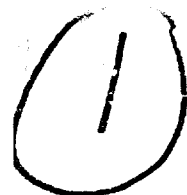
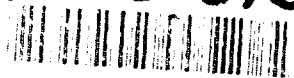


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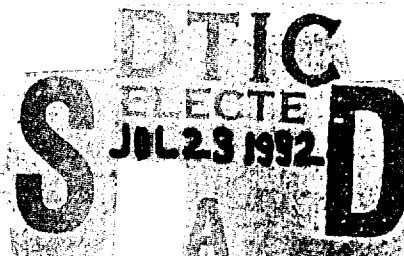


THE EFFECTS OF SOUTHERN RAILROADS ON INTERIOR LINES DURING
THE CIVIL WAR

A Thesis

BY

THOMAS GEORGE ZIEK JR.



Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of
MASTER OF ARTS

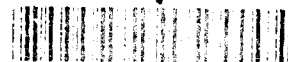
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ABSTRACT

**The Effects of Southern Railroads on Interior Lines During
the Civil War (May 1992)**

Thomas George Ziek Jr. B.S., U. S. Military Academy

Chair of Advisory Committee: Dr. Joseph Dawson III

The purpose of this paper is to study the effects of the Southern railroad system on interior lines during the Civil War and determine whether or not the South enjoyed the advantage of interior lines. The use of railroads during this conflict placed an enormous physical strain upon the limited industrial resources of the Confederacy, and a great strain upon the intellectual agility of the Confederate High Command. Based upon the evidence studied, and the time-space comparisons of both Northern and Southern railway operations, several conclusions can be drawn: the South entered the war with a rail system that was unable to meet the demands of modern war; the Confederate leadership understood the importance of the railroad and its importance to strategic operations early in the war, but were unwilling to adopt a course of action that best utilized their scarce assets; Southern railroad speeds decreased dramatically by 1863 due to the inability of Southern railroads owners to perform needed maintenance on their railroad equipment; tactical

reverses on the field of battle, especially the losses of both Corinth in May of 1862 and Knoxville in September of 1863 increased the distances that re-enforcements would have to travel to fight a mobile intra-theater war; Union control, maintenance, and organization of its railway assets ensured that it would be able to move large numbers of troops at the strategic level efficiently from early 1863 to the end of the war. Based on these conclusions, the Confederacy lost the ability to shift troops on the strategic level more rapidly than the Union by 1863. This was a result of its physically weakened railroad system and military setbacks which caused Southern railroads to move forces over longer distances.

ACKNOWLEDGEMENT

I would like to thank the members of my committee, Drs. Joseph Dawson, James Bradford, and William Harris for their kind support and timely criticisms throughout this project. I would also like to thank B.G. Frank Akers, and LTC's Raymond Drummond and Randy Glass. Without their moral support and faith in my abilities, this project might never have occurred.

Thomas G. Ziek Jr.

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CHAPTER I

INTRODUCTION

The idea of utilizing railroads in the defense of the United States was not a new concept that blossomed with the Civil War. As early as 1828, both military leaders and several politicians recognized the importance of rail transportation as a means of rapidly moving large bodies of troops to threatened areas on the eastern seaboard. For reasons of politics and money, these visionaries were thwarted in their efforts to build an integrated rail network that could be used for the defense of the nation. It was not until the Civil War that railroads came into their own as an important part of the national defense for America.¹

With few exceptions, historians view the American Civil War as the first modern conflict. Advances in technology, mass armies, command and control systems, and civil-military relations all lend credence to this conclusion. Without a doubt, the Civil War was the first war in which the railroad made a significant contribution to the outcome of the conflict. In Civil War historiography, both the participants in the conflict and the later historians have agreed that the railroads were a significant factor in the conduct of the war, with consensus occurring on the contention that Northern

The journal style used is Civil War History.

railroads were better built, managed, and supplied than their Southern counterparts. In addition, it is accepted that for a variety of reasons the Southern railroad system fell apart between 1861-1865, and was unable to help bring victory to the Confederacy.

These two facts appear to contradict another widely held belief concerning strategy and the definition of interior lines as espoused in the United States Army Manual 100-5: Operations. This belief is reflected in the contention that the South enjoyed the advantage of interior lines throughout most of the war; and that in order for the South to win the war, it had to make use of its interior lines in order to concentrate its inferior manpower numbers against the North at strategic points.

One of the earliest examples of this perception about the advantage attributed to the fact that the South enjoyed interior lines is expressed by Matthew Steele and his early influential work, American Campaigns. Steele states,

"If we consider the whole vast theater of war from the Potomac to the delta of the Mississippi, the Southern armies had the advantage of interior lines. Never before in any of the world's great wars would it have been possible to shift armies from one side to another of such a wide theater in time for sudden strategic combinations; but it was possible at this time by means of the railways within the Southern lines."²

This belief continues to be expressed throughout Civil War historiography. Noted historians of Southern railroads,

Robert Black and Angus Johnston, both maintain that the South enjoyed the advantage of interior lines until late 1864, even though they both do an excellent job of describing the disintegration of the Southern rail network. Both authors looked at the question from a purely geographical point of view but failed to take into account the effects that technology had on time-space relationships. This view of interior lines is still widely reflected in more recent scholarship as the accepted view. It is espoused by such noted historians as Edward Hagerman, George Turner, James McPherson, Shelby Foote, Steven Woodworth, T. Harry Williams, Richard Beringer, and Archer Jones.³ All of these historians give the advantage of interior lines to the South. Archer Jones went so far as to say that the South actually made excellent use of interior lines on a strategic level, with strategic concentration being achieved at both Shiloh and finally at Chickamauga. Jones faults Southern generalship as throwing away the advantage of interior lines in these instances of strategic concentration.⁴ Woodworth also points out that strategic concentration was the only strategy for the Southern cause that had a chance of succeeding. He blames the Southern political leadership for not implementing the strategy, specifically criticizing Jefferson Davis. T. Harry Williams, like Jones, believed that generalship was the major factor in explaining why the South lost the war; yet he came closest in recognizing technology as a factor affecting

interior lines when he criticized Confederate General Robert E. Lee in this manner: "He does not seem to appreciate the impact of railroads on warfare or to have realized that railroads made Jomini's principle of interior lines obsolete."⁵

Williams' statement, ignored by the rest of the historical community, both clears up and muddies the view of the importance of technology and its impact on the traditional view of interior lines. For the first time Williams posited that technology could overcome a physical disadvantage. Yet Williams' statement also begs several questions that he failed to address. Did the South ever have the advantage of interior lines? At what point in the war did the South lose the ability to move large bodies of soldiers between the eastern and the western theaters? Were there technological differences between the Northern and the Southern rail networks, and if so, what effects did the differences have upon the strategic movements of large bodies of troops?

These questions are important to historians who believe that the Confederacy had a chance to win the Civil War through the use of strategic concentration, or at least in prolonging the war until peace on Southern terms was attained. These questions require not only a strictly military and physical look at Southern railroads, but also a focus on the political and social fabric of the Confederacy

and raise doubts about its ability to use all available assets. In other words, in order to utilize its physical advantage of interior lines for strategic concentration, the South would have had to possess a rail system that would have allowed it to shift large bodies of troops faster than the North in order to achieve tactical numerical advantage at a decisive point. In addition, the South also needed to have the political and social strength to subordinate local and state concerns to the common national good, without compromising the laissez-faire business and state's rights political doctrines that were central to its way of life.

There is no denying that the South made excellent use of interior lines at the theater level in order to minimize its manpower disadvantage. Numerous examples of this can be found in the Eastern theater, specifically in the First Manassas campaign and in the Seven Days campaign in which forces were moved from western Virginia and the eastern seaboard to re-enforce what was to become the Army of Northern Virginia. Prior to the battle of Shiloh, Confederate General Albert S. Johnston based his strategy for the western theater on the use of the rail line running from Memphis to Louisville to rapidly concentrate his forces that were garrisoning strategic points in Kentucky and Tennessee. However, because of a strategic plan that emphasized both cordon defense and theater self-sufficiency, the South was unable to capitalize on its tactical understanding of the use

of railroads for concentration and failed to broaden that conceptual understanding to the strategic level.

Robert Black maintains that the South lost its advantage of interior lines by December 1864.⁶ It is the contention of this author that at the outset of the war, the South did in fact enjoy the advantage of interior lines and utilized its advantage to achieve strategic concentration in the eastern theater to fight the battle of First Manassas. This was accomplished in spite of local jealousies and a rail system that exhibited flaws in transporting large bodies of troops and supplies effectively. In addition, the South also made excellent use of interior lines in order to concentrate troops from as far away as New Orleans and Florida under Albert Sidney Johnston to fight the battle of Shiloh, although the Southern rail network almost failed this test of moving troops to the threatened western sector. With the fall of Corinth on 30 May 1862 the South lost its advantage of interior lines and the ability to rapidly shift troops from the states of Louisiana, Arkansas, Texas, and Mississippi to other regions.

Although Braxton Bragg's successful movement of forces for his 1862 Kentucky Campaign was an inter-theater movement, it points to the severe difficulties that the loss of Corinth created for the Confederate high command. Instead of moving from Corinth, Mississippi, to Chattanooga, Tennessee, a distance of some 280 miles, Bragg had to move from Tupelo,

Mississippi, through Mobile, Alabama, through Montgomery, Alabama, through Atlanta, Georgia, to Chattanooga, Tennessee. This represented a total distance of almost 700 miles. Not only was the distance greater but there were four gauge changes and one steamboat connection that had to be coordinated in order to complete the movement.⁷

The South's loss of the rail line running through eastern Tennessee and western Virginia in mid 1863, coupled with the physical deterioration of the rail network and a lack of centralized planning led to the loss of strategic interior lines as an advantage for the Confederacy for the rest of the war. In order to account for the South's loss of the advantage of interior lines, one must examine the Southern rail network, the technology of these times, and the Northern rail network. Additionally, one must understand the changes in the Southern rail network as the war progressed with regards to speed and line-haul capability and compare that to the North's system in order to understand that the South very early in the war lost the ability to move large bodies of troops rapidly between theaters. This view of the Southern rail network will also be juxtaposed with the views of the Confederate government and the major commanders to show that along with an inadequate rail system, the South was also hampered by a state's rights doctrine which prevented the centralized control necessary to use its railroads most efficiently. Additionally, there was a lack of will among

major army commanders, specifically Robert E. Lee, to use assets for strategic concentration due to mistrust in the rail system. These facts, coupled with local jealousies and a strategic outlook that dismissed the shifting of forces on the scale necessary to achieve overwhelming superiority at a decisive point, precluded the ability of the Confederacy to utilize the concept of interior lines effectively.

ENDNOTES

1. The best synopsis of early railroad strategic thought can be found in E. G. Campbell, "Railroads in National Defense, 1828-1848," Mississippi Valley Historical Review 27 (December 1940): 361-378.
2. Matthew F. Steele, American Campaigns (Washington D.C.: United States Infantry Association, 1943; [1905]): 356.
3. Richard Beringer maintains that the Southern rail system was in fact an effective system throughout the entire war. He points to troop movements and the movements of supplies throughout the war, along with trains continuing to run up until the end of the war as proof of this point. Beringer is in the extreme minority with this contention. In addition, his point of the physical loss of the interior lines advantage is incorrect when he states that Confederate troops had to move farther than their Northern adversaries during the Chickamauga Campaign. The Northern troops from the Army of the Potomac moved 1,200 miles to re-enforce the Union army that was trapped at Chattanooga while James Longstreet's Confederate corps moved only 750 miles. See Richard Beringer, et al., The Elements of Confederate Defeat: Nationalism, War Aims, and Religion (Athens: Univ. of Georgia Press, 1988): 134, 194.
4. Archer Jones' ideas on generalship and the use of

interior lines can be found in Archer Jones, "Jomini and the Strategy of the American Civil War, A Reinterpretation," Military Affairs 34 (December 1970): 129.

5. T. Harry Williams, "The Military Leadership of North and South," in Why the North Won the Civil War, ed. David Donald, (New York: Macmillan Publishing Co., 1960): 48.

6. This is found in Robert Black, The Railroads of the Confederacy (Chapel Hill: Univ. of North Carolina Press, 1952): 268.

7. An excellent rendition of the woes that Bragg faced in this movement can be found in Grady McWhiney, Braxton Bragg and Confederate Defeat: Volume I. Field Command, (New York: Columbia Univ. Press, 1969): 267-271. McWhiney ably shows that even by June 1862 major field commanders had their doubts about the ability of Confederate railroads to move their soldiers long distances.

CHAPTER II

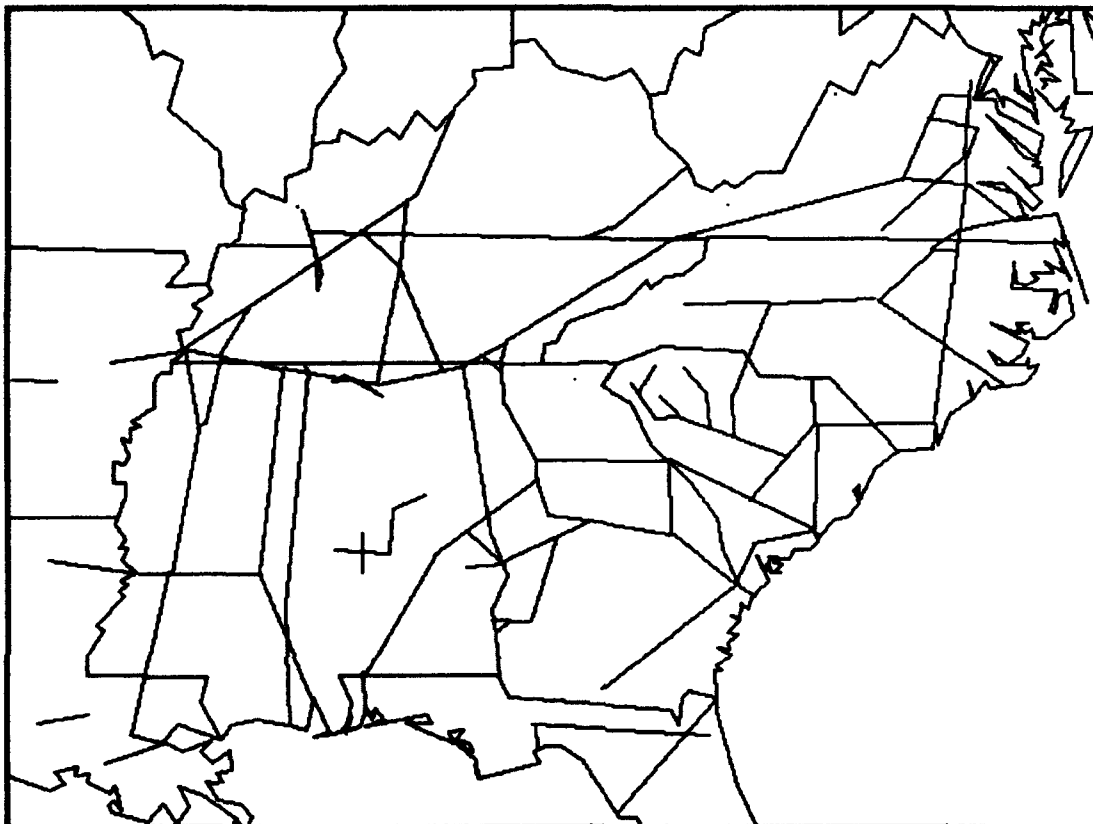
THE PRE-WAR RAILROAD NETWORKS

IN THE NORTH AND THE SOUTH

The origins of the Southern railroad system that supported the Confederacy in the Civil War can be found in the rapid expansion that occurred during the 1850's. During that decade, several factors influenced Southern railroad development: economic competition with the North for western markets; faulty centralized planning; geography; a small industrial base; little hard capital; and the individualistic Southern mentality. These factors combined to create a railroad system that did not integrate well into the existing Southern transportation network. While many Southern railroads were initially built to bring cotton and consumer goods to the rivers for transport to Southern seaports, many of the railroads that came into existence during the 1850's, such as the Mississippi and Tennessee Railroad, were built to compete against the Southern river system. Therefore, instead of complementing the existing Southern river transportation network, many railroads duplicated existing transportation lines. While the Southern rail network was designed to turn a profit by transporting agricultural goods and passengers in peacetime, it was not designed nor was it able to meet the great demands placed on it during the Civil

