constructing 'information maps'. This consisted in making a skeleton map from the best map to be had of the country, and placing upon it the results of inquiries and the information obtained from scouts, spies, citizens and all other sources.[35]

The operation was not confined solely to army headquarters. Captain Nathaniel Michler, chief topographical engineer, created an organization which extended throughout the army. Since some subordinate commanders were already making piecemeal attempts on their own, Michler coordinated their efforts and at the same time prodded those commanders who were not. The limited number of assigned engineer officers was overcome by detailing an infantry officer to topographical work at all levels through brigade. Thus each subordinate unit had someone familiar with topographical operations and the terrain of its sector. A general order formalized the plan.

> The commanding officer of every corps, division, and brigade in this army will detail from his command a competent officer to act as topographical engineer. The officer so detailed will collect all the information accessible to him in relation to roads, fords, ferries, bridges, mountain passes, defiles, the general

> configuration of the country, its resources, and c., and prepare sketches of the same. The information thus collected will be promptly reported to Capt. N. Michler, chief topographical engineer, on duty at these headquarters.[36]

Captain Fisher became the topographical officer for his division in the Twentieth Corps and was provided a copy of Michler's skeleton map to begin his work. The map included only major rivers, roads, towns, and hills. All attempts to depict detail on the general maps, the major source of their inaccuracies, were removed when the skeleton map was compiled.[37] In December 1862, as the armies approached Stone's River and battle became imminent, Fisher concentrated on filling in the details for his sector on the skeleton map. To learn the location of lanes and trails in the area, he rounded up about a dozen farmers. Unlike his Eastern counterparts, however, he did not try in vain to reconcile contradictory stories, but rather separated the group and threatened to shoot the first one whose information did not agree with the others. Each was questioned individually and the information proved reliable.[32] For information on the more remote areas in his sector, Captain Fisher used a knowledgeable source, a Murfreesboro physician. This practice he had learned in the spring when moving with Buell's lead column to support Grant at Shiloh. The only known road to the Tennessee River was long and indirect, and Grant was already under attack. One of the staff officers in the column pointed out that if anyone in the area knew of shorter routes it would be a doctor by virtue of his job. The village doctor was located and able to guide them on a direct path large enough to accomodate only the infantry and

cavalry. The route cut hours off their journey and enabled them to arrive in time to support Grant's hard-pressed army during the critical first night of the battle. Fisher's Murfreesboro physician was also able to provide valuable information, which was partially confirmed by data in a sketch book Fisher compiled of areas he had passed through in the summer and fall. Satisfied as to the accuracy of his information, Captain Fisher drew a detailed map of the area and sent a traced copy to army headquarters for inclusion in its compilation of the subordinate units' maps.[39]

Despite Fisher's success, other soldiers in both the Eastern and Western theaters encountered one drawback in gaining topographical intelligence even when a friendly citizen was found. Of the Kentucky people he encountered, Major Sligh noted that there were "few that had ever been ten miles from home."[40] About the same time, a Wisconsin soldier in the Iron Brigade was making a similar observation about some Virginia inhabitants. "The most ignorant of any place i have been, they were born and raised here and have never been anywhere else, i have seen old men...that told me they were never ten miles from home in their lives...they have never heard of a state such as Wisconsin."[41] During 1862 commanders in both theaters used commercial maps in their operations, the most popular of which were those made by J.T. Lloyd Company of New York. The Virginia map, based on the original state survey, sold for a quarter, while the Kentucky and Tennessee maps cost fifty cents apiece. All three were available in a special linen-backed pocket edition for army officers for a dollar and a half. Lloyd advertised directly on his maps that they had been used by

Generals McClellan, Buell, and Halleck to plan their campaigns in early 1862.[41]

The scale of Lloyd's maps, one inch to eight miles (about 1:500,000), limited their usefulness considerably. They depicted no vegetation, and all population centers, except cities and county seats, were represented by the same symbol. They included only general outline of mountains and a few major bridges and fords. The Virginia map contained more detail than the other two.[43]

An indication of the accuracy of Lloyd's maps can be obtained by comparing them to the Corps of Engineer suveys of various counties conducted after the war. A brief examination of Rappahannock County, Virginia, discloses the following discrepancies of Lloyd's depiction of the county on his 1862 Virginia map.

(1) Flint Hill was actually due south, not forty-five degrees east of south of Sandy Hook.
(2) Poe's Old Road ran into the main road one mile south, not North, of Sandy Hook.
(3) Newby's Crossroads was less than half a mile west, not four miles southeast, of Battle Mountain.
(4) Battle Mountain was higher than Jawbone Mountain. Yet only one mountain showed on Lloyd's map, depicted between the actual locations of the two and labeled Jobber Mountain.

Towns were about the correct distances apart, but their relative directions were very poor.[44] Thus while the maps were better than nothing, they were more appropriate for following the campaigns from the homefront than for conducting them.

As 1862 drew to a close, a change in army doctrine addressed part of the problem in gathering topographical intelligence. The War Department revised the 1861 Army Regulations to include adding seven paragraphs to the section covering marches and movements. Whereas the original regulation included only formations and

technicalities of movements, the revision added requirements which made the unit commander responsible for maintaining a daily journal "to furnish data for maps, and information which may serve for future operations."[45] The added paragraphs outlined basic examples of map sketching and a list of topographical features with their corresponding symbols. Besides their intended purpose, the paragraphs served as a reference for map reading. The revision underscores the trouble Federal commanders were having in the area of topographical intelligence and their realization that a valuable untapped source was often their own units.

During this first full year of campaigning, organizational approaches to the topographical problem emerged along several lines. In the East, McClellan had centralized all topographical engineers on the army staff and employed them interchangeably with his other engineers. In December, Burnside made a preliminary attempt to extend the organization below army level. Rosecrans in the West had used his trained engineers as a nucleus. While there had been some overlap in responsiblilties among engineers, the topographer's domain was more clearly separated than in the East. As 1862 closed, steps had been taken to extend the organization to brigade level. Meanwhile, for Grant the organizational issue had little significance during the year. With only one engineer assigned to his army, Grant was forced to employ him on the top priority engineer task during each phase of a campaign. As is frequently the case in bureaucratic development, these initial approaches exerted strong influence on the direction of their respective organizations in subsequent years of the war.

1. Charles Scranton letter to Kearney, Feb. 4, 1862 in Haskell Papers.

2. OR Atlas, I, plates 7 and 27.

3. George B. McClellan, Report on the Organization and Campaigns of the Army of the Potomac, 157.

4. George B. McClellan, McClellan's Own Story, 253-255.

5. John G. Barnard, Report of the Defenses of Washington, 8.

6. Ibid., 6.

7. Gouverneur Warren letter, Apr. 18, 1862, in Gouverneur Kimble Warren, 65.

8. George B. McClellan to Stanton, May 8, 1862, OR, IX, pt.3, 151.

9. Andrew Humphreys' Peninsula campaign report, OR, XI, pt.1, 152-154.

10. 1861 Army Regulations, para. 1211.

11. AR of TB for 1846, AR of SW for 1846.

12. George B. McClellan, Report on the Organization, 65.

13. Prince of Joinville, The Army of the Potomac, 53.

14. Ibid., 60.

15. Ibid., 38.

16. Marguerite Merington (ed.), The Custer Story, 30-31.

17. Edward Boynton, History of West Point, 274.

18. Fitz Porter to McClellan, May 26, 1862, OR, XI, pt.1, 677.

19. John Newton's brigade report, OR, XI, pt.1, 623.

20. Douglas Southall Freeman, Lee's Lieutenants, I, 231-235.

21. Andrew Humphreys' report, OR, XI, pt.1, 152-154.

22. John Pope to Rufus King, Aug. 4, 1862, OR, XII, Pt.3, 532.

23. D.C. Houston to Corps Chief of Staff, Jul. 28, 1862, OR, XII, pt.3, 516-518.

24. Daniel Leasure, "Personal Observations and Experiences in the Pope Campaign in Virginia", Glimpses of the Nation's Struggle, 149.

25. Ibid, 161.

26. Erwin Sumner's report of Antietam campaign, OR, XIX, pt.1, 27[illegible].

27. John C. Gray letter to wife, Nov. 5, 1862, in War Letters, 18.

28. John Parke (Army Chief of Staff) to William Franklin, Jan. 20, 1863, OR, XXI, 79.

29. U.S. Grant, Memoirs, 150-151.

30. Ibid., 171.

31. Don Carlos Buell, "Shiloh Reviewed", Battles and Leaders, I, 487-539.

32. Horace Fisher, A Staff Officer's Story, 25.

33. James Sligh's letter to his wife, May 17, 1862, Sligh Papers.

34. J.H. Simpson's report of Kentucky campaign, Nov. 27, 1862, OR, XVI, pt.2, 664.

35. William Rosecrans' Testimony, Report of the Joint Committee on the Conduct of the War, III, 17.

36. General Order No. 29, Department of the Cumberland, Dec. 2, 1862, OR, XX, pt.2, 115.

37. Fisher, op. cit., 116.

38. Ibid., 51.

39. Ibid., 10-12, 53-55.

40. John Sligh, diary entry for Jan. 14, 1862. Sligh Papers.

41. Henry Young's letter to wife, Jan. 23, 1862 in Alan Nolan, Iron Brigade, 47.

42. Lloyd's 1862 maps of Kentucky, Tennessee, and Virginia.

43. Ibid.

44. Lloyd's 1862 map of Virginia; Rappahannock County map published 1875, Office of the Chief of Engineers.

45. 1861 Army Regulations, para. 668-698; 1861 Army Regulations, Revised 1862, para. 708-714.

CHAPTER 5

"I ALONE WAS TO HAVE CONTROL OF THE CORPS, DIVISION, AND BRIGADE TOPOGRAPHICAL ENGINEERS, AND NO INTERFERENCE WAS TO BE PERMITTED BETWEEN ME AND ANY SUBORDINATE OF MINE."

---CAPTAIN WILLIAM MERRILL
CHIEF TOPOGRAPHICAL ENGINEER
ARMY OF THE CUMBERLAND, 1863

While 1862 ended with a doctrinal change which addressed one serious topographical deficiency, 1863 began with an act which entrenched another aspect of the problem. Prompted by a petition of engineer officers supported by senior officers, Congress formally merged the Topographical Corps with the Corps of Engineers. The primary rationale was the scarcity of military engineers and the resulting need to employ engineers of both corps in overlapping duties.[1] Supporters believed that commanders like McClellan had clearly demonstrated the superiority of such organization on the true test ground, the 1862 battlefield.

The outset of the 1863 campaign season found the Army of the Potomac with a new commander, Major General Joseph Hooker, and another chief topographical engineer, Brigadier General Gouverneur Warren. Warren had been highly critical of Burnside's staff during the preceding campaign. "The army has become greatly disorganized in its staff appointments, especially in the Engineering, which is at its lowest ebb."[2] With his staff and construction elements from the engineer brigade, Warren went to work repairing roads and compiling a map for the spring campaign.[3] In conjunction with the

latter, he drafted a general order.

> To secure reliability, efficiency, and unity of action in the performance of topographical duty, and to prevent unnecessary repetition of labor by different parties, all officers or enlisted men voluntarily on this duty, or assigned to it at corps, division, or brigade headquarters, will report in person to Brig. Gen. G.K. Warren, chief topographical engineer, at this headquarters. It is not the intention to detach them from their present commands, but to ascertain the extent of their information and means of reconnoitering, and to supply their necessary requirements.[4]

Superficially this order appears similar to Rosecrans' order; however, its intent and implementation was quite different. With no requirement for subordinate commanders to detail officers to topographical duty, even some corps staffs did not include an engineer officer.[5] The order was not an attempt to expand Burnside's initial topographical structure throughout the army. On the contrary, Warren was proud of the fact that he had completely disbanded the system.[6] Thus, the order was basically a one-shot attempt to consolidate the topographical information scattered throughout the army. Warren, like Humphreys on the Peninsula, focused the topographical effort exclusively at army staff level. His approach came through bluntly by emphasizing that while subordinate commands must send all their maps and books to him for the consolidation, his information would be provided to them "only for military purposes and on proper application."[7]

Warren's map was based on earlier campaign maps and had the same major deficiency as the other attempts. Information about the land south of the Rappahannock River, behind enemy lines and where the fighting would take place, was sparse and came primarily from the unreliable "indirect sources" like Negroes, deserters,

prisoners, and captured maps. In addition, searches continued throughout the North for persons familiar with areas of the South. Mr. A. Wornall, a citizen of Baltimore, remarked in a letter to a friend, "Genl. Hooker has found out that I know something of the country between Richmond and Falmouth. I lived there for six years and used to be good at topography."[8] At the Engineer Bureau, Wornall attempted to verify the general accuracy of portions of the campaign map south of Fredericksburg.

The campaign started well for the Federals, but after surprising General Robert E. Lee with a quick river crossing, Hooker balked and shifted to the defensive. The extensive woods and rough terrain south of the Rappahannock River made orientation on the ground especially difficult. The commanding general recalled Warren, who was supervising the construction of a bridge, to army headquarters. Hooker needed immediate help selecting a defensive position which he had assessed from his maps as being formidable. After consultation with Hooker, Warren spent the next five days directing the placement of corps, divisions, brigades, and artillery batteries. In addition, he supervised road repair and pontoon bridge construction. His staff assisted him in this work and was frequently called upon to serve as guides while at the same time attempting to improve and correct their maps.[9]

Following Hooker's defeat, the maps were updated to incorporate additional information which would improve their accuracy and value in future campaigns. As Warren explained, however, the maps served another valuable purpose.