War.¹

Figure 1: Southern Rail Net, 1861



In the decade prior to the Civil War, Southern railroad expansion increased fourfold from 2,309 miles of operating lines to 8,795 miles of operating lines, with almost two times that much planned. (See Figure 1 for the Southern rail network in 1861.) There were 155 main line railroad companies in existence along with 39 branch line companies.² The total net worth of these railroad assets in 1860 was \$235,960,842.³ In addition, this huge expansion

occurred under very favorable circumstances. By 1860, Southern railroads were built at one half the cost per mile that it took to build Northern railroads. Further, there were only three railroad companies in the South that defaulted on their payments for a total loss of \$2,020,000. In the North, eleven companies defaulted on loan payments during the 1850's for a net loss of \$39,000,000.⁴ On most Southern lines dividends fluctuated between 8 and 10 percent.⁵

This impressive expansion was due in part to an impression among Southerners that the North was isolating the South by syphoning off its trade with the western states. By the end of 1860 four major east-west trunk lines operated, tying the Northern and western sections of the country together. Three of these lines ran through New York and Pennsylvania. The fourth ran through Maryland. Thus, when war came, there was not a single east-west through line that was totally in the South. By the mid 1850's it was both cheaper and faster to ship agricultural goods from Memphis to the east coast using railroads than it was to ship them down the Mississippi river through New Orleans.⁶ In addition, there was no north-south rail line that linked the Northern and Southern sections of the country together at the outset of the war.⁷ By 1860, there were two rail lines under construction that would link the South and the West together, but neither had been completed by the beginning of the war. Because Southern railroad expansion was not aimed primarily

at inter-sectional ties, the Southern railroad system tied the South together as a section, increasing the Southern output of cotton as a cash crop by opening the Southern interior to inexpensive transportation costs. Socially, the railroads offered a new outlet for the use of slavery in railroad construction thereby strengthening the South's reliance on that form of labor.⁸

As early as 1850 J. D. B. De Bow, one of the foremost advocates of Southern industrialization, called for a convention on Southern railroad expansion, hoping to coordinate growth and centralize planning.⁹ The first of several conventions was held in New Orleans in January 1852, and many leading railroad owners attended it.¹⁰ De Bow called for a consensus on railroad development in the South to integrate construction and future expansion into a cohesive plan. For a variety of reasons, De Bow's dream of a centralized Southern railroad net was never realized, even though in 1856 the Southern Railroad Association was formed to plan and coordinate future railroad construction.

In 1850, the majority of the Southern railroads ran north-south due to the topography of the region. Until the decade prior to the Civil War, Southerners relied primarily on their waterway system to move bulk goods to market. The largest of these rivers, with the exception of the Mississippi, ran east-west. Therefore, the initial Southern railroads augmented the existing transportation system by

running north-south. These initial lines relied upon fees for passenger service to raise the majority of their revenue instead of charges for the shipment of bulk goods. This allowed rail companies to construct their lines using light weight materials.¹¹ During the decade prior to the war, investors began several east-west lines, specifically in Kentucky, northern Alabama, Mississippi and North Carolina. In many cases these lines competed with river transportation companies. These new lines were begun primarily to entice the interior cotton belt and western trade back to the Southern states instead of going to the Northern ones. Although unfinished in 1861, these lines would be crucial to the Confederate war effort.

Another major obstacle to east-west railroad construction was introduced by the various mountain ranges that ran northeast-southwest in the South. It required higher outlays of capital for labor, earth-moving, and bridging in order to cross them once the decision was made to build through the mountains. With hard currency scarce in the South, many railroad companies that cut lines through the mountains tried to minimize costs when building these roads.¹²

There was little industry in the South to support this rapid railroad expansion. As early as 1852, De Bow recognized this dearth of heavy industrial assets, but believed that if

the railroads expanded quickly, then the industry would follow.¹³ Throughout the 1850's, heavy industry did expand, making its most impressive gains at the close of the decade. Only one plant, the Tredegar Iron Works in Richmond, produced locomotives.¹⁴ It also manufactured rails. By 1854, there were two plants in Wheeling, Virginia, that also produced rails. This number would grow to six with other plants in New Orleans and Georgia.¹⁵ In 1853 the South imported three rails for every one rail it manufactured for railroad construction. By 1856 the South had cut that ratio down to one to one.¹⁶ While these industrial gains were impressive, it would remain to be seen whether Southern manufacturing would be up to the challenge of supporting both the railroads and the Confederate civilian and military economy in wartime.

Hard capital was also scarce in the decade prior to the Civil War. In order to alleviate this problem, Southerners came up with innovative solutions. Foremost among the solutions was state ownership, where the state floated bonds to finance its own railroads. Georgia used state bonds to great profit; the Southwest Railroad Company of Georgia posted a 13 percent dividend rate in 1860.¹⁷ Other states, observing Georgia's example, tried this experiment. For instance, Virginia owned 60 percent of its rail lines at the outset of the war.¹⁸ In addition, Southerners actively sought outside investment. Money flowed primarily from Great Britain and, ironically enough, from Northern businessmen.

Because industrial capital was scarce, rail companies took shortcuts in construction costs. Additionally, with the bulk of non-agricultural capital tied up in railroads and slaves, there was little left over to diversify the economy into other supporting industries.

Finally, and possibly most damaging to a cohesive transportation network, was the factor of the individualistic Southern mentality and the local lobbies it engendered. Planters and state government officials fought an integrated Southern rail system for fear that it would syphon both capital and trade out of their states.¹⁹ There are numerous examples. North Carolina and Virginia could not agree on the connection between Danville, Virginia, and Goldsboro, North Carolina. The seacoast towns of New Bern and Wilmington lobbied against the connection because they feared that their trade would then go to Richmond.²⁰ North Carolina legislators also voted for a gauge difference in 1858 between their state and South Carolina on the lines connecting Asheville, North Carolina, and Greenville, South Carolina, in order to inhibit trade flowing south out of the state.²¹ Florida and Georgia delayed connecting their rail systems due to Florida's fear of a trade monopoly by Savannah. A bridge over the Savannah River connecting the Charleston and Savannah railroad was completed just prior to the war.²² This ended a long period of frustration in which freight would have to be off-loaded from rail cars at the

river, shipped across to the Georgia side of the river, and then re-loaded on rail cars, for transport on the same line, for its trip into Savannah (or vice versa on its trip to Charleston). The best example of this lobby effort, however, was Richmond. Richmond was the terminus of five railroads, none of which were interconnected. Early in the war, the companies agreed to make connections using light rails, but provisions in the agreement stipulated that once the war was over, these interconnecting rails would be removed and the gaps between the rail lines re-established so that the individual railways could go back to business as usual.²³

The railroad companies shared responsibility for reducing the efficient use of Southern rail assets. Companies refused to agree on rolling stock exchange policies and through fares necessary to create a more efficient system. Additionally, hotel owners, saloon keepers, and freight companies actively blocked rail companies from interconnecting within the major transportation hubs in the South. While little written evidence of their lobby efforts remains, the physical ramifications of their parochial views were clear enough. In Savannah, three major lines converged, all of the same gauge, yet these lines were not connected. Similar conditions prevailed in Louisville, Charleston, New Orleans, Chattanooga, Knoxville, and Jackson. Atlanta was the only major Southern terminus city with interconnecting track lines prior to the war.²⁴

Other major deficiencies inhibited the Southern railroad net from providing the service that was necessary to carry out successful and timely transportation operations in support of combat operations. These deficiencies fell into four categories: lack of east-west connecting routes, inefficient terminus operations, poor construction, and inadequate supply.

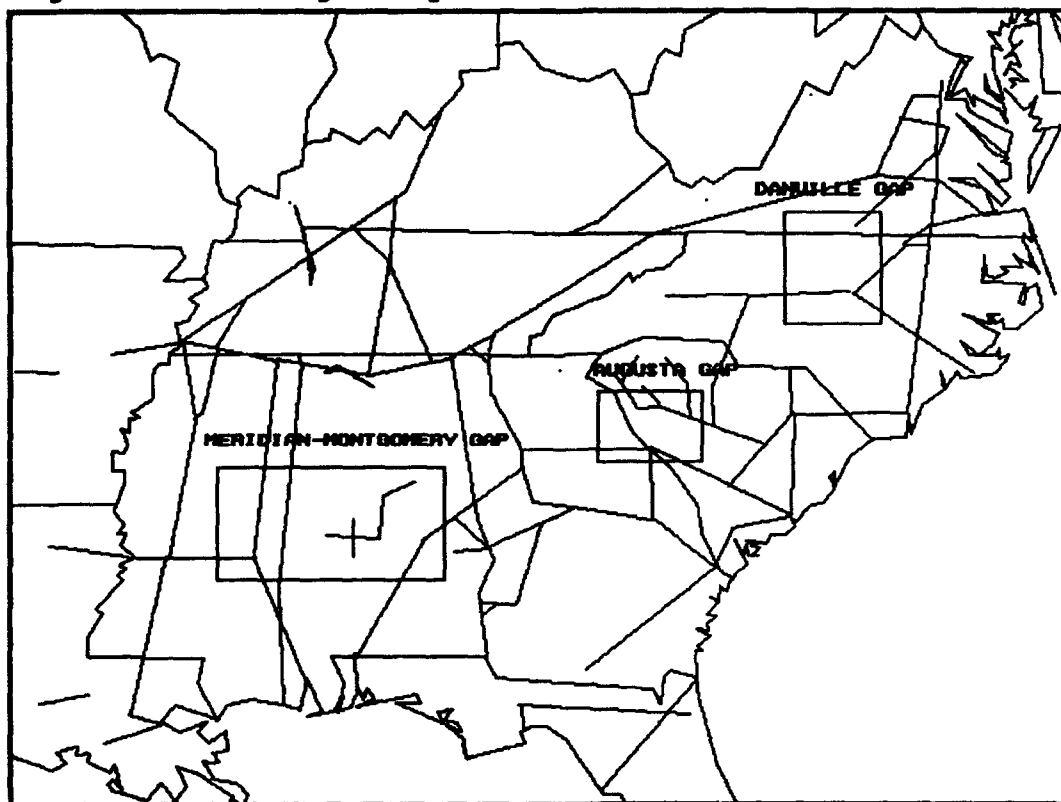
At the beginning of the war in 1861 there was only one east-west line that connected the eastern seaboard with the Mississippi River: a collection of independent lines running through Richmond-Bristol-Chattanooga-Corinth and finally arriving at the Mississippi at Memphis. A second line running through Charleston-Augusta-Atlanta-Montgomery-Meridian-Vicksburg was complete at the start of the war, except for a gap between Meridian and Montgomery. At the outset of the war the northern route would give Confederate forces the ability to rapidly shift troops and supplies both east and west depending on the situation. It was, however, extremely vulnerable to attack by Union forces because it was very close to both the Kentucky and the West Virginia borders; any break on the line negated its advantage to the South for strategic movement.

If the Northern line were in fact interdicted by Union troops, Confederate forces and supplies could then be shifted from Virginia using the seaboard railroad network to compensate for the loss of the northern route. Using the

seaboard line for this type of movement would necessitate a much greater movement distance via rail. In addition, the previously mentioned Meridian to Montgomery gap in Alabama would have to be eliminated to facilitate east-west movement.

Two other serious gaps existed in the Southern rail network that could potentially render much of the rail system useless in time of war should the Union realize the importance of interdicting the Southern railroads. The first gap was the already mentioned Danville gap. The second was the Augusta gap between Columbia, South Carolina, and Augusta, Georgia. If the seaboard railroad were cut by Union forces during the early part of the war, these gaps would preclude any continuous rail transfers between the eastern and western theaters. If the Confederates closed these gaps, their forces would have the advantage of more rapid and direct routes between the Virginia and the western states of the Confederacy. See Figure 2.

Particularly damaging to the Confederacy was the almost total lack of railroads in three of her states--Arkansas, Texas, and Louisiana, west of the Mississippi River. These states, located in the Trans-Mississippi Department, were virtually isolated from the Confederacy at the outset of the war because of this fact. Any reinforcements or supplies coming from these states had to be brought overland and then shipped across the Mississippi River. Since no bridges existed over the Mississippi, this was an expensive and time

Figure 2: Strategic Gaps

consuming process. Reinforcements or supplies coming from Texas had to be shipped by sea through the ports of Beaumont or Galveston, since Texas railroads did not connect with those of either Louisiana or Arkansas.

Terminus operations also retarded the swift, easy movement of troops and supplies. As stated previously, lobbying by freight transfer companies, hotel and saloon owners, railroad owners, and state government officials blocked interconnecting tracks between lines in every major transportation terminus within the South, except Atlanta. Consequently, long delays had to be factored in to movement

tables to compensate for trains having to be unloaded, troops and equipment moved to the next line, and then reloaded onto new trains to continue the journey. This state of affairs also included a coordination nightmare in that at each terminus, two sets of trains, theoretically identical in composition, had to arrive at the same place and time to achieve timely transfer of troops and material. In those cities where track gauges differed, this procedure was unavoidable. In those places where the track gauges were the same, particularly Richmond, Chattanooga, Savannah, and Charleston, this transfer process would soon grow to be intolerable. In addition to the problems resulting from the lack of track connections at the hubs, troops would have to de-train, and move to new trains when switching to new lines because there were as yet no agreements between railroad companies to share rolling stock.

At the beginning of the war, the Southern railroad system was a polyglot of eleven different gauges.²⁵ Three of these gauges were fairly common: 4'8.5" primarily in Virginia and North Carolina; 4'10" in Mississippi; and 5' in Virginia, South Carolina, Georgia, Tennessee, and Mississippi. The other eight gauges made up branch lines and were not important to the strategic movement of troops.²⁶ There appears to be no one reason that accounts for the development of the rail system in this manner. The American Railroad Journal printed articles explaining the technical

strengths and weaknesses of one particular gauge over another. Cost, however, appears to have been a major factor.²⁷ Southern railroad companies were good at curbing construction costs, as shown in their low default record for 1860. For instance, all railroads used single track construction. In addition, the Southern railway companies constructed very few sidings. Sidings gave rail lines the ability to schedule more traffic and set priorities for that traffic without affecting safety, while at the same time increasing efficiency.²⁸ In the case of North Carolina and her insistence on 4'8.5" gauge, the decision was motivated by the fear of the state government that it would lose trade to both Virginia and South Carolina.