> No pains have been spared to make the forest

> topography on this map as complete as possible. It will be of great assistance in future operations, and it will aid those seeking to understand why the numerous bloody battles fought between the armies of the Union and of the Secessionists should have been so indecisive... A proper understanding of the country, too, will help relieve the Americans from the charge so frequently made...of want of generalship.[10]

Criticism from officers of the prestigious European armies, public opinion, and the activities of the Committee on the Conduct of the War appear to have driven the topographical effort as much as the needs of future operations. With terrain as a primary rationale for defeat, priority went to supporting the case in the map work which accompanied the official report of the battle.

When General Lee invaded the North in June, it soon became apparent that fighting on friendly soil did not enhance the Federal topographical effort. Warren, now chief engineer of the Army of the Potomac, was ordered to submit a report evaluating the routes north through Virginia to Maryland and Pennsylvania. While Warren's report contained some technical evaluations of the roads and fords, he cautioned that it not only lacked detail, but might also have significant errors and omissions. As usual, Warren had a logical explanation. The report had been compiled entirely from memory by five officers, a stopgap measure necessitated by the fact that "the records of the engineers have all been carried off by my predecessors."[11] Lack of transition between incoming and outgoing engineer staff officers in the East continued to be a serious deficiency. Warren's excuse, however, was considerably weakened by his having been responsible for topographical operations for over four months. His inability to perceive the problem earlier

and take some measures to rectify it indicates his preoccupation with past and immediate operations, without attempting to anticipate future topographical needs.

When the campaign carried into Pennsylvania, the situation worsened.

> Ten days before the Battle of Gettysburg it was discovered that there was at general headquarters no adequate detailed map of Pennsylvania. Colonel Roebling (an assistant to Warren on the army staff) remembered that his father possessed such a map. He was immediately ordered to go to Trenton and bring back the map.[12]

Roebling's father had been a surveyor employed by the state of Pennsylvania before moving to New Jersey.[13]

Lack of adequate information at army level precluded assistance and guidance to subordinate commanders. Major General Winfield S. Hancock, commander of Second Corps, reported that after a march of thirty miles his corps halted short of a destination he should have passed. "Frizellburg was not reached, owing to its being considerably farther from Monocacy Junction than indicated by the maps."[14] Brigadier General Alpheus Williams, a division commander in Twelfth Corps, complained that despite being in the North, "I literally knew nothing of the topography or geography of the country."[15] Other division commanders, like Brigadier General James Wadsworth in First Corps, made attempts to fill the information void.

> At Wadsworth's request, Lieutenant Colonel Kress set out to discover, if possible, a map in some friendly farm-house, for the unexpected course of the campaign into Pennsylvania had found the Army of the Potomac but meagerly supplied with topographical information.[16]

Fortunately, the Union army was operating in an area where

help was available from friendly inhabitants. Lack of maps, though, was a serious handicap as the dispersed corps maneuvered over greater distances than in the past. Confederate action compounded the shortcomings of the Union topographical effort. Southern troops in advance of the main army captured most of the maps of Franklin, Adams, and Cumberland counties from the walls of personal homes and record offices of the towns. Major General Darius Couch, who was frantically organizing the state's home defense forces, found only one map of the southern regions of the state, while the governor found none. Besides stripping the maps as their units moved through, Confederates got advance information by sending men posing as map peddlers just prior to the campaign who procured county maps by buying or trading for them.[17]

Lee's defeat at Gettysburg and subsequent retreat to Virginia again caught the Federal army short of appropriate maps. Fortunately, the army was near Washington and Warren wired Major Isreal Woodruff at the Engineer Bureau to forward "all the maps you can spare of the Shenandoah Valley and the routes east of the mountains to Gordonsville."[18] As Williams marched his division south after the retreating Confederates with the aid of a Lloyd's map, his letter home correctly assessed its value. "If you have a Lloyd's official map you can follow our lines of march pretty accurately though the roads and relative positions of the villages are by no means correctly laid down."[19]

Army headquarters needed information to plan its crossing of the Potomac and Warren coordinated the reconnaissances. Lieutenant

Ranald S. MacKenzie's report to Warren during Lee's retreat highlights an often overlooked aspect of topographical information.

> The river has fallen here (Sandy Hook, Maryland) 18 inches in the last twenty-four hours, and is still falling. A citizen states that he is acquainted with the river here, and that he judges from its appearance at this place that the fords near Shepherdstown and Williamsport are now practicable for infantry.[20]

Since much information was time and weather dependent, some topographical resources had to be used to verify the current validity of the changeable features.

In early 1863 in the West, Grant with one army tried to take Vicksburg, while Rosecrans with another maneuvered against Bragg between Nashville and Chattanooga. After a year of campaigning, Grant's army finally received topographical support when Captain James Wilson transferred from the East and became his chief topographical engineer. Wilson wanted to begin organizing his staff at headquarters, but Grant sent him to subordinate units to serve as a cavalry officer. This action prompted Wilson's assessment of Grant as a commander who lacked appreciation for technical details as well as organizational skill. When Wilson finally returned to headquarters and began his engineer function he was appalled to find nothing had been done in the topographical area. Starting from scratch, he gathered a staff and began ordering equipment.[21]

When overland attemps to take Vicksburg failed, Grant tried to bypass the fortress by digging a canal, a project which occupied Wilson for weeks. Following several other unsuccessful attempts

to get at Vicksburg from the north or bypass it to the west, Grant decided to cross the river south of the city, march to Jackson, and attack Vicksburg from the east. The general order to the Fifteenth Corps outlining the bold plan specifically addressed the distribution of topographical intelligence. "Each division commander will be provided with a correct map by Captain Pitzman (corps engineer officer) from which brigade commanders should make sketches."[22] Grant had little knowledge of the terrain south and east of Vicksburg and only four engineer officers with his army. Instead of consolidating these at army headquarters, however, he distributed them to the corps staffs.[23] Some division commanders were aided by the assignment of an additional aide-de-camp who had some engineer experience.[24]

The employment of Lieutenant Francis Tunica, engineer officer in the Thirteenth Corps, was typical of the use of engineers during the campaign. Since his corps led the initial advance, Tunica, using his general map as a guide, moved with the corps' advance element most of the time. He made sketches of the route which he reproduced himself by hand at night, sending copies in the form of a rough reconnaissance map to corps and army headquarters. When Grant needed more detailed information, Tunica personally returned to confer with him and provide the supplemental data. Following engagements, Tunica made sketches of troop positions for inclusion later in detailed drawings of the battlefields.[25]

The keys to Grant's plan were speed and surprise, retaining the initiative to rapidly attack the separated Confederate forces

before they coordinated their efforts. He recognized the limitations of possessing only a general knowledge of the topography. Rather than allowing the lack of detailed information to slow him, however, Grant chose a method of land navigation which depended only on major map features.

> The troops were moved one (sometimes two) corps at a time to reach designated points out parallel to the railroad and only six to ten miles from it...The cavalry was used in this advance in reconnoitering to find the roads, to cover our advances, and to find the most practicable routes from one command to another so they could support each other in case of attack.[26]

With the commencement of siege operations, all the engineers concentrated on constructing defensive works. Precise surveys of the enemy's fortifications and approaches to them were made by a three-man party from the coast survey which had joined the army.[27] As the siege drew to a close, Major General Sherman was alerted that his corps might have to march a few miles east to disperse an enemy relief force. Immediately he sent messages to the other commanders asking if they still had their maps of the area west of the Big Black River. Though the area was less than ten miles from his present location at Vicksburg, he embarrassingly admitted "I sent my old ones off, supposing we were done with them."[28] In the West as in the East, an army's immediate map supply concentrated exclusively on the area presently occupied. Unexpected movements resulted in a lack of appropriate maps; a problem aggravated by commanders who were quick to unburden themselves of maps they did not feel they needed.

In Tennessee, Rosecrans and the Army of the Cumberland, the other major Federal army in the West, were inactive for a long

period after Stone's River. In late May 1863, Captain William Merrill became the chief topographical engineer in the army. In contrast to Eastern experience, the orders assigning Merrill specifically directed that he take over all maps, books, and papers from his predecessor. During his preliminary assessment of the situation, Merrill noted that the initial steps toward a systematic topographical approach which Rosecrans and Michler had taken the previous year had been allowed to deteriorate during the inaction of the spring. Input from subordinate commands dwindled as commanders assigned their designated topographical officers other primary duties. Furthermore, topographical engineers began to be assigned other engineer tasks. These observations prompted Captain Merrill to discuss the matter with the commanding general and chief of staff, and demand one prerequisite for his services as chief topographical officer: "I alone was to have control of the corps, division, and brigade topographical engineers, and no interference was to be permitted between me and any subordinate of mine."[29]

Upon Rosecrans' agreement, Merrill drafted a general order to strengthen the positive start of the previous year and rectify the problem areas. Merrill's order clearly established a topographical system and delineated policies and procedures. While acknowledging that he was under Brigadier General James Morton, the army's chief engineer, Merrill asserted his exclusive control over the topographical effort. Every Monday, brigade topographical officers submitted all maps, reconnaissances, and other related information to division officers. On Tuesday, division information

was consolidated and sent to the corps topographical officers in preparation for their Wednesday meeting with Merrill. In addition to the information, the corps officers submitted a weekly list which included the names and positions of the topographical engineers and assistants, as well as all instruments on hand. Merrill systematically assigned field surveys to the corps which then assigned them to subordinate units. This procedure covered unknown areas and helped eliminate redundant work. The order also emphasized that no extraneous duties would be assigned by commanders to topographical officers. When the officers had no specific assignment from higher headquarters, the commanders employed them improving the detail on maps of the unit's immediate locality. To overcome another noted shortcoming, Merrill established standardized scales which were included on all maps and sketches. Areas less than two miles square would be mapped with a six inches to one mile scale (1:11,000); two to four miles square with four inches to the mile (1:16,000); four to eight miles square with two inches to the mile (1:32,000) and over eight square miles with one inch to the mile(1:63,000). Maps of large areas of the theater were small-scale, usually one inch to four miles (1:252,000). Merrill also procured instruments for subordinate officers and trained those who needed instruction.[30]

Three major differences distinguished Merrill's system from the Eastern trends. Unlike his Eastern counterparts, Merrill was not reluctant to require subordinate commanders to designate a topographical officer for their units. Nor did he fear infringing on commanders by assigning work to their officers; on

the contrary, he insisted on it. Rosecrans by supporting Merrill reinforced his earlier belief that an effective topographical structure must extend to subordinate units , even if it meant diverting infantry officers from other tasks.

The second difference was the strong emphasis on specialization. Interestingly, Merrill was an officer in the Corps of Engineer, not the Corps of Topographical Engineers, and had served on McClellan's staff during the Peninsula campaign. Due to a shortage of regular-army engineer officers, he had been assigned as the chief topographical engineer when transferred West. This initial disregard for the officer's engineer corps, however, was where the similarity with Eastern armies ended. Merrill rejected his Peninsula experience as a model for engineer organization and insisted that once the functional assignment had been made within the Army of the Cumberland, the engineer concentrated exclusively on his field of responsibility.

The third major difference between Merrill's system and the Eastern effort was the two-way flow of information. When the corps-level information was consolidated and the details filled in on the skeleton maps, commanders through brigade level received a copy of the updated map. Army-level topographers did not exist merely to keep the army commander informed while subordinate commanders fended for themselves.

How did the system function in practice during the Tullahoma and Chickamauga campaigns? Merrill issued his initial skeleton maps, printing question marks on the maps where he wanted priority effort. Colonel O. LaGrange and his First Wisconsin Cavalry made

one of the preliminary reconnaissances. Lines of responsibility were clearly evident in the product of the mission as LaGrange confined his comments to intelligence on enemy activity while Lieutenant William Greenwood, the corps topographical officer, submitted a separate report focusing exclusively on roads and terrain.[31]

After successfully maneuvering Bragg out of his strong positions north of Tullahoma, Rosecrans consolidated his army at Manchester. Immediately his chief of staff contacted corps commanders.

> As soon as practicable, corps engineers will report to these headquarters, with sketches of the ground occupied, and the relative positions of the troops. They will bring their maps for the latest corrections. Division and brigade engineers will report to corps engineers, with their maps for correction, and will furnish all the information they have obtained.[32]

Rosecrans strongly praised Merrill for his contribution to the Tullahoma success. He wrote that it was Merrill's "successful collection and embodiment of topographical information" and rapid distribution to subordinate commands which "contributed very greatly to the ease and success of our movements over a country of difficult and hitherto unknown topography."[33]

The successful system continued as Rosecrans pressed forward and without a battle maneuvered Bragg out of Chattanooga and his strong defensive line behind the Tennessee River. As the Federal army spread out along the river to deceive Bragg as to the actual point of crossing, detailed sketches flowed into army headquarters. Typical was the sketch of Harrison's Landing by Lieutenant George R. Crow, a brigade topographical officer in the Twenty First Corps, showing the terrain occupied by his unit as well as the enemy across

the river. The map depicted woods, roads, streams, hill masses with approximate heights, and concealment like cornfields. In addition, Crow included comments on bank conditions, and whether the soil in certain sectors could support artillery.[34] Advance divisions addressed their topographical information directly to Merrill. There was no doubt among subordinate commanders who was in charge of the collection and dissemination of topographical data as messages and reports even referred to "Merrill's maps".[35]

While Merrill's system was effective it did not mean that the topography of the region was always known. Point units, especially in the remote mountain regions, sometimes moved blindly. With the army advancing on a front over one hundred miles wide with corps abreast, some smaller units occassionally groped along isolated trails.[36]