In addition to the rail gauges being different, rail quality and construction also varied widely. Throughout the 1850's, many Southern railroads compromised sound engineering for low construction costs. The vast majority of track laid during this decade was of light construction. Most of it was strap iron rail which consisted of a thin strip of rolled iron attached to a wooden beam, or stringer. These stringers were then laid perpendicular to the railroad ties to complete the track building process. Prior to the Civil War, most railroad companies were in the process of exchanging this strap rail for more modern U-rail or pear shaped rail (sometimes referred to as T-rail), but they had not completed the process.²⁹ As an example, the Western and

Atlantic Railroad was a mixture of all three types of rail at the beginning of the war.³⁰ In Louisiana, most of the short lines were of strap rail construction.³¹ The Louisville and Chattanooga Railroad was also predominantly strap rail. Even in Virginia, the Richmond, Fredericksburg, and Potomac Railroad used a combination of strap and T-rail (54 pounds) in its construction.³²

The use of light rails, as expressed as rail weight per yard, also pointed to the light construction of the Southern railroad system. Strap iron weighed anywhere between 18 and 24 pounds per yard. U-rail weighed up to 60 pounds per yard. T-rail weighed between 35 and 68 pounds per yard.³³ These light rail weights were adequate for the shipment of cars of produce and passengers, but would be unable to withstand heavy loads and continuous traffic for prolonged periods of time without a major maintenance effort to replace worn track. Additionally, by 1861 much of the iron rails had been used extensively and were in need of replacement. As an example, much of the iron rails in Virginia were between seven to ten years old when the Civil War began.³⁴ While the Northern railroads had replaced the vast majority of their strap rails with more modern types, their rail lines were in similar shape. This fact, however, is lessened in importance when viewed from the standpoint that Northern industry would be able to more than adequately meet the Northern railroad repair demand.

U and T rails were joined together by U-bolts. Claw headed spikes augmented the U-bolts in both aligning the joined rails and resisting lateral movement of the rails.³⁵ The joints between the two rails were the weakest points of the rail line. If the joints came loose or were knocked out of alignment by heavy traffic, a train could de-rail and the cars would overturn. Strap rails were aligned by nailing the stringers together. In some cases the stringers were bolted together. Whether bolted or nailed, this type of track was much less stable than either the U or the T rails. Consequently, authorized speeds on these tracks were lower than on the more modern rails.

Tie life was also an important factor in affecting the ability of the railroad system to support the military's needs at the beginning of the war. On the average there were about 2,500 ties per mile of track.³⁶ Many railroads in the South prior to the Civil War laid their ties on the ground without any ground preparation. In most cases there was no ballast and very crude grading.³⁷ This arrangement meant that the ties were not uniformly supported to resist the stress of trains passing over them. Weather and the effects of ground conditions also combined to rot ties at a rapid rate. Tie life averaged from five to seven years.³⁸ Worn ties with no ballast increased the instability of the line. Authorized speeds had to be reduced, and there was an increased chance for accidents. At the outset of the war, a

portion of the ties in the South were rotted or close to being rotted and thus they needed to be replaced.³⁹ For those lines completed either at the beginning of the decade, or those lines built during the 1830's and 1840's, this problem of rotted ties would be the case if scheduled repairs had not been completed by the railroad companies.

The locomotives that operated on the Southern lines were a mixture of many different manufacturers and sizes. It is erroneous to believe that since the vast majority of Southern locomotives were of the 4-4-0 type that they were identical and that parts were interchangeable. Generally speaking, Southern locomotives were lighter than their Northern counterparts, ranging anywhere from 14 to 40 tons. There were huge differences even among locomotives of the same company. On the Virginia and Tennessee Railroad, locomotive weight ranged from 23 to 33 tons. On the Savannah, Albany, and Gulf, engine weight ran between 14 and 25 tons.⁴⁰ Northern locomotives weighed up to 55 tons.

Steam was used to develop motive power on the locomotives of the era. It was generated from a boiler, fired by either coal or wood, and then injected into a chamber which pushed a piston. The piston was attached to one of the drive wheels. There was no standardization on piston size. As an example, bore diameters ranged from 16 to 24 inches. In addition, the drive wheels differed on many of the engines built by the same company. These two vital components

affected train speed and pulling capacity.⁴¹

Thermal efficiency also played a large part in both hauling capacity and speed. On the average, North Carolina railroads used one cord of wood for every 25 miles travelled. This figure would vary depending upon the weight of cargo carried on the train.⁴² In Georgia, thermal efficiency ran at 81 miles per cord of wood on the Central of Georgia Railroad.⁴³

This, then, was the railroad system that was available to support the Confederacy in her bid for independence from the United States, and the system that would supposedly ensure her being able to take advantage of interior lines on a strategic level. The rail system was incomplete, lightly constructed, and in need of major repairs. It was disjointed. Its management was fraught with internal and external jealousies. In addition, the South possessed neither the industrial base needed to expand or repair the existing rail system, nor a stockpile of spare parts or raw materials needed to facilitate repair or replacement. In order to overcome these problems, strong centralized control would have to have been exerted over the rail companies. This control was incompatible with the Southern laissez-faire system espoused by the states' rights groups in the South.

Some of the South's railway problems also plagued the Union railroad system. Yet the North's system was much more extensive in tying east and west together and the Northern

rail system complemented its water transportation network. At the beginning of the war, the Northern states had 21,276 miles of rail line to support its military operations. The system grew to 25,372 miles by the end of the war.⁴⁴ By 1860 the rail lines radiating from Lakes Erie and Michigan touched the Ohio and Mississippi rivers at eight and ten points respectively.⁴⁵ These facts point to a rail system that was integrated, despite numerous problems, into a transportation system easily adapted to the strategic movement of troops and supplies.

The North's extensive rail system also included adequate rolling stock to move both troops and supplies to support a war effort. The three east-west trunk lines alone had over 650 locomotives and over 9,100 freight and passenger cars among them.⁴⁶ In locomotives alone this figure was in excess of all of the locomotives found in Virginia, Georgia, Louisiana, North Carolina, Alabama, and Mississippi (the entire Northern locomotive strength numbered 3,978 engines while total Southern assets yielded only 732 engines).⁴⁷ The Illinois Central had 110 locomotives and 2,600 freight cars to call upon at the outset of the war, more than most Southern states.⁴⁸ More important than these differences between the Northern and the Southern rail nets was the North's industrial capability to produce more of everything needed for railroad maintenance and improvement and still supply the demands of the Union war effort.

In further support of this impressive railroad network, the North brought many men into Federal service with some appreciation for the capabilities of railroads. Abraham Lincoln, George B. McClellan, Nathaniel P. Banks, and Ambrose E. Burnside had all worked for the Illinois Central Railroad.⁴⁹ Interestingly enough, McClellan was the president of the still incomplete Ohio and Mississippi Railroad when the war broke out.⁵⁰ More importantly, Lincoln was to pick men from the Pennsylvania Railroad Company to head his military railroads, specifically, Herman Haupt, Daniel McCallum, and Thomas Scott. These three men probably did more to establish a coherent and well running transportation network than any other men in the North.

Like its Southern counterpart, the Northern railroad system suffered from several disadvantages that kept it from being a truly integrated system. These included gauge differences, poor construction, interconnection problems, and local or state lobby efforts to discourage inter-line service. Most Northern rail lines operated on one of seven different gauges, ranging from 4'8.5" to 6'. The most prevalent gauge was 4'8.5" running throughout most of the Northern states. There were, however, two important exceptions that inhibited through traffic. The rail system in Ohio was predominantly 4' 10" while the rail lines in New York were predominantly 6'.⁵¹ Many of these problems could be eliminated, however, if the Baltimore and Ohio Railroad

and the Northwestern Virginia Railroad could be kept in operating condition. These two railroads, using standard gauge, effectively bypassed all of the lines in Ohio with 4'10" gauge almost to Cincinnati.

In addition to gauge differences there were the same interconnection problems in the Northern cities that plagued Southern cities. As an example of this problem, Philadelphia had four main depots and three minor depots to service the rail lines entering it, none of which interconnected at the outset of the war. A similar problem existed in Baltimore where three separate depots serviced its three rail lines. None of these railroads interconnected, even though all lines were of standard gauge. Fortunately for the North, this problem was less prevalent the farther that one moved west. For example, in Toledo, Ohio, a single depot supported six lines.⁵²

These interconnection problems were exacerbated by intense lobbying efforts on the part of freight companies, saloon and hotel owners, politicians, and railroad companies. These interests fought not only interconnections within cities but also gauge standardization. Railroad companies were also loath to agree on rolling stock exchange for through traffic. They were also unwilling to finance connecting tracks between lines for the sake of military necessity.⁵³ It took great political clout to overcome these lobbying efforts.

At the outset of the war, it appeared as though both Northern and Southern rail nets shared mutual problems, yet the North enjoyed several advantages that the South did not. Foremost among them was the disparity in industrial strength between the two sections. The North possessed the potential to both repair and expand its rail network. This potential also gave the North the ability to overcome any physical deficiencies that would be identified in the early stages of the war. The North also enjoyed a great advantage in the amount of rolling stock available. This superiority in rolling stock, in great part, would alleviate the problems with coordinating trains to be at the same location in order to transfer cargo between different gauge lines. Additionally, the Northern and western railroad systems interconnected, thereby facilitating rapid shipments between the two sections. Finally, the Northern and western rail system complemented the water system to a much greater degree than its Southern counterpart. This fact allowed the Northern and Western states to move troops and supplies into areas where no rail lines existed in conjunction with major rivers; the Cumberland and the Ohio Rivers being prime examples.

Even with these differences that the Northern rail system enjoyed over the Southern rail system, the advantage of interior lines lay with the South for purely geographic reasons. Whether this would create a major advantage for the South would depend on two factors: which side would recognize

the strategic importance of rail operations first, and which side would allocate the necessary resources to operate the rail network. Included in these resources would be the manpower necessary to run and maintain the rail system and to garrison strategic rail terminals. The South could do nothing about the second condition, based upon its paucity of assets, yet it had an equal chance with the North to recognize early the strategic importance of its assets and to formulate an appropriate strategy that best utilized its rail network.

ENDNOTES

1. For an excellent overview of the Southern rail network and its effects on interregional trade, see Albert Fishlow, "Antebellum Interregional Trade Reconsidered," American Economic Review 54 (May 1964): 352-364.
2. The beginning figure for 1850 was taken from The Industrial Resources Ect. of the Southern and Western States ed. J. D. B. De Bow (New Orleans: Office of De Bow's Review, 1853) 2: 435. Hereafter cited as Industrial Resources. The figure for 1860 was taken from a compilation of all railroads in existence in the South, minus Maryland, that were found in De Bow's Review, ed. J. D. B. De Bow, 28 (January 1860): 343-346. Hereafter cited as De Bow's Review.
3. De Bow's Review 27 (January 1860): 593.
4. For more information on these numbers, and also western figures see De Bow's Review 29 (July 1859): 208.
5. Ulrich Philips, History of Transportation in the Eastern Cotton Belt to 1860 (New York: Columbia Univ. Press, 1909): 216, 279.
6. The American Railroad Journal, ed. Henry Poor, (New York: J. M. Schurtz and Co.): 43 (23 October 1858): 683. Hereafter cited ARJ.
7. For a pictorial representation of this point see Eliot Jones, Principles of Railway Transportation (New York: Macmillan, 1931): 53.

8. The use of slave labor increased throughout the decade of the 1850's and continued throughout the war. See De Bow's Review, 29 (July 1860): 254-255. In addition, the Southern Pacific Railroad in Texas ran an ad in the Richmond Enquirer on 29 July 1861 wanting to hire 500 or 1,000 slaves as laborers on the railroad. See Richmond Enquirer, 29 July 1861: 3.

9. De Bow's Review 12 (January 1852): 554-562.

10. Industrial Resources, 434.

11. James Ward maintains that Southern economic development required little more than haphazard railroad development to fulfill the South's needs. James Ward, "A New Look at Antebellum Southern Railroad Development," Journal of Southern History 39 (August 1973): 410.

12. Two examples of this are the Winchester and Potomac in western Virginia and the Western and Atlantic in central Georgia which used little or no ballast in their construction. See Jeffrey Lash, "Joseph E. Johnston and the Virginia Railways, 1861-1862," Civil War History 35 (March 1989): 9; and James Bogle, "The Western and Atlantic Railroad--1864," Atlanta Historical Journal 25 (Summer 1981): 47.

13. De Bow's Review 12 (January 1852): 558.

14. ARJ, 49 (December, 1853): 779. Also see Angus Johnston, Virginia Railroads in the Civil War (Chapel Hill: Univ. of North Carolina Press, 1961): 12. Johnston states that while

the Tredegar Works did in fact produce locomotives, they stopped production in 1858. There were only two places that had the ability to produce locomotives at the outset of the war, Tredegar in Richmond and a plant in Nashville. See Robert Black, The Railroads of the Confederacy (Chapel Hill: Univ. of North Carolina Press, 1952): 23. Charles Dew, on the other hand states that the Tredegar Works quit production of locomotives in 1860. See Charles Dew, Ironmaker of the Confederacy: Joseph R. Anderson and the Tredegar Iron Works (New Haven: Yale Univ. Press, 1966): 126.

15. ARJ, 18 (6 May 1854): 281, and Black, Confederate Railroads, 23.

16. De Bow's Review, 12 (January 1857): 518. As an example, the Western and Atlantic Railroad in Georgia used rails principally imported from England. See James H. Johnson, The Western and Atlantic Railroad of the State of Georgia (Atlanta: Georgia Publishing Service Commission, 1932):44.

17. Philips, Eastern Cotton Belt, 279.

18. Johnston, Virginia Railroads, 8.

19. As an example, planters in South Carolina fought railroad expansion in their state because it would not benefit them. See Alfred Smith, Economic Readjustment of an Old Southern State: South Carolina, 1820-1860 (Columbia: Univ. of South Carolina Press, 1958): 192.

20. Allen Trelease, The North Carolina Railroad, 1849-1871 and the Modernization of North Carolina (Chapel Hill: Univ.

of North Carolina Press, 1991):xii. Also see George Taylor and Irene Neu, The American Railroad Network 1861-1890 (Cambridge: Harvard Univ. Press, 1956): 43.

21. Cecil Brown, A State Movement in Railroad Development: The Story of North Carolina's First Effort to Establish an East and West Trunk Line Railroad (Chapel Hill: Univ. of North Carolina Press, 1928): 137.

22. Black, Confederate Railroads, 9. Taylor and Neu, Railroad Network, 43.

23. See George Turner, Victory Rode the Rails: The Strategic Place of the Railroads in the Civil War (Indianapolis: Bobbs-Merrill Co., 1953): 38; and Charles Ramsdell, "The Confederate Government and the Railroads," American Historical Review 22 (July 1917):797.

24. The maps of these cities can be found in The Official Atlas of the Civil War, ed. Thomas Yoseloff, (New York: Thomas Yoseloff, 1958): Louisville, plate CII, #3; New Orleans, plate XC, #1; Richmond, plate LXXXIX, #2; Savannah, plate LXX, #2; Atlanta, plate LI, #2; Chattanooga, plate XLIX, #1; Knoxville, plate XLVIII, #2; Jackson, plate XXXVII, #2.

25. Turner, Victory, 31.

26. This observation is taken from the map provided at the end of Taylor and Neu, Railroad Network.

27. As an example for technical arguments concerning broad versus narrow gauge see ARJ 9 (26 February 1853): 157. For

cost arguments see Ibid., 20 (14 May 1853): 406.

28. At the beginning of the war the South had an aggregate total of 260.6 miles of secondary track and siding in existence to support almost 9,000 miles of rail line. By contrast, the North operated a total of 3,043.5 miles of secondary track and siding. See *ibid.*, 18 (20 September 1862): 733-736; Black, Confederate Railroads, 14.

29. U-rails consisted of iron that was shaped in the form of an inverted U and then affixed to the railroad ties using spikes. Train wheels would then pass over the rail utilizing the top and the inside of the U. T-rails are shaped the same as the rails utilized in modern railroad construction. Edwin Alexander, Civil War Railroads and Models (New York: Fairfax Press, 1989): 46.

30. Bogle, "Western and Atlantic," 48.

31. Lawrence Estaville, Confederate Neckties: Louisiana Railroads in the Civil War (Ruston: McGinty Publications, 1989): 8.