In battle, commanders took advantage of their topographical engineer organization to keep them informed of the terrain and the enemy. Division commanders like Major General Richard Negley of the Fourteenth Corps, consolidated the brigade engineers at division headquarters on the eve of battle. He made one engineer responsible for the topography of the division rear; another for the local topography; and two on the battleline for the topography of the battlefield and the position of the friendly and enemy lines. Meanwhile, the division topographical officer was placed in charge of the ammunition and ambulance trains with instructions to insure their safety and immediate availability to the division by the most direct route. All five engineers reported to Negley every half hour, in person if possible, with update reports.[37]

In battle, accurate maps assisted officers and the army's signal stations in interpreting what was happening elsewhere on the field. Throughout the day at Chickamauga, General Morton monitored the intensity of firing and clouds of dust. With his prismatic compass and map he accurately estimated friendly and enemy movements to include which roads the columns were using.[38]

After the defeat at Chickamauga and retreat to Chattanooga, Chief Engineer Morton began ordering topographical engineers to construct emergency fortifications. His action brought an immediate response from Merrill. "I would respectfully request from department headquarters a letter of advice defining the exact relations which exist between General Morton, chief engineer of this department and myself, the chief topographical engineer."[39] Merrill argued that the recent merger of the two engineer corps by Congress had prompted a clash of mutual authority. He acknowledged the current emergency, as well as his subordination to Morton, but emphasized that Morton's recent directives to topographical officers interfered with map operations. If he required help, Morton should make his request to Merrill who could then determine the specific assignments of his officers so as to minimize the disruptive effects to the topographical effort.[40] The chief of staff issued a directive supporting Merrill.[41]

In the East in 1863, continued indiscriminate employment of all military engineers did little to advance the topographical effort. In the Army of the Cumberland, Merrill maintained an effective organization by fighting to uphold a clear separation between topographical and other engineer functions. The under-

mining impact of the merger of the two engineer corps by Congress was successfully opposed. Separate branch designations could be abolished so long as the functional distinction and organization within Rosecrans' army remained. Meanwhile, Grant decentralized his engineers and used them interchangeably, but in a coordinated manner. During the maneuver phases of his campaign they focused on topographical intelligence; during the siege on construction of fieldworks. His orders to subordinate commanders directing their routes of march inherently identified geographical areas and topographical priorities. At the outset of the siege, the arrival of the coastal survey team, specialists in mapwork, enabled Grant to focus his engineers on field fortifications.

1. Henry Jewett, "History of the Corps of Engineers to 1915," Military Engineer (Aug, 1946), 340.
2. Gouverneur Warren quoted in Taylor, Gouverneur Kemble Warren, 97.
3. Gouverneur Warren's report, OR, XXV, pt.1, 194.
4. General Order No. 12, Feb. 19, 1863, Army of the Potomac, ibid., 89.
5. Francis Walker, History of the Second Army Corps, 315, 406.
6. Gouverneur Warren's report, OR, XXV, pt.1, 194.
7. General Order No. 12.
8. A. Wornall's letter to Dr. Robert Montgomery in Ari Hoogenboom, "Spy and Topo Duty Has Been...Neglected", Civil War History (Dec. 1964), 368.
9. Daniel Butterfield, Army Chief of Staff, to Warren, Apr. 30, 1863, OR, pt.2, 305; Howard's report, 629, Slocum's report, 673, and Warren's report, 204, OR, XXV, pt.1.
10. Gouverneur Warren's report, ibid, 193.
11. Gouverneur Warren to Butterfield, June 16, 1863, OR, XXVII,

pt.3, 148-149.

12. Hamilton Schuyler, The Roeblings, 191.

13. Ibid., 42-71.

14. Winfield S. Hancock's report, OR, XXVII, pt.1, 367.

15. Milo Quaife (ed.), The Civil War Letters of General Alpheus S. Williams, 225.

16. Henry Pearson, James S. Wadsworth, 202.

17. Richard Stephenson, op.cit., 19.

18. Gouveneur Warren to Woodruff, July 14, 1863, OR, XXVII, pt.3, 691.

19. Quaife (ed.), op.cit., 142.

20. R.S. Mackenzie to Warren, July 12, 1863, OR, XXVII, pt.3, 669.

21. James Wilson, Under the Old Flag. I, 139.

22. General Order No. 26, 15th Army Corps, Apr. 25, 1863, OR, XXIV, pt.3, 233.

23. U.S. Grant, Memoirs, 280.

24. Engineer reports of the Army of the Tennessee, OR, XXIV, pt. 2, 177-208.

25. Francis Tunica's report, ibid., 186-189.

26. U.S. Grant, Memoirs, 261.

27. Frederick Prime to Lauman, June 8, 1863, OR, XXIV, pt.3, 391.

28. William Sherman to Ostehaus, July 4, 1863, ibid., 475.

29. Special Field Order No. 146, May 28, 1863 quoted by Merrill, OR, XXX, pt.3, 912.

30. General Order No. 124, Department of the Cumberland, May 31, 1863, OR, XXIII, pt.2, 376-377; William Merrill to Garfield, Sept. 28, 1863, OR, XXX, pt.3, 912.

31. O. LaGrange's report, July 4, 1863, OR, XXIII, pt.1, 549; OR Atlas, plates 34 and 35.

32. James Garfield to corps commanders, July 1, 1863, OR, XXIII, pt.2, 494.

33. William Rosecrans' report, OR, XXIII, pt.1, 409.

34. Report and sketch from 2d Division HQ to 21st Corps HQ, Aug. 22, 1863, OR, XXX, pt.3, 121.

35. Daniel McCook to Garfield, Sept. 5, 1863, ibid., 368; Negley to Thomas, Sept. 2, 1863, ibid., 300.

36. James Connolly's letter of Aug. 18, 1863 to wife in Angle (ed.), Three Years in the Army of the Cumberland, 114.

37. J.R. Hayden's Chickamauga campaign report, OR, vol. XXX, pt.1, 344; Ingraham's testimony at Gen. Negley's Court of Inquiry. ibid., 1035.

38. James Morton's testimony, ibid., 950; two signal reports, Sept. 28, 1863, ibid., 912-913.

39. William Merrill to Garfield, Sept. 28, 1863, ibid., 912-913.

40. Ibid.

41. James Garfield to Merrill, Sept. 30, 1863, ibid., 948.

CHAPTER 6

"THERE WAS NO MATERIAL WHATEVER WHEREWITH TO MAKE A MAP ON A SCALE SO LARGE AS ONE INCH TO A MILE."

---COLONEL THEODORE LYMAN
STAFF OFFICER
ARMY OF THE POTOMAC, 1864

The events of the year 1864 conclusively decided the outcome of the war. Grant, now the commander of all Union armies, moved East and accompanied Major General George G. Meade and his Army of the Potomac. Colonel Michler, who had planted the initial topographical seeds for Rosecrans in 1862, became the final topographical chief in the Eastern army. His predecessors had successfully used the position as a stepping stone to senior command with Humphreys and Warren reaching corps level. But Michler limited his ambition and remained in the topographical position for the remainder of the war.

Prior to the spring campaign, he prepared a twenty-nine sheet series of the area between Gettysburg and Petersburg using a scale of one inch to one mile (1:63,000). Each sheet covered 875 square miles and was divided into twenty-five square mile blocks for reference. Michler's staff prepared the sheets by hand and then sent them to the Topographical Bureau to be photographed and lithographed. The bureau printed about 1200

map sheets prior to the campaign as well as several small-scale maps which encompassed the entire theater of operations.[1]

Except for frequent use as guides, members of Michler's staff were able to concentrate on their topographical duties.[2] They worked with their counterparts on corps and division staff, some of which included topographical officers for the first time in the war.[3]

> Topographers are sent out as far as possible in the front and round the flanks. By taking the directions of different points, and by calculating distances by the pacing of their horses, and in other ways, they make little local maps, and these they bring in in the evening, and during the night they are compiled and thus a map of the meighborhood is made. If the next day is sunny, photographic copies are taken of this sketch and sent to the principle commanders, whose engineers add to, or correct it, if need be, and these corrections are put on a new sketch.[4]

Thus, the topographical organization and functions more closely resembled those of the Army of the Cumberland, Michler's former unit, than either the Eastern army of 1862 or Grant's former command, the Army of the Tennessee.

Grant opened the campaign by attacking Lee in the Wilderness, where a year earlier the army had fought the battle of Chancellorsville. As the battle raged, Colonel Theodore Lyman faced a cold realization, previous occupation of the terrain had not improved map results.

> In vain I try to correct myself by the engineer maps; they all disagree...the result has been almost ludicrous! Some places (e.g. Spotsylvania) are from one to two miles out of position, and the roads run everywhere <u>except</u> where laid down. I suppose the fact is that there was no material whatever wherewith to make a map on a scale so large as one inch to a mile.[5]

In addition to inaccuracies, commanders complained about the maps

themselves: "Coarsely executed, and printed in true congressional style on wretched spongy paper, which wore out after being carried a few days in the pocket."[6]

Michler soon recognized the inadequacies of his initial series.

> However well the only accessible maps might have served the purposes of general knowledge, still they furnish but little of that information so necessary in selecting the different routes of marching columns, and were too decidedly deficient in accuracy and detail to enable a general to maneuver with certainty.[7]

During May and June, he issued several complete editions of eleven sheets in the series.[8] A comparison of the revised editions with post-war surveys shows that major errors persisted. Todd's tavern was one mile too far north; the south bend of the Po River and Spottsylvania Court House were over two and a half miles too far west; and directional errors of thirty to forty-five degrees were not uncommon. "The effect of such a map was, of course, utterly to bewilder and discourage the officers who used it, and who spent precious time trying to understand the incomprehensible".[9] Grant's orders, based on the maps, frustrated subordinates trying to execute them. General Winfield S. Hancock, directed to position his corps at Harrison's Creek, later discovered why he could not find the stream. Contrary to the map, it was an "insignificant rivulet" located well behind enemy lines.[10]

Once the army commenced siege operations at Petersburg, engineers surveyed the area with precise instruments and prepared an accurate map edition.[11] Captured enemy maps further attested to the inadequacy of the pre-war county and state maps. While the Confederates had most of these in their possession, they based

their military maps on surveys conducted by Confederate engineers after the outset of hostilities.[12]

The Army of the Potomac finally had an effective topographical organization. Unfortunately, it came several years too late. Accurate maps of northeastern Virginia would benefit future historians, but they were of no use to the army by the summer of 1864.

In the West, Sherman had three armies under his command for the Atlanta campaign. Colonel Orlando Poe, Sherman's chief engineer from the Army of the Tennessee, recognized the superiority of the topographical organization in the Army of the Cumberland.

> In the Army of the Cumberland each corps, division, and nearly every brigade was provided with an officer detailed from among the commissioned officers of the infantry regiments, whose duty it was to make such surveys and reconnaissances as might be wanted. The other two armies were not so well provided, but had sufficient organization to do all that was requisite.[13]

Sherman clearly indorsed Poe's assessment of the Army of the Cumberland topographical superiority, even over his former command, the Army of the Tennessee. Whether he considered the topographical organizations of the other two armies "sufficient" is questionable in light of the directive to Merrill and his staff to provide campaign maps for all three armies. Merrill described his execution of the order in considerable detail.

> Two days before the army started from Chattanooga on the Atlanta campaign, I received notice of the intended march. Up to this moment there was but one copy of the large map of Northern Georgia and this was in the hands of the draughtsman. I kept back until the last moment so as to get on it the latest information that Sergeant Finnegan might

> be able to extract from the motley crew turned over to the Provost-Marshall General for examination. The map was immediately cut up into sixteen sections and divided among the draughtsmen, who were to work night and day until all sections had been traced on thin paper in autographic ink. As soon as four adjacent sections were finished they were transferred to one large stone, and two hundred copies were printed. When all the map had thus been lithographed the map mounters commenced their work. Being independent of sunlight the work was soon done---the map mounting requiring the greatest time; but before the commanding generals left Chattanooga each had received a bound copy of the map, and before we struck the enemy, every brigade, division, and corps commander in the three armies had a copy. The copies for the cavalry were printed directly in muslin, as such maps could be washed clean whenever soiled, and could not be injured by hard service. Many officers sent handkerchiefs to the office and had maps printed on them.[14]

As in earlier campaigns, Merrill made skeleton maps using the small one inch to four miles scale (1:256,000) since little was known about the country south of Chattanooga. Increasing the scale would have merely magnified the errors which existed on the general maps. Detailed sketches would be made by subordinate engineers as the armies advanced. The initial maps included railroads, towns, rivers, streams, roads, mountains, and ridges. Elevation, as on most Civil War maps, was depicted by hachures of different intensities. Details, especially of fords, were more numerous on sheets of the northern third of the area between Chattanooga and Atlanta, with almost no bridges or fords depicted on the southern half of the series.[15]

A difficult relationship to establish is that between Merrill 's maps and Sherman's success in the Atlanta campaign. The campaign, like Rosecrans' in 1863, was characterized by successful strategic maneuvers. While one of Sherman's armies advanced directly

toward Joseph Johnston's Confederate army, another conducted a flanking maneuver which threatened the Confederate line of communication and forced a withdrawal. Such a campaign optimized the use of small-scale maps. Exactly how responsible Merrill's maps were for preventing the campaign from deteriorating into a series of direct confrontations is impossible to judge. But Sherman's campaign strategy and Merrill's maps were perfect complements to each other.

In topographical operations the three individual armies perpetuated their earlier practices. The Army of the Tennessee, formerly Grant's army, allocated its engineers to its corps and divisions. Little topographical work had been accomplished by this army prior to its arrival at Big Shanty, one hundred miles south of Chattanooga and only twenty miles from Atlanta. The army provided the topographical information needed to supplement Merrill's maps in a hand-to-mouth operation by permanently assigning a company of mounted infantry to duty with Chief Engineer C.B. Reese. Reese rode with the advance element to familiarize himself with the roads and topography, then guided the staff officers of the corps who directed subordinate unit commanders.[16] Only after Sherman crossed Peach Tree Creek and began to approach the Confederate works around Atlanta itself were divisions in the Army of the Tennessee required to submit daily sketches of their positions.[17]

The Army of the Cumberland continued to rely on maps. These were rapidly distributed from its army staff and adeptly supplemented by officers on lower staffs charged with topographical responsibility.