32. John Mordecai, A Brief History of the Richmond, Fredericksburg, and Potomac Railroad (Richmond: Old Dominion Press, 1941): 27; Johnston, Virginia Railroads, 9.

33. All figures found on rail weight fall within the weights listed which are taken from Black, Confederate Railroads, 13. As examples, see Mordecai, Richmond, Fredericksburg, and Potomac, 27; Johnson, Virginia Railroads, 9; Estaville, Neckties, 8; Trelease, North Carolina Railroads, 34.

34. Johnston, Virginia Railroads, 10.
35. E. E. Russell Tratman, Railway Track and Track Works (New York: Engineering News Publishing Co., 1897): 71, 84-85.
36. Ibid., 21.
37. Ibid., 16. The purpose of ballast is to evenly distribute the weight of the load over the roadbed, form support for the ties, and provide efficient drainage. Engineers calculated the minimum safe depth for ballast to be 12".
38. Ibid., 23. Tratman maintains that tie life in the North averaged seven years while that in the South averaged six years. He bases this on the Southern railroads utilizing pine for their ties.
39. Ties were pieces of wood that measured roughly six to eight inches in diameter and were from eight to ten feet in length. They would be laid perpendicular to the track line and the track would be affixed to them. Ties increased track stability. This stability was further increased, and tie life extended, when the ties were placed in ballast which assisted the ties in distributing train weights. Alexander, Railroads and Models, 38; Tratman, Railroad Track, 10-13.
40. Black, Confederate Railroads, 16.
41. As an example, two engines built for the Nashville and Chattanooga Railroad by the same company had drive wheels of 54" and 60" respectively even though the trucks and the tender were identical. Alexander, Railroads and Models, 171.

Alexander also shows a chart of USMRR locomotives built before 1863. Most of these engines were captured from the South. The chart clearly shows the different sized drive wheels. See page 119.

42. Trelease, North Carolina Railroads, 55.

43. Black, Confederate Railroads, 88, 125. Although not stated by either Trelease or Black, the only explanation for the large difference in thermal efficiency between the two states must come from the type of wood that each used. Central North Carolina is a predominantly sandy soil region where pine trees are the major tree. Central Georgia is mountainous and many hard woods such as oak and walnut abound. Since pine is a soft wood, it burns faster. Much more of it would have to be used to go the same distance that a cord of hard wood could take a train.

44. This real growth in rail line additions does not take into account the more than 2,000 miles added by the United States Military Railroad Service. See Thomas Weber, The Northern Railroads in the Civil War, 1861-1865 (New York: Kings Crown Press, 1952): 15.

45. Ibid., 4.

46. Ibid., 10-12.

47. Overall figures for this fact are seen in the locomotive returns column in the ARJ 18 (20 September 1862): 733-736. Poor's figures are incomplete with regard to several lines. As an example, Poor shows that Louisiana has only 57

locomotives while Lawrence Estaville shows 80 locomotives at the outset of the war in Louisiana. See Estaville, Neckties, 9.

48. Weber, Northern Railroads, 98.

49. John Stover, History of the Illinois Central Railroad (New York: Macmillan Publishing Co., 1975): 87.

50. George McClellan, McClellan's Own Story: The War For the Union, The Soldiers Who Fought It, The Civilians Who Directed It and His Relations to It and Them (New York: Charles L. Webster and Co., 1887): 43.

51. These observations are made after perusing the maps accompanying Taylor and Neu, Railroad Network. In addition, these problems in gauge differences are discussed in Edwin Pratt, The Rise of Rail Power in War and Conquest, 1833-1914 (Philadelphia: J. B. Lippincott , 1916): 18; and Weber, Northern Railroads, 6.

52. Weber, Northern Railroads, 8, does an excellent job in portraying interconnection problems in Northern cities. These interconnection problems would have serious consequences for the 6th Massachusetts Regiment on 19 April 1861, when it was set upon by a mob of angry Southern sympathizers while marching from one depot to another in Baltimore. See James McPherson, Battle Cry of Freedom: The Civil War Era (New York: Oxford Univ. Press, 1988): 285.

53. As with Southern rail lines, few primary sources remain to show these facts. These ideas are put forth both in Taylor

and Neu, Railroad Network, 52; and Turner, Victory, 376.

CHAPTER III

THE WAR YEARS: EXPERIMENTATION AND LEGISLATION

During the Civil War, both the North and the South approached the use of their respective railroad systems in different manners, each according to the strengths and weaknesses that they brought into the war. The North's use of its rail assets rested both on its advantages in management and industry as well as its early wartime experiences. These experiences galvanized the Northern government to take centralized control of its rail assets. In the South, on the other hand, leaders decided not to consolidate control over the region's railways, although many members in the Confederate Congress gave railroads a high priority. This decision ensured that, due to the weak nature of the Southern railroads at the outset of the conflict, at some time the Southern railway network would require extensive maintenance to the point that it would be unable to meet the strategic demands that would be placed upon it for the successful prosecution of the war. In addition, even though the Confederate government observed glaring railroad problems early in the war, it was unwilling to take centralized control of its transportation assets until 1863. Once he had the power, however, Jefferson Davis was loath to use it. This unwillingness to centralize control of its

railroad system reflected the basic Southern belief in a weak central government. It also hurt the South in its ability to use its limited railway assets to maximum advantage.

The North approached its rail net problems in three ways: technologically, organizationally, and legislatively. In order to lessen problems caused by gauge differences, three expedients were devised with success in all three areas: extra broad wheel treads (compromise cars), straddle track, and adjusting axles.¹ As early as 1860, the compromise car was in service in the North. It had a five inch wheel tread which meant that it could operate over both 4'8.5" and 4'10". In addition, several railroad companies laid a third rail on their lines called a straddle track. This third rail allowed cars of different gauges to be used on the same line. The Atlantic and Great Western Railroad in New York was an example of this expedient in which gauges of six foot and 4'10" were allowed to operate on the same line.² In 1863 Charles Tisdale invented the adjusting axle in which the axle of a freight car could be adjusted to the specific width of the track in order to alleviate the problem of downloading, moving, and then uploading on to another car the specific freight that was being hauled. Tisdale's invention worked well, but unfortunately was not adopted in large numbers outside of Pennsylvania.³ In addition, during the war the United States Military Railroads (USMRR) re-laid track on Southern railroads, in many instances to standard

gauge in order to permit their use of a part of the Northern transportation network.

Northern locomotives at the outset of the war were, by and large, the same 4-4-0 type that Southerners relied upon to pull their trains. As the war progressed, Northern rail lines began using more of the modern and powerful 2-6-0 and 4-6-0 designs. These larger engines were better able to handle the heavier loads demanded by war.⁴

The Union also experimented with several methods of decreasing the amount of upkeep needed to maintain track. This came in two forms: tie life and rail life. In the Northern states, railroad companies injected a chemical solution into the ties. This solution increased tie life expectancy by reducing the effects of weather on the tie. In order to increase rail life, several companies experimented with Bessemer processed steel rails. These companies used the new rails in small numbers, and only in an experimental capacity. Although the tests with these rails would be of great benefit in the post-war years, the Northern railroad system relied on the standard iron rails of the time period.⁵ During the war, the North tore up rail from less important lines and re-laid it on more important lines. This phenomenon appears to have been practiced more by the USMRR in keeping captured track in workable condition than by Northern railroad companies.⁶

The North utilized its industrial advantage to more

fully integrate and expand its rail system. This industrial strength would have a great impact on the Union's ability to use its rail assets to negate the Southern geographic advantage of interior lines. The effects of the Northern industrial advantage are seen in both the expansion of the Northern railroad system and in the increase in the amount of rolling stock and the number of locomotives that occurred during the war.⁷

In addition to its technological attempts to integrate its rail network to respond to the requirements of war, the North experimented with organizational and legislative expedients that would improve the utilization of its rail network. The importance of rail transportation for the strategic movement of both troops and supplies became evident to the Northern government in the spring of 1861. Southern sympathizers in Maryland had all but cut off Washington, D.C., from the Union by closing the terminus at Baltimore. The USMRR was born during these hectic days when General Benjamin F. Butler seized Annapolis and the railroad from there to Washington, D.C. This allowed the Union to ship men and material from Philadelphia to Havre de Grace, Maryland, thence by water on the Chesapeake Bay to Annapolis, and then by rail from Annapolis to Washington D.C., thereby passing Baltimore. To secure this line, President Lincoln federalized both the Annapolis to Washington rail line, and the Philadelphia, Wilmington, and Baltimore Railroad on 31

May 1861. He rationalized this unauthorized use of presidential power as necessary due to the extreme emergency of the time.⁸

In January of 1862, Congress passed a landmark bill granting the President the power to federalize any railroad that he deemed important to the war effort.⁹ On 11 February 1862, Daniel McCallum of the Pennsylvania Railroad was appointed Director of the USMRR with the rank of colonel.¹⁰ On 20 February 1862, Congress passed a bill setting freight rates paid to the railroads for through traffic. This meant that the Union government would not have to pay excessive transportation rates, and it also insured the cooperation of the railroads in moving Union troops and supplies. Additionally, Congress taxed the railroads three percent of their gross receipts to assist in paying for the war.¹¹

The Illinois Central Railroad played a particularly important role in the west. It had benefitted from governmental land grants during the antebellum period and, by the terms of the legislation that provided the land, was obligated to ship materials free of charge in time of war. Strict adherence to this policy would have bankrupted the company and created problems for the Union war effort. The company and the government worked out a compromise whereby the government would pay the going military rate. The Illinois Central would then give back one-third of the total to the government.¹²

These initial legislative acts were extremely important in convincing private businessmen as to the seriousness of the war and laying the ground rules by which the North would prosecute the war from the standpoint of rail operations. Moreover, these steps initiated what was to become a good working relationship between the government and the railroad companies. The government recruited railroad experts to run the federalized railroads. More importantly, the government gave the experts the authority to accomplish their assigned task of efficiently running the Union transportation network. Finally, President Lincoln demonstrated very early in the war that he would use all powers at his disposal to prosecute the war. For the railroads, this meant federalizing the lines of recalcitrant owners or operating them under private control but in conformance with Federal regulations.¹³

As the Federal government recognized the importance of railroads, so too did the Union officer corps. As noted earlier, many West Point trained officers brought an understanding of railroads with them into the war. As the war progressed, Union generals gained an increasing appreciation for the flexibility and strategic value that the railroads gave an army. George B. McClellan showed an early appreciation for rail lines.¹⁴ In November of 1861, McClellan wanted Don Carlos Buell to take Knoxville to cut the Confederate supply line coming from the west. A month later he moved to cut the Confederacy's eastern seaboard rail

network from Georgia to Richmond. McClellan gave this mission to Ambrose E. Burnside for his coastal campaign, with dismal results.¹⁵ George G. Meade, one of McClellan's subordinates, also saw the strategic importance of the railroad and its impact on the Confederate ability to wage war. During the Peninsula Campaign, Meade urged McClellan to swing south and sever the Richmond and Petersburg Railroad, thereby cutting off the Southern capital from reinforcements and supplies.¹⁶ Both men recognized the need to destroy the South's early strategic interior line advantage, but were unsuccessful in doing so.

The most astute Union general with regard to the importance of railroads was Ulysses S. Grant. Early in 1862 Grant saw that the railroads were of strategic importance to the Confederate army under Albert Sidney Johnston. He also recognized the importance of the rail terminal at Corinth as a major strategic point for the western Confederacy. With the capture of Corinth in May of 1862, the Union effectively severed the eastern and western parts of the Confederacy. This prevented rapid troop movements, thus significantly disrupting the South's ability to benefit from its interior lines.¹⁷

William T. Sherman also saw the importance of railroads in modern warfare. By 1864, he saw the Army of Tennessee's weak point as its rail line of communication. He based his 1864 campaign for the destruction of the Army of Tennessee,

and the capture of Atlanta, on threatening that army's line of communication, the Western and Atlantic Railroad.¹⁸ Additionally, Sherman based his 1865 campaign through the Carolinas on a sound rail plan. His rationale for doing this, however, was more logistically oriented than strategic in nature.

Although some officers recognized the potential of railroads, as with any innovative piece of technology in the art of war, problems arose with regard to how they should be employed. In the initial stages of the war, these problems came from disagreements between the railroad professionals who were tasked to run the rail lines and those army officers who had an incomplete understanding of railroad operations. These problems were ironed out largely through the efforts of one man, a fiery West Point graduate turned railroad engineer named Herman Haupt. Haupt performed wonders not only in engineering feats but also in raising the consciousness of the Union high command as to the importance of efficient railroad organization. Haupt also initiated the standard operating procedures that would make Union railroad usage smooth and efficient through the use of telegraphs for scheduling, a dedicated Construction Corps whose primary function was to keep the rail lines open, and the innovation of using trains for reconnaissance. Haupt's innovations would be of immeasurable help to the entire Union war effort later in the war. In early 1862 Haupt got into several major

arguments with superior officers concerning the inefficient use of rail assets. Union General Irvin McDowell was so impressed with his logic that all railroads in the Army of Virginia's area were placed under his control. Haupt proposed that with proper management a single rail line could support an army of 200,000 men.¹⁹

As the war progressed, Union railroad operations became more efficient and responsive to Union needs. Using Haupt's work as the standard, theater railroad supervisors such as Grenville M. Dodge, Thomas Scott, and Thomas Devereaux were able to perform minor engineering miracles to support Union army operations. They changed gauges on important rail lines to enhance movement, laid interconnecting track in the cities to facilitate through traffic operations, and rebuilt damaged and destroyed rail lines. An example of this work was Dodge's efforts to assist the Union campaign for Chattanooga in 1863 in which his Construction Corps rebuilt 182 miles of track and bridges in ten days in order to support the Union army.²⁰ Better known examples deal with the supplying of the Army of the Potomac, 150,000 men and 60,000 animals, after the Antietam Campaign in 1862, and railroad operations in support of Sherman's army, 120,000 men and 60,000 animals, during his Atlanta Campaign. After Antietam, the Union army received its supplies over 100 miles of single track. During Sherman's campaign, General Dodge operated a single track supply line 473 miles long through hostile country.

Throughout the entire campaign, logistics never hampered Sherman's tactical plan.²¹ These operations proved Haupt's prediction true. A large, modern army could in fact be adequately supplied through the efficient use of a single track rail line.

Railroad operations also became flexible enough to support Union armies wherever they went. For example, Haupt shifted the Union supply base to support the Army of the Potomac during the Gettysburg Campaign with no warning or previous planning.²² Throughout the war the Union forces, whichever theater they operated in, did not lack for supplies or for reliable transportation. There were many instances of rapid troop movements by the Union Army during the war. In 1864, Union controlled railroads moved 15,000 men almost 80 miles in 24 hours from Alexandria to Strasburg to counter Confederate General Jubal Early's Shenandoah Campaign.²³

There are two other examples of Union strategic troop movements that indicate that the Confederates had in fact lost their interior lines advantage. On these occasions, Union commanders moved large numbers of troops in response to Confederate deployments. On both occasions, these movements were accomplished rapidly enough to thwart any Confederate advantages that may have accrued at the beginning of the campaigns. In January of 1865, 15,000 men complete with baggage and artillery moved from the valley of the Tennessee River to North Carolina to augment Sherman's army.

This Union corps moved 1,400 miles in eleven days.²⁴ The most famous troop movement, however, occurred as a response to the Union defeat at Chickamauga in 1863 when Hooker's corps of 23,000 men moved from northern Virginia to Chattanooga, complete with horses, artillery, and baggage in just seven days. They covered a distance of over 1,200 miles.²⁵ These examples are important because they clearly show the distances, speed, and line-haul capacity that the Union armies enjoyed during the Civil War. These troop movements also indicated a smoothly operating and extremely flexible Union rail system that was able to support either planned or ongoing combat operations.