During the campaign, maps were "sent to division commanders to indicate routes of march."[18] Major James Connolly, an infantry officer serving on a division staff in the Army of the Cumberland, outlined his duties as the topographical officer. "I am expected to find out all about the roads we travel on and cross roads we pass---where they run to---in which direction they run---whether they are good or bad---what stream they cross---something about the feelings of the citizens who live on our line of march."[19]

General John Schofield, commander of the smaller and less experienced Army of the Ohio with its limited engineer assets, informed Sherman of his need for topographical assistance. Sherman suggested to General George Thomas, commander of the Army of the Cumberland, that he transfer some of his experienced topographical officers to Schofield. Thomas rejected the recommendation.[20] His army had built an effective topographical organization through sacrifice and hard work. Training and experience had been gained by removing officers from other functions and dedicating them to topographical work. Maintenance of the organization depended on the resistance of its army commanders and chief topographical engineer to pressures aimed at dismantling it. The Army of the Cumberland assisted the Army of the Ohio by providing it with maps, but not topographical officers.

As in earlier campaigns, the engineers played an important role in the placement of tactical units. Sherman regarded this function highly. "I am more than ordinarily indebted for keeping me supplied with maps and information of roads and topography,

as well as in the more important branch of duties in selecting lines and military positions."[21] The maps were the key to the campaign of maneuver from Chattanooga to Atlanta; the tactical positions the key to the battles around Atlanta.

1. Nathaniel Michler's report, OR, XXXVI, pt.1, 291-295.
2. Ibid.
3. Francis Walker, History of the Second Army Corps, 207, 315, 406.
4. George Agassiz (ed.), Meade's Headquarter's, 136-137.
5. Ibid.
6. Theodore Lyman, "Uselessness of Maps", Papers of the Military Historical Society of Massachusetts, 79-80.
7. Nathaniel Michler's report, OR, XXVI, pt.1, 291-295.
8. Ibid.
9. Lyman, op.cit., 79-80.
10. Walker, op.cit., 528.
11. Francis Miller (ed.), Photographic History, V, 234-238.
12. Nathaniel Michler's report, OR, XXVI, pt.1, 291-295.
13. Orlando Poe's report, OR, XXXVIII, pt. 1, 128.
14. Thomas Van Horne, History of the Army of the Cumberland, II, 457-458.
15. Three sheets of Northern Georgia map series, printed by Merrill, May 5, 1864.
16. R.C. Reese's report, OR, XXVIII, pt.3, 63-68.
17. General Order No. 10, Aug. 2, 1864, OR, XXXVIII, pt.5, 338-339.
18. Milo Quaife (ed.), The Civil War Letters of General Alpheus S. Williams, 339.
19. James Connolly's letter to wife, May 22, 1864 in Angle (ed.),

Three Years in the Army of the Cumberland, 213.

20. George Thomas to Sherman, Aug. 8, 1864, OR, XXXVIII, pt.5, 419.

21. William Sherman's Atlanta campaign report, Sept. 15, 1864, OR, XXXVIII, pt.1, 38.

CHAPTER 7

CONCLUSIONS

At the outset of the war detailed topographical information was almost nonexistent and the number of military engineers available to field armies was severely limited. In both categories, Federal commanders in the East enjoyed initial advantages relative to their Western counterparts.

The Eastern approach to the problem centralized topographical engineers at army level where they interchanged functions with other engineers. Assignments to construct bridges and fortifications or supervise volunteer engineer units frequently interrupted map work. This indiscriminate employment of engineers was consistent with both existing doctrine and the precedence of the Mexican War. Compounding these initial problems was the limited geographic size of the theater which placed a premiun on large-scale maps. Campaign maps were often little more than an enlargement of small-scale maps with no means to confirm the increased detail of the features. Numerous inaccuracies frustrated commanders trying to plan and direct operations based on the maps.

Concentration of topographical resources on the army staff left subordinate commanders to fend for themselves after receiving maps at the outset of the campaign season. To correct inaccuracies or compensate for the lack of maps, they made their

own sketches of unit sectors. The drawings benefited only the immediate unit as copies were seldom forwarded to the higher headquarters. Except for a brief period under Burnside in late 1862, the topographical organization in the East remained unstructured until 1864. Deficiencies of the piecemeal effort were further aggravated by the use of the position of chief topographical engineer as a stepping stone to high command. Turnovers occurred at the disruptive rate of one per month in the period July to November 1862 with problems compounded by a lack of coordination between incoming and outgoing chiefs. Michler's assignment to the position in early 1864 stabilized the situation and began the semblance of organization which extended through the army. Specialization among the engineers, however, did not significantly improve the quality of the large-scale maps until the regions were secured and formally surveyed using precise instruments.

Meanwhile in the West, two different approaches to topographical organization and employment developed. In the Army of the Tennessee, Grant attacked the problem by decentralizing most of his engineers to corps and division staffs, and using them interchangeably. His directives provided centralized control and functional priorities for the engineers. They generally moved with cavalry and advance elements, sketching a region about a day before the unit occupied it. When specific information was needed at army headquarters, the subordinate engineer updated the commanding general in person. Grant relied primarily on small-scale maps and based orders for movement on prominent map features, directing advances along rivers, railroads, or major roads.

Only the Army of the Cumberland developed an army-wide topographical system. Michler used his few topographical engineers as a nucleus for the infantry officers on corps, division, and brigade staffs designated as topographical officers. Merrill decisively capitalized on this start and formally established a topographical system after strengthening the organization to preclude interference by subordinate commanders and other engineers. Ironically, Merrill, who had been schooled under McClellan on the Peninsula, rejected the Eastern prescription for engineer employment. In the Army of the Cumberland, he designed a system which specifically addressed Eastern deficiencies. Two factors enhanced the impact of the system, a map requirement generally limited to small-scale maps and an appreciation for the strengths and weaknesses of existing maps. Merrill distributed small-scale skeleton maps, from which all attempt at detail had been removed. After subordinate engineers completed the details for their sectors, Merrill consolidated their results and rapidly disseminated the product army-wide. Updates were a continuous process. More than once he and the commanding general successfully resisted pressures to undermine the organization. The Tullahoma, Chickamauga, and Atlanta campaigns clearly demonstrated the efficiency and effectiveness of the system, the antithesis of the topographical chaos which characterized the army as it blindly stumbled north after Bragg in 1862. Even Sherman recognized the topographical superiority of the Army of the Cumberland relative to his former command, the Army of the Tennessee.

In the East and West topographical officers retained two

important battlefield functions throughout the war. Initially they assisted commanders in selecting positions, with some commanders granting them carte blanche in the placement of tactical units. All results were not as dramatic or citical as Warren's selection of Little Round Top at Gettysburg, but most topographical engineers exercised strong influence in terrain analysis and selection. The second battlefield function was the responsibility to record the positions of both armies on a map for the official report of the battle. The link between these two functions was stronger than the superficial connection of knowing where units fought during a battle because the engineer had positioned them earlier. Best expressed by a young Confederate engineer is the importance of the link to effective use of the terrain in future battles.

> Nothing cultivates the judgment of topography, in relation to the strategic strength of position, so well as to ride over the ground while the dead and wounded still remain as they fell. You see exactly where the best effects were produced and what arm of service produced them, for there lies the harvest they have reaped, each sheaf distinctly labeled with the name of the reaper in the wound received. Artillery tears its sheaves out by the roots and scatters the fragments while infantry mows them down in well heaped windrows.[1]

Geographic size of the theater, location of the capitals, commanders' strategies, and enemy commanders determined the degree of detail required on the maps. The Confederates in the West had a vast territory to protect with few river lines to assist the defense. Southern commanders frequently failed to maintain contact or actively contest Federal thrusts south. These factors combined to place a premium on strategic maneuver by the

from prevailing as the most effective in providing topographical intelligence. Why? In the opinion of this author, five major reasons explain the superiority.

First, the Eastern army was shackled by tradition and pre-war doctrine. In the Washington spotlight, intensified by prestigious foreign observors, commanders of the Army of the Potomac relied on "proven" approaches to their problems. Without analyzing how their specific situation (e.g. - size of the army) impacted on the basic assumptions of pre-war doctrine, they adopted the guidance without adjustment. Meanwhile in the West, the microscope of Washington and foreign critics was not as intense. Commanders perceived no pressure to maintain an army and staff consistent with established criteria. Constrained resources, to include qualified personnel, further prompted a readiness among Western commanders to innovate in order to meet their needs.

The second factor stemmed from the first. The officers and men of the Eastern army soon considered themselves the ideal model for all Federal armies. This belief entrenched the "we've never done it that way before" syndrome. An organization with a self-image approaching perfection was not receptive to change or outside assistance. Paralleling the European assessment of American armies, Eastern officers doubted that anything could be learned from the Western "mobs". To them, the success of Federal armies in the West hinged on one factor, they never fought Robert E. Lee or Stonewall Jackson. The attitude prevailed among staff officers. Merrill is a typical example. In the East, he complacently accepted McClellan's indiscriminate employment of engineers. Who was he to

challenge the prestigious system? When transfered West, his attitude changed dramatically. His first act upon joining the staff of the Army of the Cumberland was to confront the commanding general and lay down his own rules. His ideas rejected his Eastern experience and were driven by the pragmatic situation facing him in the West. The absence of an unchallengeable mystique within the Western army allowed him to advance his proposals and see them through to fruition.

The third reason for the Army of the Cumberland's superiority in topographical intelligence was a function of job satisfaction, personal ambition, and what the position of topographical chief represented in each army. In the East, the position became recognized as a key step for engineers enroute to high command of infantry units. The visibility was good but remaining in the position too long could be detrimental if the army commander was sacked before he distributed rewards for faithful service. As a result, no chief focused on establishing a long-term system. More important from a promotion standpoint was meeting the commander's demands for several months by the most expedient means. After that brief period, it was someone else's problem. On the other hand, in the Army of the Cumberland the position was considered an end in itself. Chief topographical engineers had a vested interest in policies which affected their operations. They fully expected to have to live with the results for many months. Hence they were motivated to take a long-term approach and develop a system to deal with redundant problems. In addition, the Army of the Cumberland was fortunate to be assigned several topographical

chiefs who were not only gifted, but also satisfied with the lower ranks associated with the staff positions of the "scientific services". The three inherent issues within this reason transcend the Civil War and remain prevalent today. How does one instill long-term approaches in a situation where the actors are aware that they will be gone before final results are realized? How does a personnel system identify qualified individuals who will remain highly motivated in a job despite the position's lack of promotion potential? Is there a way to adequately reward technical service in a narrow field so that an individual's personal interest in such service is not a career-retarding decision? Dual specialties and longer tours begin to address these issues, but represent only start points.

The fourth major reason was that Merrill founded his innovations on sound principles of "modern" management. Since his education and background were the same as his peers, his insights probably stemmed from his personal analysis of how to overcome noted problems. More important than the process was the fact that he recognized that problems existed. Without this admission solutions could not have been found because they would not have been sought. What was modern about his managerial approach? First, he realized the implications of the first American "mass" armies. Their magnitude when applied to the topographical problem precluded a reliance on "generalists" as McClellan had done. The problem required dedicated specialists from a technical as well as functional standpoint. Next he realized that the complexity of the problem negated a highly centralized solution. While

centralized direction and control were required, effective execution depended on decentralization. Only with specialists at lower levels could a large army overcome the problems of magnitude, complexity, and geographic dispersion. At the same time, such an approach provided sufficient flexibility to subordinate commanders, who unlike their Mexican War counterparts, had a valid need for their own topographical specialists. Merrill translated these insights into an organization by not allowing the apparent block to such an approach, limited resources, from stopping him. Taking a cadre approach, he used his few engineers as a nucleus to manage and train unskilled officers, thus extending the effective reach of his organization many fold. Contemporary lesson? As magnitude and complexity increase, resist the tempation to centralize resources. Rely on centralized coordination of specialists dispersed to grassroots level where they can identify and address the details of the problem. Furthermore, this can only be done with central "protection", insuring that the specialists are employed in their primary duty, not used for unrelated administrative functions.

The final reason for the Army of the Cumberland's superiority was Merrill's success in establishing a positive attitude of topographical teamwork throughout the army. Subordinate commanders realized the mutual benefits of close cooperation. Even when correcting map errors, the attitude reflected in their messages was positive, constructive criticism. On the other hand, the Army of the Potomac was plagued with the timeless problem of staff-line relations, the "we-they" syndrome. Subordinate commanders constantly complained about the poor maps produced by the army

topographers. Even worse than their devisive comments was the fact that they seldom accompanied them with the information necessary to correct the map errors about which they complained. It was the army staff's duty, not theirs, to compile and update maps. If operations failed because maps mislead the commanders, the army staff was to blame. Like many of the earlier reasons, the issue is pertinent today. When elements of an army understand the responsibilities of other components and firmly believe in the mutual benefit, combat effectiveness rises appreciably.

Merrill dared to throw the rock of innovation into the tranquil lake of tradition. The Army of the Cumberland forged its model topographical system in an era when the muzzle-loading Springfield rifle and the 12-pound Napoleon cannon dominated the battlefield. Today these weapons are museum pieces. However, the reasons behind Merrill's success and others failures transcend the Civil War, and are as pertinent today as nuclear weapons and modern tanks.

1. Cpt. W.W. Blackford as quoted in Freeman, op.cit., II, 442.

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