Due to its early experience in the war, the Union leadership quickly grasped the importance of the railroad in warfare. The North acted decisively in the initial stages of the war to ensure that their rail system operated efficiently through the use of organizational techniques and effective legislation. Furthermore, President Abraham Lincoln demonstrated that he would use his powers as commander in chief to ensure a responsive rail network. By the beginning of 1863, the Union rail system was an efficient combat multiplier.

Historians Charles Ramsdell and Robert Black argue that the Southern leadership did not understand the importance of the railroad and its effects on interior lines in the initial stages of the war. In contrast to those conclusions,

some evidence indicates that the Southern leadership, at least initially, understood the importance of and effectively used its limited railroad assets to maximize the available combat power in what the leadership considered the critical zone of operations: Virginia. The initial squandering of combat assets came, not in the misuse of rail assets, but in a flawed strategic concept that was based upon political considerations: cordon defense. Southern leadership, like that of the North, relied primarily upon West Point trained officers who had some background in the engineering of railroads. This understanding of railroads, for a variety of reasons, did not translate into an effective strategy whereby the railroads would play an important role in strategic decision-making.

The triumvirate of major military commanders in the Confederacy, Albert Sidney Johnston, Robert E. Lee, and Joseph E. Johnston, grasped the importance of railroads in the initial stages of the conflict. Albert Sidney Johnston based his western defense strategy on the Louisville and Nashville Railroad in 1862. He stationed troop concentrations at strategic points and then planned to utilize the railroads to concentrate these forces at threatened points. He realized that if he lost the rail system he lost the western theater.²⁶ With the fall of Forts Henry and Donelson, Johnston finally persuaded Jefferson Davis to reinforce the western army from the other three departments of the

Confederacy. This troop concentration culminated in the Battle of Shiloh. Unfortunately for the Confederacy, Albert Sidney Johnston died during this battle. The Confederacy would not be able to benefit from his strategic understanding of railroad operations for the last three years of the war.

Robert E. Lee also understood the strategic importance of railroads early in the war; however, he was hampered by a view of strategy that hobbled his ability to think of railroads as anything other than an intra-theater tool. Lee saw the strategic importance of the Baltimore and Ohio Railroad to the Union war effort.²⁷ It was not until 1864 that Lee broke his intra-theater mindset and started advocating inter-theater troop movements. By this time it was too late for the Confederacy.²⁸

Joseph E. Johnston came to the Confederacy with a more extensive background in railroad operations than either Lee or Albert Sidney Johnston. Prior to the war, Johnston surveyed lines for several railroad companies. He was intimately acquainted with both the construction and the technological aspects of railroads.²⁹ On 28 March 1862 he pushed for a strategic concentration of troops in Virginia against the Union army. During the First Manassas Campaign, Johnston utilized rail assets to concentrate his forces with those of Pierre Gustave Toutant Beauregard to defeat Union general Irvin McDowell at the First Battle of Manassas. Johnston's grasp of the strategic possibilities of the

railroads was tempered by the horrible performance of Southern railroads with regard to troop movement from the Shenandoah Valley to Manassas, Virginia, during this campaign, and the subsequent problems in supplying the Virginia army after its first major battle.³⁰

For the remainder of the war, Johnston's use of rail assets for concentration, supply, and as a military objective was erratic at best. During the Vicksburg Campaign, Johnston attempted to use railroads to concentrate forces, with dismal results. In 1864 he allowed precious rolling stock to be destroyed in Mississippi rather than quickly recognizing that it must be transferred to a safer line. Throughout the Atlanta Campaign, Johnston attempted to use his cavalry to interdict General Sherman's supply lines. Although Johnston understood the strategic importance of railroad operations, he was unable to translate this understanding into a coherent plan of action that Jefferson Davis would or could act upon.³¹

The second tier leadership of the Confederacy also recognized the importance of railroads and their effects on military operations. In early 1861, Thomas Jackson, known as the nemesis of the Baltimore and Ohio Railroad, not only stole some twenty trains in the vicinity of Harpers Ferry, but he also destroyed much of the track on which the Baltimore and Ohio operated.³² He recognized that the stretch of rail line in the vicinity of Harpers Ferry was

extremely important to the Union war effort with regard to the shifting of troops and supplies between the western to the eastern theaters. Jackson also utilized rail transportation to reposition his forces during the 1862 Valley Campaign to reinforce the main Confederate army in the Peninsula Campaign. While Jackson was never given command of a major independent field army, he demonstrated a fundamental understanding of the strategic importance of railroads and their effects upon combat operations at the theater level. Whether or not he would have been able to expand his view as to their strategic importance with regard to inter-theater troop transfers will forever remain a matter of conjecture.³³

Another leader who showed a fundamental grasp of the strategic importance of railroads was James Longstreet. On 2 September 1863, he urged Robert E. Lee and Jefferson Davis to detach his corps to reinforce the Army of Tennessee in its bid to regain western territory that was lost the previous year.³⁴ This ultimately led to the strategic movement of Longstreet's corps to reinforce Braxton Bragg for the Battle of Chickamauga. Again in 1864, Longstreet requested that troops be stripped from the South Carolina coast to reinforce his independent command so that he could attempt to interdict Sherman's supply line during the 1864 Atlanta Campaign.³⁵ Longstreet showed a strategic grasp of the power of railroads and their effects upon combat operations. Unfortunately, this

grasp came at a point in the war when the Confederate railroad network was unable to support the types of movements that Longstreet envisioned. The Confederate government was also unwilling to adopt his plans.³⁶

Pierre G. T. Beauregard and Braxton Bragg also saw the need for the Confederate armies to concentrate against one Union army at a time. Both consistently advocated this course from late 1862 onward. Both were also unable to utilize the railroad system in order to carry out their plans, although Bragg came closest in the 1863 Chickamauga Campaign.³⁷

Early in the war the Confederate field commanders recognized the importance of strategic railroad operations. These commanders operated with either one of two views concerning the strategy of concentration: either find the assets within the theater or concentrate forces from all over the Confederacy at a decisive point. The ultimate decision as to which strategy to use rested with President Davis and the Confederate government.

As in the North, many in the Confederate government recognized the need for centralized control of its railroad assets. As early as 29 July 1861, the provisional Confederate Congress introduced resolutions to increase governmental control in the area of railroad regulation.³⁸ On 19 November 1861, Jefferson Davis sent a letter to Congress urging that money be allocated for construction of a connecting rail line between Meridian, Mississippi, and

Montgomery, Alabama.³⁹ This same letter pointed to the weakness of the Southern rail network in terms of physical attributes, and to the ideological weakness of the Southern belief in laissez-faire as a means of waging war. "For the successful prosecution of the war it is indispensable that the means of transporting troops and military supplies be furnished, as far as possible, in such a manner as not to interrupt the commercial intercourse between our people nor place a check on their productive energies [emphasis added]." Again on 17 December 1861, Davis showed that he understood the critical importance of the Southern railroad network to the successful prosecution of the war when he wrote, "If the railroads should be generally disabled for the transportation of troops and military supplies for the prosecution of the war the results would be most disastrous."⁴⁰

These three early instances show that the Confederate government was aware of both the need for effective control of its rail assets and the need to correct several of the most glaring deficiencies in its transportation system. Both of these measures were allowed to die as the Provisional Congress adjourned, but were taken up again when the permanent Congress went into session.⁴¹ By January 1863, Davis knew that without forceful control over a weak rail system, the Southern cause was lost. On 12 January 1863 he wrote to the Confederate Congress, "The embarrassments resulting from the limited capacity of the railroads to

afford transportation and the impossibility of otherwise commanding and distributing the necessary supplies for the armies render the control of the roads under some general supervision and resort to the power of impressment military exigencies [emphasis added]."⁴² These powers were not granted until 1865.

Due to the make-up of the Southern mentality and several of the professed reasons for Southern secession (state's rights and a laissez-faire attitude towards governmental intervention) it is not surprising that governmental intervention with the railroads ran into stiff opposition. On 10 February 1862, a loud minority led by Robert Toombs of Georgia opposed both governmental regulation and railroad construction on both constitutional and moral grounds.⁴³ Although this minority was unable to stop financial aid for railway construction in both North Carolina (the Danville connection) and Alabama (Selma to Montgomery), it was able to effectively block governmental regulation of railroads. On 3 December 1862, Congress passed a bill reorganizing the Quartermaster Department to include a Superintendent of Railroads. The Confederacy chose William Wadley, an extremely capable, though abrasive, former railroad superintendent, to fill the position. While this appointment should have gone a long way in coordinating the Confederate rail system, the congressional minority opposed to centralized control effectively emasculated Wadley's power by denying him the

right to take over railroads for the good of the nation. Wadley also had to deal directly with the governors of various states when removing both rolling stock and rails for military necessity.⁴⁴

This decentralized method of dealing with railroad matters and the reliance of most states on the doctrine of state's rights instead of the common good ensured major coordination problems. Wadley had no power to coerce recalcitrant railroad owners, or governors for that matter, into abiding with previous agreements concerning both rates and through traffic. He could not censure railway officials for prioritizing civilian traffic over military traffic. Wadley had to rely on persuasion in order to accomplish anything. The depth of the enmity that he engendered was seen in the Confederate Congress' decision not to promote him to colonel in May of 1863 and directing the Quartermaster Department to find another Chief of Railroads. Frederick Sims, another former railroad superintendent, replaced Wadley as the Chief of Railroads until the end of the war.⁴⁵ In March 1863 the Railroad Bureau was created, thirteen months after Northern leaders created the USMRR, which took the railroads outside of the Quartermaster Department. This measure, had it been adopted earlier, along with Senate bill 112 authorizing governmental control of strategically important rail lines, and then utilized to its extreme potential, would have gone a long way toward maximizing the

use of limited Confederate rail assets.⁴⁶

It is interesting that a Georgian led the fight against governmental control and financing of railroads. Although there is no evidence to support it, one can not help speculating if Robert Toombs was motivated more by greed than altruistic reasons. The state of Georgia owned most of the railroads within its boundaries and these rail lines were extremely profitable. Further, because of the strategic location and the industrial concentrations in both Atlanta and Savannah, the Confederate government owed a great deal of money to the state due to heavy traffic through these two cities. Georgia had the most to lose if the Confederacy nationalized its rail system.⁴⁷

It was not until 1 May 1863 that Senate bill 112, sponsored by Texas Senator Louis Wigfall, passed both the House and the Senate and was signed into law. This bill gave President Jefferson Davis the power to nationalize railroads for military necessity. Unlike his opposite number, Abraham Lincoln, Jefferson Davis was loath to use his power. Legislation after Senate bill 112 gave the government increasing control over the management, construction, and repair of railroads, even calling for a shift in resource allocation to produce rail iron. These bills, which passed in 1864 and 1865, signalled the end of the vision of the state's rights position in the Confederate government. The recognition that state's rights and laissez-faire doctrines

inhibited Southern prosecution of the war with regard to railway operations came too late to help the Confederacy.⁴⁸

The problems of laissez-faire business practices are clearly seen in the business sector's dealings with both the government and the military. In the initial burst of patriotism, Southern railroad leaders offered to carry war materials for free.⁴⁹ These offers did not last long. A railroad convention met in the fall of 1861 to fix prices for the government. This convention fixed governmental rates at a higher level than civilian traffic paid.⁵⁰ Corruption also occurred in dealings between Southern railroad owners and the Confederate government. The Confederate Railroad Papers clearly show that railroad owners blatantly lengthened distances between points in order to charge higher fees to the government.⁵¹ As the war progressed, the War Department directed Confederate officers to cannibalize unused rail lines to keep critical rail lines operational. These actions drew virulent criticism from both local owners and state governors.⁵²

Unlike the Union, the Confederate government had very little hard currency with which to pay the railway owners for their work. At the outset, railroad owners wanted specie payment for their efforts. The government offered bonds as payment in lieu of hard currency. Although this was initially unacceptable to many railroad owners, Georgia's specifically, both the owners and the government had no other

recourse than to utilize this method of payment.⁵³

Davis' ideas on strategy, like the bickering in Congress and the problems with businessmen, also hampered the Confederacy in its utilization of its rail system to maximum advantage. On several occasions, Davis authorized the strategic movement of forces early in the war to bolster a threatened point, specifically in the calling for troops from the Carolinas and the eastern seaboard to reinforce the Confederate army in its fight against McClellan's Army of the Potomac in the Peninsula Campaign, and in the reinforcement of Albert Sidney Johnston's army for the Battle of Shiloh. Because of Davis' insistence on the cordon defense in the first two years of the war, Confederate forces were dispersed throughout the Confederacy. This fact necessitated the central control of rail assets in order to rapidly shift forces to threatened points. At no time during the war, however, did Davis shift troops in the numbers necessary to gain the major advantage that he needed in order to decisively defeat a Union army.

Davis' reliance on the cordon defense also surrendered the initiative to the Union forces. This loss of initiative made it difficult to exploit the use of interior lines which could be used for a strategic advantage by concentrating overwhelming combat power at a decisive point. It, in essence, gave the Confederates a defacto view of railroad operations as stop gap measures primarily used to plug holes

in a leaking defense. This idea is a far cry from the original intention of Frederick the Great and his use of interior lines.⁵⁴

There are two important instances in which Davis authorized the shifting of forces in order to try to achieve an advantage through the use of interior lines: the reinforcement of John Pemberton at Vicksburg during Sherman's abortive attempt to capture that city in late 1862, and the misunderstood movement of Longstreet's corps to reinforce Braxton Bragg for the Battle of Chickamauga. Both of these instances illustrate that Davis had a good grasp of the fundamentals of interior line operations. They also point to Davis' unwillingness to take the accompanying risks to concentrate the massive forces necessary to deliver a decisive blow as seen in the sizes of the forces sent. Unfortunately, by 1863 the Confederate rail system was unable to perform the task of concentration.

Initially, both sides recognized the importance of the railroad in strategic operations. Clearly, the North acted both legislatively and organizationally much sooner than the South did in harnessing its rail assets to achieve its goals. Additionally, the North illustrated that it had the will to do whatever was necessary in order to have a responsive rail network. It took the Southern leadership two years to enact effective legislation in order to centralize control of its rail assets. Even then, Davis did not use the powers granted

to him by the Confederate Congress. By this time the Confederate rail system had disintegrated to the point where it physically could not meet the requirements needed in order to assist the Confederacy in strategic concentration of forces.

ENDNOTES

1. Weber, Northern Railroads, 8.
2. Taylor and Neu, Railroad Network, 54.
3. Ibid., 54-59. A description of these expedients can also be found in Weber, Northern Railroads, 8. No mention is given in either citation concerning why Tisdale's invention was not adopted. It is possible that due to the poor reputation that the Pennsylvania Railroad had with its competitors, other railroads saw this invention as a means of the Pennsylvania Railroad trying to gain influence in other lines.
4. The number designations on the locomotives refer to numbers of wheels. The first and third numbers refer to guide wheels which help keep the locomotive on the track and distribute locomotive weight. These sets of wheels are called trucks. The middle number refers to the number of drive wheels. The South also utilized locomotives larger than the 4-4-0 type, but in the Confederate states, these newer locomotives were the exception rather than the norm.
5. See Tratman, Engineering, 37, for tie life.
6. Edwin Pratt, The Rise of Rail Power in War and Conquest: 1833-1914 (Philadelphia: J. B. Lippincott, 1916): 22, 23.
7. As an example, the Illinois Central Railroad expanded from 112 locomotives and 2,428 cars of all types in 1861 to 148 locomotives and 3,473 cars of all types. See Henry Poor, Manual of the Railroads of the United States For 1868-1869

(New York: H.V. and H.W. Poor, 1868): 353. Other examples can be found in pages 258-263 of the same source for different lines.

8. James McPherson, Battle Cry of Freedom (New York: Oxford Univ. Press, 1988): 286; Turner, Victory, 53-57.

9. This early use of presidential authority and the accompanying legislation is explained more fully in Taylor and Neu, Railroad Network, 56; and Pratt, Rise of Rail Power, 11-17. Also see Hermon Murphy, "The Northern Railroads and the Civil War," Mississippi Valley Historical Review 5 (June 1918): 328.

10. When McCallum was appointed, the USMRR consisted of just seven miles of damaged track in the Alexandria area. This number would grow to 2,105 miles of track, 419 engines, 6,330 cars, and a labor force of 24,064 men. The USMRR expended \$42,462,142.55 for supplies. This expenditure of assets, just for the USMRR alone, indicates the seriousness that the North placed in its railroad effort. See Daniel McCallum, "Military Railroads United States: Report of Brevet Brigadier General D. C. McCallum, Director and General Manager from 1862 to 1866," dated 26 May 1866, found in "Operational Reports on Military Railroads, 1863-1865," Record Group 92, Records of the United States Army Quartermaster Office, 1798-1916, National Archives.

11. Murphy, "Northern Railroads," 332-334; McCallum, "Military Railroads Report, 1866," RG 92.

12. In 1850, Illinois, Alabama, and Mississippi received massive land grants for railroad construction. One of the stipulations of the 20 September 1850 Land Grant Act said that in time of war all military related traffic would travel free of charge. Had the government followed this practice, the Illinois Central Railroad would have been ruined. The government worked out a compromise with Illinois Central President William Osborn in which the company would charge the government the going military rate and then subtract one-third of the total bill. Even with this agreement, the Illinois Central turned outstanding profits. See Robert Sutton, "Origins of American Land-Grant Railroad Rates," Business History Review 40 (Spring 1966): 67-72.

13. William B. Wilson does a good job of showing this working relationship in A Few Acts and Actors in the Tragedy of the Civil War in the United States (Philadelphia: Published by Author, 1892): 90-95. As an example, Wilson points to the Pennsylvania Railroad giving \$50,000 to the state in 1862 to assist in the raising of soldiers from Pennsylvania. While the gesture is magnanimous, it proves nothing. Southern railroads at the outset of the war offered to carry freight for free to support the cause, yet the working relationship between railroad companies and the Confederate government was very strained. Unlike Wilson, I believe that this amicable working relationship sprang more from fear of federalization than from any altruistic

motivation on the part of Northern railroad owners.

14. Edward Hagerman, The American Civil War and the Origins of Modern Warfare: ideas, Organization, and Field Command (Bloomington: Indiana Univ. Press, 1988): 34-35.

15. George McClellan, McClellan's Own Story: The War For the Union, The Soldiers Who Fought It, The Civilians who Directed It, and His Relationships to It and to Them (New York: Charles L. Webster and Co., 1887): 203-204.

16. George Meade saw the importance of the Southern and southwestern railroads feeding into Richmond as the key to defeating the Confederate army in Virginia. It is interesting to note that on 4 January 1862, ten months before Meade wrote his thoughts to his wife, an editorial in the Richmond Dispatch saw the same danger. See George Meade, The Life and Letters of George Gordon Meade, Major General, United States Army (New York: Charles Scribner's Sons, 1913): 330. Richmond Dispatch, 4 January 1862.

17. Ulysses S. Grant, Personal Memoirs of U. S. Grant, 2 vols. (New York: Webster, 1885): 1: 280.

18. William T. Sherman, Memoirs of General W. T. Sherman (New York: Literary Classics of the United States, Inc., 1990, [1885]): 889.

19. Herman Haupt's memoirs are an excellent source in that he reproduces the documents that were actually sent between himself and the major actors during the Civil War. These letters are interspersed throughout Herman Haupt,

Reminiscences of General Herman Haupt (Milwaukee: Wright and Jones, 1901): use of telegraph for train scheduling, 60; use of railroads for reconnaissance, 104; General Order 23, Haupt to control all railroads in the Army of Virginia area, 70; problems with military interference, 57 and 59; Construction Corps Standard Operating Procedure, 64; and the prediction that a single track could support 200,000 men, 170. In addition, the Correspondence File in "Operational Reports on Military Railroads 1863-1864," RG 92, abounds with letters from Haupt showing problems that the USMRR overcame.

20. Ulysses Grant, "Chattanooga," Battles and Leaders of the Civil War, 4 vols. (New York: Thomas Yoseloff Inc., 1956): 3: 692-693.

21. McCallum, "Railroad Operations Report, 1866" in RG 92. In addition, Roger Fitch and Major Duncan wrote an excellent account of the logistical support of Sherman's army during the Atlanta Campaign in which they continually show the excellent working relationship between General Dodge and Sherman. See Roger Fitch and Major Duncan, The Supply of Sherman's Army During the Atlanta Campaign (n.p.: The Army Services School Press, 1911): 15, 40-46.

22. Haupt, "Operational Reports on Military Railroads, 1862-1863," 9 September 1863, RG 92. The Antietam statistics found in Alexander Anderson's 8 September 1863 report, RG 92. For an excellent biographical treatment of Haupt, see James Ward, That Man Haupt: A Biography of Herman Haupt (Baton Rouge:

Louisiana State Univ. Press, 1973).

23. Report from Adna Anderson, Chief Engineer of Construction, USMRR, Virginia, 8 September 1863, RG 92.

24. Sherman, Memoirs, 891.

25. Turner, Victory, 293; Sherman, Memoirs, 891. There is a discrepancy in numbers between the two sources. Sherman states 23,000 men and Turner states 25,000 men. I have utilized the lower number.

26. Black, Railroads, 71; Turner, Victory, 122. Johnston had placed 10,000 men at Columbus, Kentucky, 4,000 men at Bowling Green, Kentucky, and another 20,000 men spread along the Memphis and Ohio Railroad.

27. Lee's Dispatches: Unpublished Letters of General Robert E. Lee, CSA to Jefferson Davis and the War Department of the Confederate States of America: 1862-1865, ed. Douglas Southall Freeman, (New York: G. P. Putnam's Sons, 1957): 49-51, 61. Jubal Early also credits Lee with this insight in Jubal Early, Lieutenant General Jubal Anderson Early, CSA: An Autobiographical Sketch and Narrative of the War Between the States (Philadelphia: J. B. Lippincott, 1912): 383.

28. Turner maintains that Lee early in the war saw both the advantages of railroad usage and also the South's railroad weaknesses. See Turner, Victory, 63-64.

29. This occurred in 1852 when Johnston surveyed a line in Texas. See Jeffrey Lash, "Joseph E. Johnston and the Virginia Railways, 1861-1862," Civil War History 35 (March 1989): 6-7.

30. Johnston, Memoirs, 36-37. Because the railroads were unprepared for his movement from the Shenandoah Valley to Manassas, Johnston began walking and shuttling his troops towards Manassas. Jeffrey Lash, Destroyer of the Iron Horse: General Joseph E. Johnston and Confederate Rail Transport, 1861-1865 (Kent: Kent State Univ. Press, 1991): 1-40. Lash gives an excellent overview of Johnston's Virginia Campaign and his uneven use of railroads. Also see Frank Vandiver, Their Tattered Flags: The Epic of the Confederacy (New York: Harpers Magazine Press, 1970): 91-92.

31. Vandiver, Their Tattered Flags, 252-253, 257-258, 318. Johnston's memoirs make mention of several times in which he utilized cavalry to interdict Union rail lines. In 1862 Johnston urged Davis to concentrate all forces on the eastern seaboard against McClellan, *Ibid.*, 113. In addition, Johnston saw the importance of concentrating against Grant in the latter part of 1862 yet he failed to do so. *Ibid.*, 152-154. See also Lash, Destroyer, 148, 151.

32. Turner, Victory, 73-76, 89.

33. G. F. R. Henderson, Stonewall Jackson and the American Civil War (New York: Da Capo Press, Inc., 1988, [1943]): 701-709; and Frank Vandiver, Mighty Stonewall (New York: McGraw Hill 1957). Neither Henderson nor Vandiver say whether or not Jackson would have made the intellectual leap that was necessary in order to effectively utilize the Southern railroad network. Henderson comes closest to saying that had

Jackson been given command of a major field army he would have been extremely successful, yet all the evidence that he uses points to an intra-theater point of view.

34. James Longstreet, From Manassas to Appomattox: Memoirs of the Civil War in America (Bloomington: Indiana Univ. Press, 1960, [1896]): 435. Longstreet recommended that Bragg be reinforced with his corps and Johnston's army in Mississippi. He went to Secretary of War James Seddon over Lee's head in making this recommendation.

35. Ibid., 544. Longstreet requested 20,000 men.

36. Clement Eaton, A History of the Southern Confederacy (New York: Macmillan and Co., 1954): 116. Eaton maintains that Longstreet understood interior lines better than any other general in the Confederate army. This sentiment is echoed in two of Longstreet's biographies in which both authors, William Piston and H. J. Eckenrode, maintain that by early 1863 Longstreet both saw the need for interior lines concentrations against enemy armies in the west, and consistently advocated this concentration to both General Lee and Secretary of War James Seddon. See William Piston, Lee's Tarnished Lieutenant: James Longstreet and His Place in Southern History (Athens: Univ. of Georgia Press, 1987):38, 41-42; H. J. Eckenrode and Bryan Conrad, James Longstreet: Lee's Warhorse (Chapel Hill: Univ. of North Carolina Press, 1986, [1936]): 167, 172.

37. Thomas Connelly and Archer Jones, The Politics of Command: Factions and Ideas in Confederate Strategy (Baton Rouge: Louisiana State Univ. Press, 1973): 30-41. Both authors give these two men credit for more strategic insight than Robert E. Lee. See also Herman Hattaway and Archer Jones, How the North Won: A Military History of the Civil War (Chicago: Univ. of Illinois Press, 1983): 282. See also T. Harry Williams, P. G. T. Beauregard: Napoleon in Gray (Baton Rouge: Louisiana State Univ. Press, 1954): 181-182, for Beauregard's 1863 strategy.

38. Journal of the Confederate Congress of the CSA: 1861-1865, 7 vols., (Washington D.C.: Government Printing Office, 1904): 1: 290, hereafter cited JCC. Congressman Charles M. Conrad of Louisiana introduced the bill. It is interesting to note that Wilfred B. Yearns, The Confederate Congress (Athens: Univ. of Georgia Press, 1960): 129, shows that in April of 1861 the Military Committee and Special Investigation Committee recommended to Congress that the Confederate government take control of all major railroads.

39. JCC, 1: 470.

40. The Messages and Papers of Jefferson Davis and the Confederacy, Including Diplomatic Correspondences; 1861-1865, ed. James Richardson, 2 vols. (New York: Chelsea House, 1966, [1905]): 1: 138-139, 152-153, hereafter cited Letters and Papers. Although Davis recognized the importance of the railway system, his belief in the laissez faire system of

government led him to a course of suggesting to Congress what to do. As an example, in his 17 December 1861 letter Davis suggested that the Congress should apportion assets as it deemed necessary to help the railroads instead of forcefully directing Congress to do what he believed important. Emory Thomas maintains that while the laissez faire belief inhibited the Southern leadership from going farther than it did concerning centralized control of rail assets, the steps taken by the Confederate government were of a very radical nature. See Emory Thomas, The Confederacy as a Revolutionary Experience (Englewood Cliffs: Prentice Hall, 1971): 68-69.

41. Yearns, Congress, 129.

42. Letters and Papers, 1: 295.

43. JCC, 1: 781-782.

44. On 17 April 1862, the Confederate Congress passed a bill authorizing a Superintendent of Military Railroads. This bill was extremely strong in language and authorized the Superintendent of Military Railroads to nationalize rail lines and court martial recalcitrant railroad owners. JCC, 2: 251-252. The Confederate Senate balked at these extreme measures. The bill that eventually passed both houses was very weak. See Turner, Victory, 245. William Wadley was a Northerner by birth. Unlike William S. Ashe, who controlled all railroads in the Virginia theater of operations from 1861 to 1862 (he resigned his commission, disillusioned at the lack of centralized control, and went back to North Carolina

where he was president of the Wilmington and Weldon Railroad), Wadley was to coordinate all rail transportation in the Confederacy. He dealt mainly with the problems of through traffic and rate agreements but was largely unsuccessful in his attempts to coordinate the Confederate rail system. He was succeeded by Frederick W. Sims, an amiable and persuasive Georgian, who was more successful in getting the rail companies to abide to previous agreements. Sims served until the end of the war. See Eaton, History of the Confederacy, 256-257.

45. Black, Confederate Railroads, 120-121, 170; Ramsdell, "Government," 801.

46. Black, Confederate Railroads, 257.

47. None of the three biographies on Robert Toombs indicate that he acted out of anything other than his belief in the state's rights position. In fact, all three biographers cite his honesty as a character strength. The question is still valid considering the extensive railroad lobbying that occurred during the time. See Pleasant Stovall, Robert Toombs: Statesman, Speaker, Soldier, Sage (New York: Cassell Publications, 1892); Ulrich B. Philips, The Life of Robert Toombs (New York: Burt Franklin, 1913); and William Thompson, Robert Toombs of Georgia (Baton Rouge: Louisiana State Univ. Press, 1966).

48. JCC, 3: 349-351. Senate bill 112 cleared both the houses on 27 April 1863 and Davis signed it into law on 1 May 1863.

49. The letters of Secretary of War Leroy Walker to the first railroad convention can be found in "Confederate Railroad Papers," 24 and 25 April 1861, in Record Group 107, National Archives.

50. Black, Confederate Railroads, 81-82. Black also points to the fact that due to civilian traffic being bumped for military traffic, Southern railroads were losing money prior to the revised 4 October 1861 pay scale. Also see Ramsdell, "Government," 796. By 25 November 1863, the Southern Railroad Convention issued very specific guidance with regard to rates. See "Proceedings of the Southern Railroad Convention, Macon, Georgia," RG 107.

51. See the railroad ledger papers of the Virginia Central Railroad, 1862, found in RG 107 as an example. The surviving documents are riddled with trains going between two points and the mileage charged being different in numerous entries.

52. As an example, see two letters concerning the removal of railroad iron from Secretary of War George Randolph to General Mansfield Lovell, and to W.A. Gordon, President of the Mexican Gulf Railroad, dated 7 April 1862, in RG 107.

53. See the letter from Secretary of War Randolph to President Harvie, Richmond and Danville Railroad, 26 September 1862, in RG 107. For Georgia's refusal of bonds, see James H. Johnson, The Western and Atlantic Railroad of the State of Georgia (Atlanta: Georgia Publishing Service Commission, 1932): 53.

54. Frederick the Great was a master at using interior lines to rapidly shift forces in order to defeat an enemy in detail. His campaigns in 1754 and again in 1759 during the Seven Years War attest to this fact. The Confederates failed to follow his audacious example. For a study of Frederick the Great's campaigns, see Theodore Dodge, Great Captains: A Course of Six Lectures Showing the Influence on the Art of War of the Campaigns of Alexander, Hannibal, Caesar, Gustavus Adolphus, Frederick, and Napoleon (Boston: Houghton Mifflin, 1898): 151-163.

CHAPTER IV

THE DISINTEGRATION OF THE
SOUTHERN RAIL NETWORK

At the beginning of the Civil War the Southern railroad network was weak and in need of overhaul. Light rail and locomotive construction ensured that the heavy wartime traffic demands placed upon it would exacerbate all of its weaknesses. Early in the war, the railroad network showed signs of disintegration. Speeds dropped, train wrecks increased in frequency, movement times slowed as railroad companies refused to cooperate, and rolling stock wore out. In addition, the Union forces began massive campaigns of destruction in which railroads were the prime targets for Union cavalry. With an almost nonexistent industrial base, the normal replacement of worn tracks and engines and the repair of Federal damage to the railway system became almost impossible. Railroad companies tried many innovations to keep the trains running, but their efforts were minuscule compared to the effort that was needed to continue adequate transportation for the Confederate war effort.

The disintegration of the railway system is best seen, ironically enough, in one of the very areas that historians point to as a Confederate success with regard to their use of rail assets to facilitate the Southern advantage of

interior lines: Chickamauga.¹ This battle, plus several lesser tactical movements, indicates that the Confederate advantage of interior lines disappeared by 1863. Not only does this battle point to a vacillating Confederate high command, it also points to a rail system that was physically unable to meet the demands placed upon it. From Chickamauga to the end of the war, the Union rail system proved more than adequate to the strategic task demanded of it to redress the tactical defeat of General William S. Rosecrans' army.²

* * *

Prior to the war rail speeds varied from company to company. The highest speed attained by a train was 60 miles per hour (mph). This, however, was the exception rather than the norm. The highest safe speed attained was 30 mph.³ Average speeds throughout the country varied. In New York, the passenger trains averaged 20 mph and freight trains averaged 14 mph.⁴ In Louisiana, outright train speeds averaged 25 mph.⁵ Similar speeds were also found in North Carolina, Virginia, and South Carolina.⁶ Throughout the first year of the war it is safe to assume based on antebellum train speeds that the average speed of troop trains was somewhere in the neighborhood of 20 mph.

As the war progressed, Southern railroad speeds dropped dramatically. This drop was due in large measure to the wear and tear that wartime traffic imposed upon the Confederate rail system.⁷ The delays that Southern troops faced in using

the Confederate rail system were caused by two major factors: worn equipment and poor scheduling. While a shortage of cars did exist among the Confederate railroads, commanders overcame this lack of resources by placing more soldiers into the boxcars. This expedient, however, accelerated the wearing out of these cars as soldiers made modifications to them in order to travel more comfortably. The first factor influenced speeds and haul capacity as early as 29 January 1862. A Confederate Congressional Special Investigating Committee recommended that an average speed of 10 mph with six trains a day going to the headquarters of the several army corps throughout the Confederacy be the norm. The reality of the situation showed an average of only two trains a day getting to the major field commands with an average speed of only 6 mph.⁸ Union repairs of captured Confederate rail lines could only bring average speeds up to about 10 mph by early 1863.⁹ By 1864, it took an average of seven days to move just one regiment from Charleston, South Carolina, to Petersburg, Virginia, a distance of 425 miles. The average speed was almost 4 mph.¹⁰ General Jubal A. Early also lamented the shape of the railroads after he was detached from the Army of Northern Virginia for the 1864 Valley Campaign. On 17 June 1864 Early complained of decrepit trains and rolling stock that were moving his command to Lynchburg, a distance of only 150 miles. Five days later, Early started his campaign with unmounted officers because the rail system

could not transport his wagons, artillery, or horses.¹¹ This was a far cry from the 78 hours that through traffic was scheduled to take from Richmond to New Orleans in June of 1861!¹² Even with the slower speeds, however, there were still derailments. These derailments were primarily caused by poor track conditions, but longer and more heavily weighted trains were probably a contributing factor.¹³

The second factor, poor scheduling, occurred as early as the First Bull Run Campaign in 1861. Although Confederate reinforcements arrived in a timely manner from the Shenandoah Valley, the movement was an organizational nightmare. Not only did General Joseph E. Johnston have to shuttle troops to Manassas, the counterattack forces arrived just in time to turn the tide of the battle.¹⁴ Confederate success in this first major use of railroads to gain a tactical advantage was more luck than skill. Had Union General Irvin McDowell pressed his troops to greater speed in the attack, Johnston's forces would have arrived too late to influence the battle.¹⁵

Confederate field commanders exacerbated the scheduling problem by ordering trains to do their bidding. As seen earlier, the North surmounted this problem through the efforts of Herman Haupt. It took a general order from Robert E. Lee to attempt to fix this problem.¹⁶

The First Manassas Campaign was indicative of the problems that would plague the Confederate railroad system

for the rest of the war. Rolling stock was available in limited numbers in order to affect smooth transfers between the Shenandoah Valley and Manassas, not to mention from more remote parts of the Confederacy. In addition, there was only one line of track to affect the movement. At the conclusion of the campaign, railroad owners admitted that they needed as much lead time as possible to facilitate train coordinations in order to get the numbers of troops needed to any particular area.¹⁷ The Manassas scenario would be repeated time and again in which a faltering rail system would not meet the expectations of the Confederate high command. Fortunately for the South, its transportation weaknesses would be matched by a bumbling Union tactical effort in which Federal forces moved either too slowly or did not reinforce promptly utilizing their superior transportation network.¹⁸

Several leaders in the Union army recognized the Southern weakness with regard to their rail system. On 7 September 1861 J. H. Sullivan, a special agent for the Baltimore and Ohio Railroad, wrote General George McClellan that the Confederate railroads were in terrible shape and that their removal of nine miles of railroad track and key machinery from the Martinsburg, Virginia, repair shop pointed to that effect. McClellan's after action report covering the operations of the Army of the Potomac from 27 July 1861 to 9 November 1862 also indicated that he too understood the

weakness of the Confederate rail system.¹⁹

There are numerous historical examples that support these two men's understanding of the weakness of the Southern rail system. Confederate railroads took four days to move General William H. Whiting's 6,000 men from Richmond, Virginia, to Charlottesville, Virginia, in June 1862, a distance of only 75 miles with an average speed of just over 1 mph.²⁰ In another case, in February 1863 the average speed of a large troop movement was 3.5 mph.²¹ Numerous other movements of a general nature bear out this loss in average speed to ridiculously low levels. It took five days in June and July of 1862 for General Samuel McGowan's division to move from Atlanta, Georgia, to Chattanooga, Tennessee, a distance of some 250 miles. This works out to an average speed of just over 2 mph.²² Again in December 1862 it took three weeks to move 9,000 men from Murfreesboro, Tennessee, to Jackson, Mississippi, a distance of 600 miles with an average speed of 1.7 mph.²³

In 1862, Confederate railroads enjoyed some success in moving men and equipment in accordance with an army commander's wishes. The concentration of forces for the Battle of Shiloh showed what could be accomplished with the use of rail transportation. Again, from 27 June 1862 to 3 July 1862 General Braxton Bragg moved 3,000 men 776 miles to Chattanooga on a trial basis with an average movement speed of 7 mph.²⁴

In order to fully appreciate the dearth of Confederate resources and the problems with scheduling, one must understand line-haul capacity and the amount of rolling stock needed to move large numbers of troops and equipment in order to take advantage of interior lines. The average coach measured 42'x 9.5'x 6.5'.²⁵ Passenger cars carried from 50 to 60 personnel.²⁶ Freight loads varied from five to thirteen tons per car with the average being about ten tons.²⁷ Train length also varied according to weight and locomotive size. The average size for a Northern train was ten cars per locomotive.²⁸ In the South, train size seldom exceeded fifteen cars.²⁹

Therefore, these figures indicated that 160 cars and from eleven to sixteen engines per day were needed to adequately supply an army of 100,000 men.³⁰ It also meant that 100 cars and from seven to ten locomotives were needed to transport 5,000 soldiers from any given point in an expeditious manner. These numbers would be the minimum required if there were no gauge differences and Southern railroad companies agreed to share their rolling stock. (The numbers would double if there were just one gauge change in the planned movement.) It is readily apparent that rolling stock would be very valuable to the Confederacy if it was going to use its geographic advantage of interior lines.

It must also be remembered that these trains would be running over a single track with very few sidings. It is easy

to see how a major troop movement could conceivably turn into a logistical nightmare just from a scheduling standpoint. Railroad officials would have to juggle much needed supplies to the army in place and also plan for reinforcements coming in utilizing the same line. This scheduling situation worsened as empty trains had to be re-routed back to a terminus to pick up another load of soldiers in order to compensate for scarce rolling stock.

With the demands placed upon them from the war, locomotives and rails wore out quickly. Thermal efficiency worsened and locomotives were idled due to a shortage of spare parts³¹. Confederate authorities cannibalized secondary lines of both rails and rolling stock in order to keep main lines in operation. This decision did not sit well with railroad owners whose lines had equipment removed from them to keep the more important lines in operation. In some cases, parochial railroad owners believed that this practice was a plot conceived by competitors to drive them out of business.³²

Southern industry was unable to meet the demands needed by the rail system in order to keep the lines open. Only one plant, the Tredegar Iron Works in Richmond, could make springs of the right quality to be used in locomotive and rolling stock construction. In addition, only one plant in Georgia produced wheels for railroad cars in the Confederacy. This was done at the rate of fifteen a day. This production

could not even keep up with replacement of worn wheels, much less support the construction of new cars.³³ Additionally, since other war items took industrial priority over railroads, rails were not manufactured in the South.³⁴ Individual companies attempted innovative solutions. Railroad companies built small foundries to re-roll rails in order to lessen the impact of no new rails. On one occasion, the Richmond, Fredericksburg, and Potomac Railroad shop manufactured its own locomotive from cannibalized parts. The Seaboard and Roanoke produced grease from whale blubber in order to lubricate its machinery.³⁵ Without a concerted effort on the part of Southern industry, these innovations would not be able to reverse the decline of the Confederate railroad system.

These industrial shortfalls were exacerbated by a shortage of trained labor. Confederate generals, including Robert E. Lee, fought against giving up soldiers who were trained mechanics in order to run the railroads.³⁶ During the pre-war years railroad experts considered four workers per mile of track as the recommended number of railroadmen for safe operations. In August of 1862, only 5,718 men were deferred from military service to run 6,222 miles of track in the Confederacy. Railroad owners attempted to utilize slave labor but the results were disappointing.³⁷ Lacking in spare parts and trained labor, it is no surprise that the Southern rail network fell apart as quickly as it did.

The erosion of the Southern railroad system is best seen in the United States Military Railroad (USMRR) reports which regularly assessed conditions from 1863 onward. The vast majority of the over 2,000 miles of USMRR track consisted of captured Confederate railroads. These reports painted a grim picture of Southern rail transportation. In a 24 November 1863 report, William Wright wrote about terrible rail conditions in the western theater, poor machine shops, and frequent accidents.³⁸ Adna Anderson's report of 8 September 1863 showed similar problems in northern Virginia.³⁹ The most telling report, however, was General Daniel McCallum's; he showed that to operate with the desired efficiency, the USMRR not only had to replace worn track and rebuild numerous bridges, but also had to change the gauges of many of the more important tracks to assist in the transfer of rolling stock.⁴⁰

To add to this bleak technical picture, the tactical situation also deteriorated rapidly. In April 1862 Union forces captured Corinth, Mississippi, effectively cutting the South's major east-west rail line. This meant that reinforcements from Virginia would have to be routed down the eastern seaboard instead of through the more direct Virginia, eastern Tennessee and Alabama route. With Corinth's fall, Chattanooga became the major western terminus. By September of 1863, both Chattanooga and Knoxville had fallen to Union forces forever cutting the east-west rail lines for the

Confederacy. The cutting of this strategic line added 225 miles to the distance that Confederate rail lines would have to travel in order to move soldiers from one theater to another (705 miles as opposed to 480 miles).

While these were permanent losses for the Confederacy, they do not tell the entire story. Union forces increasingly used cavalry like their Southern counterparts to disrupt the enemy rail network, the most famous being Colonel Benjamin H. Grierson's raid in 1863.⁴¹ In addition, Union sympathizers burned bridges and tore up track in eastern Tennessee to assist in interdicting Confederate transportation. Oddly enough, no attempt was made by Union forces to interdict the seaboard railroad lines in North and South Carolina to cut Confederate rail movement until 1864 in anticipation of Sherman's march north. By then, cutting the seaboard line was not as crucial due to the Danville gap being completed in early 1864.⁴²

Union control of the waterways also played havoc with the Southern rail network. Union commanders utilized gunboats to destroy key bridges over the rivers.⁴³ From 1862 onward, Federal gunboats controlled the rivers. This had a deleterious effect on rail transportation because bridges over these waterways were not safe. In addition, replacing these bridges would be a major engineering undertaking.⁴⁴

Unlike the Northern armies, the Confederates could not quickly repair the damage done to their rail system. This

fact was due in large measure to an inferior command structure, which held that through 1863 the individual railroads were responsible for the repair of their own lines. This view was in accordance with the Southern belief in laissez-faire government. There was no Construction Corps as in the Union forces. Nor was there a stockpile of spare parts or pre-fabricated bridges that Southern companies could draw upon in order to quickly repair damaged lines.⁴⁵ After 1863, the Secretary of War tasked the Confederate Engineer Bureau to assist railroad owners in re-building their lines.⁴⁶

Confederate raids upon Union railroads were extremely damaging and Confederate cavalry commanders like Joseph Wheeler, John H. Morgan, and Nathan Bedford Forrest interrupted Northern lines on a regular basis. The impact of these raids was lessened however, by the Union Construction Corps.⁴⁷ For these raids to offer the South a strategic advantage, measured only in days, these cavalry raids would have to be part of an overall strategic plan to interdict Federal reinforcements from arriving to offset a Southern movement. Evidence indicates that while this idea was attempted, at no time during the war did this sort of synchronization occur along with the corresponding movement of a large body of Confederate forces.⁴⁸

Union raids were much more damaging. It took longer to repair Union damage done to Confederate lines. This not only

interdicted troop movements, but also supplies to Confederate forces. Like their Southern counterparts, Federal commanders did not synchronize their raids to gain a decisive advantage in any theater.

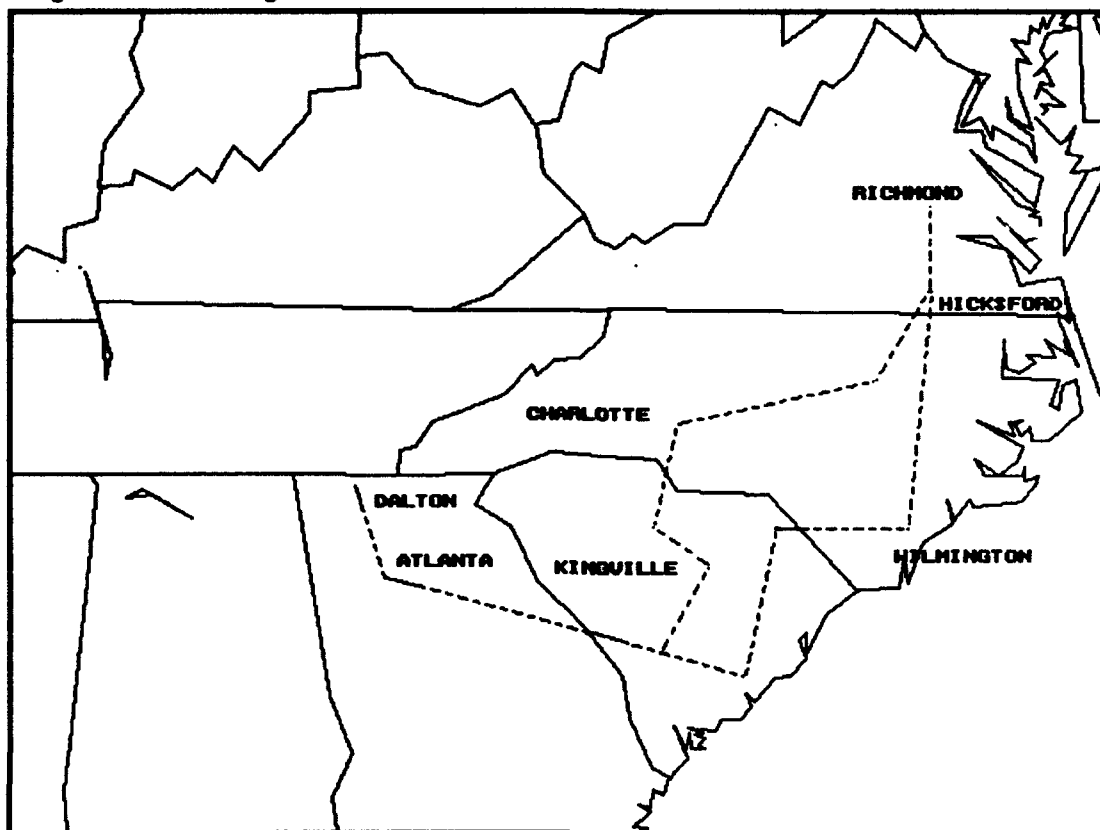
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By 1863 the Confederacy had lost its interior lines advantage. Its rolling stock was wearing out as quickly as its rails. Union forces were destroying every piece of railroad equipment that they could lay their hands on. To make matters worse, some Confederate commanders destroyed rail equipment to keep it from falling into Union hands, when instead, this equipment could have been safely evacuated.⁴⁹ Scheduling problems still persisted, exacerbated by a dearth of rolling stock. This loss of interior lines is most evident in the Chickamauga Campaign.

Chickamauga shows the fallacy of the belief that the Confederates enjoyed the strategic advantage of interior lines because of the time-space relationship comparisons between the Union and the Confederate troop movements that occurred as a result of this battle. The Confederate plan called for the movement of General James Longstreet's entire corps of 15,000 men from Richmond, Virginia, to Dalton, Georgia, to reinforce General Braxton Bragg's Army of Tennessee. This would give the Confederate forces a numerical advantage over General Rosecrans' forces and, the

Figure 3: Longstreet's Route: 1863

Confederates hoped, ensure a Southern victory. This movement began on 9 September 1863 over a route that was approximately 750 miles long. (See Figure 3.) On 19 September 1863 Longstreet was able to attack with just 7,000 men, or one half of his corps. He had neither his baggage trains nor his artillery for this attack. It was not until 25 September 1863 that Longstreet's artillery and trains arrived. The other half of his forces arrived between the 20 and 25 September.⁵⁰ It took nine days for the railroads to move 7,000 men this distance. This averages out to almost 4 mph

for these forces. Had Bragg waited for Longstreet's entire corps to arrive before committing them to battle, speed time would have dropped to 2.5 mph. These figures are in keeping with the other data that shows the relative decline in speed of the Confederate rail network.⁵¹

Contrast this with the movement of 23,000 men under General Joseph Hooker from Alexandria, Virginia, to just west of Chattanooga, Tennessee, a distance of 1,200 miles in just seven days. This movement was accomplished with the soldiers arriving in the vicinity of Chattanooga with all of their equipment. The average speed was 9.5 mph. It is interesting to note that almost 300 miles of this movement came over captured Confederate rail lines.

When comparing these two important troop movements, one can reach several conclusions. First, Union transportation was twice as fast as Confederate transportation. Second, the line-haul capacity was more than three times greater for Union railroads than their Confederate adversaries--23,000 men plus equipment as opposed to 7,000 men without equipment in approximately the same amount of time. Finally, the tactical defeat of the Union forces was more than offset by the timely reinforcements that the Federal high command ordered to Rosecrans.⁵²

In one of the few times that Confederate forces had a numerical advantage against an opponent, they came up lacking. Part of this deficiency is due to Bragg's handling

of the battle. Much more of it is due to the Southern railroads' inability to move forces in an expeditious manner. Had the railroads been more responsive to movement needs, Longstreet would have had double the number of men with which he could attack. Additionally, he would have taken fewer casualties if he had his artillery with him in support of his attack on Union General George Thomas's position on Snodgrass Hill. With 8,000 extra men Bragg also had the prospect of launching a pursuit that would have essentially eliminated Rosecrans' army as a force in the western theater.

These thoughts, however, are just conjecture. So often touted by historians such as Frank Vandiver, Glenn Tucker, and James McPherson, as the prime example of superior use of interior lines, Chickamauga is just a repetition of the slipshod support that Southern armies received during the First Bull Run Campaign. In the technical sense of the word, the South did in fact use interior lines on a strategic level to gain an advantage. The results, however, were very disappointing and actually indicate a loss of this advantage by the South when compared to the North's clear superiority in moving large bodies of troops over similar distances.

ENDNOTES

1. Archer Jones, "Jomini and the Strategy of the American Civil War, A Reinterpretation," Military Affairs 34 (December 1970): 129-130. Jones maintains that Chickamauga was the maturation of the Confederate use of interior lines.
2. It is interesting to note that historians such as Robert Black and Archer Jones do not dispute Richard Goff's claim that the Confederate rail system was unable to supply the Army of Northern Virginia as early as 1862. Yet these same historians still maintain that the same railroad network that could not get supplies to the premier Confederate field army could still move large troop concentrations anywhere in the Confederacy to either redress a tactical imbalance or mass for a decisive blow. See Richard Goff, Confederate Supply (Durham: Duke Univ. Press, 1969): 79-80; 146; 196.
3. See ARJ, 15 (5 March 1859): 146, for the highest safe speed. See also Turner, Victory, 40. Turner rightfully points out that speeds are a function of track condition. As the conditions worsen, speeds will decrease.
4. Murphy, "Northern Railroads," 325.
5. Estaville, Neckties, 10.
6. Trelease, North Carolina Railroads, 71, 73. Speeds averaged out to 20 mph prior to the war. Black, Confederate Railroads, 133.
7. Trelease, North Carolina Railroads, 164. Trelease shows that as the war progressed speeds rapidly dropped from 20 mph

to less than 10 mph, with speeds going to walking speed later in the war.

8. See The War of the Rebellion: Official Records of the Union and Confederate Armies, 128 volumes, (Washington D.C.: Government Printing Office, 1880-1901) ser.4, 1: 883-885, report by Mr. Waul. Hereafter cited as OR; all citations to ser. 1 unless otherwise noted.

9. Average speeds for Confederate railroads are most easily seen in the records of the USMRR found in RG 92. Most Confederate railroad records were destroyed as Colonel Frederick Sims fled south with Jefferson Davis in 1865. William Wright's 9 September 1863 after action report for the Richmond, Fredericksburg, and Potomac Railroad shows that 10 mph was his average speed over those lines in Virginia. McCallum's "25 May 1866 Report" also found in RG 92 shows that 10 mph was the average speed throughout the South. Finally, General Sherman's logistical trains travelled 10 mph in his 1864 Atlanta Campaign, where his supply line consisted solely of captured rail lines. It must also be remembered that these speeds were attained after the USMRR had repaired the track. See Sherman, Memoirs, 890.

10. Black, Confederate Railroads, 245. Average speed was computed using a sixteen hour movement day.

11. Jubal A. Early, Lieutenant General Jubal Anderson Early, CSA: An Autobiographical Sketch and Narrative of the War Between the States (Philadelphia: J. B. Lippincott, 1912):

373, 378.

12. Ibid., 55.

13. See the 31 August 1863 report by F. H. Forbes, a special agent commissioned to report on the condition of Southern and Western railroads by General Daniel McCallum, found in RG 92. Forbes points to frequent accidents on the railroads in the western theater, and an average speed of only 8 mph.

14. This was the fourth brigade brought by Johnston from the Valley, which de-trained at 1600 hours and marched straight into battle. See McPherson, Battle Cry, 344.

15. Johnston was extremely damning in his assessment of the railroad's performance. See Johnston, Memoirs, 58.

16. Ramsdell, "Confederate Government," 798. Even with Lee's General Order #1, general officers still interfered with the railroads. See the letter from Secretary of War James Seddon to R. R. Cuyler, president of the Western and Atlantic Railroad of Georgia, 10 December 1862, "Confederate Railroad Papers," in RG 107, stating that he ordered the Commanding General in Tennessee not to interfere with the operations of railroads in his sector.

17. See 11 May 1862 letter from Virginia Central President I.M. Fontaine to Secretary of War James Seddon, RG 107, concerning his railroad's inability to meet demands unless adequate warning was given to his line.

18. It is erroneous to assume that the Confederates did not take steps to alleviate the problems encountered during this

first campaign. The Confederate government appointed William Ashe as the railroad coordinator for the Virginia theater following the campaign. He would resign a year later, disillusioned over his inability to influence scheduling and railroad policy with the railroad owners on the eastern seaboard. See Black, Confederate Railroads, 65-70.

19. McClellan's report (4 August 1863) in QR, 5: 7; letter, J. H. Sullivan to McClellan, 7 September 1861, *ibid.*, 568. McClellan wanted forces to cut the Eastern Tennessee and Virginia Railroads while Ambrose Burnside's North Carolina expedition cut the seaboard road in order to isolate Richmond.

20. See Black, Confederate Railroads, 178-179. Average speed was figured using an sixteen hour work day.

21. *Ibid.*, 193. It took thirty hours for one brigade of Confederate infantry to travel 107 miles.

22. QR, 16, pt. 2: 721. The calculation is based upon continuous 24 hour operation. The average speed would increase to 4 mph if the railroads only operated sixteen hours a day.

23. Black, Confederate Railroads, 192. Average speed figured using a sixteen hour day. In addition to rail transportation, these troops had to utilize waterborne transports from Montgomery to Selma.

24. *Ibid.*, 181. This speed was determined using sixteen hour days as one day's travel time. While impressive for the

South, care must be taken in viewing this as the norm. Bragg's subordinates had over two weeks notice to ensure that the proper train equipment and track conditions were available for this movement. In addition, only six trainloads were needed to accomplish this feat using an average train size of ten cars with fifty men per car.

25. Eugene Alvarez, Travel on Southern Antebellum Railroads, 1828-1860 (University: Univ. of Alabama Press, 1974): 51.

26. Weber, Northern Railroads, 11; Sherman, Memoirs, 890. Sherman used fifty soldiers per car as his average planning figure. Sherman's figure will be used for all future troop movement calculations.

27. Weber, Northern Railroads, 12, states that weights ranged from five to ten tons. Black, Confederate Railroads, 18, stated that average tonnage was eight tons. Johnson, Virginia Railroads, 14, states that Virginia railroads averaged thirteen tons. William Wright's 9 September 1863 report in RG 92 stated that the average weight was ten tons per car. Ten tons per car will be the average used for any future movement calculations.

28. Sherman, Memoirs, 890.

29. Black, Confederate Railroads, 18; Johnson, Virginia Railroads, 14. For any future estimates of train size needed to move troops, ten cars per train will be utilized as the Confederate average.

30. Sherman's army needed 1600 tons of supplies per day in order to continue its offensive against General Joseph Johnston in 1864. See Sherman, Memoirs, 890.

31. Black, Confederate Railroads, 171. Black states that by 1863 no less than fifty locomotives were idled due to worn tires.

32. See the 4 November 1862 letter from Secretary of War George Randolph to Major General Faurney concerning the impressment of rails from the Montgomery and West Point Railroad; and the 12 September 1863 letter from Secretary of War James Seddon to Mr. Pollard concerning the removal of rolling stock from the Alabama and Pensacola railroad; both found in "Secretary of War Correspondences," RG 107.

33. Black, Confederate Railroads, 118. Charles Dew shows that the Tredegar Iron Works was also producing wheels and axles for the railroads from 1863 onward, but not in the quantities needed to materially affect the war. He supports Black's claim that Tredegar did not produce a single rail during the war. Tredegar did, however, produce rail spikes and chairs (metal brackets used to seat the rails onto ties) in large quantities to assist railroad companies in repairs. Dew blames the lack of railroad support on no centralized planning at the governmental level, and on the rapid re-tooling of the Tredegar Works to produce war material. See Charles Dew, Ironmaker To the Confederacy: Joseph R. Anderson and the Tredegar Iron Works (New Haven: Yale Univ. Press,

1966): 126-128, 268-270, 273.

34. Johnston, Virginia Railroads, 13. Interestingly enough, Confederate General E. Porter Alexander states that there was one plant in Atlanta that was producing rails during the war. See Battles and Leaders, 3: 746.

35. Black, Confederate Railroads, 90-91.

36. Things were so bad for the railroad owners that Secretary of War George Randolph had to intercede with the Virginia Provost Marshall to get trained engineers released from impressment. See letter from Secretary Randolph to Colonel Griswold, Provost Marshall, 14 March 1862, RG 107.

37. For a good overview of this point see Walter Licht, Working For the Railroads: The Organization of Work in the Nineteenth Century (Princeton: Princeton Univ. Press, 1983): 71-73.

38. Report William W. Wright to Colonel Daniel McCallum, 24 November 1863, RG 92. Wright's recommendation was to replace the entire line from Nashville to Chattanooga as soon as possible.

39. "Report of Adna Anderson, Chief Engineer of Construction, USMRR, Virginia," RG 92.

40. General Daniel McCallum, "May 1866 Report," RG 92. There are several letters in the "Engineer Papers," RG 107 that show poor conditions in the Confederate interior in 1863 and 1864. In addition to these letters in the "Engineer Papers" see the 23 September 1863 letter from Major Charles Carrough

to Captain T. Sharp concerning the Greenville Railroad in South Carolina and also an undated letter from Major John Whitford to Colonel Josiah Gorgas concerning broken railroad cars and poor rail shape in North Carolina found in Officer Records, M331, roll 260, National Archives.

41. Tenney, Civil War History, 349-351. Tenney states that one of the primary missions of Grierson's raid was to interrupt the flow of men and material in the western theater to support Union operations against Vicksburg. Stephen Starr, The Union Cavalry in the Civil War 2 vols., (Baton Rouge: Louisiana State Univ. Press, 1979): 1: 290, shows that in 1862 Union cavalry raids in the Virginia theater, while directed at railroads, were not tied to any strategy.

42. Charles Price, "The United States Military Railroads in North Carolina, 1862-1865," North Carolina Historical Review 13 (July 1976): 243-264, offers an excellent description on those railroads and the tactical plan used to support General Sherman's drive into the Carolina's.

43. After the fall of Forts Henry and Donelson, General Grant ordered Captain Andrew Foote to destroy the railroad bridge at Clarksville over the Cumberland River to cut Johnston's supply lines with Kentucky. See Bruce Catton, Grant Moves South (Boston: Little Brown and Company, 1960): 150-152.

44. The Engineer Papers in RG 107 show how army engineers were used increasingly to repair damage done to railroads

from 1863 onward. As an example, see the letter 13 February 1864 letter from General P. G. T. Beauregard to Major Echols.

45. General Joseph E. Johnston during his 1864 Atlanta Campaign pre-fabricated bridges to be utilized in his skillful withdrawal. Unlike the Union Construction Corps which carried these bridges as standard equipment, Johnston had them specially made for his particular situation. Henry Stone, "The Atlanta Campaign," The Mississippi Valley, Tennessee, Georgia, Alabama, 1861-1864: Papers of the Military Historical Society of Massachusetts, 8 vols. (Boston: Historical Society of Massachusetts, 1910), 8: 369.

46. There are numerous letters in RG 107 which point this out. As examples, see the letter from Secretary of War James Seddon to General Robert E. Lee, 8 December 1862, concerning the opening of supplies to the Army of Northern Virginia; and the letter from General P.G.T. Beauregard to Major Echols, 13 February 1864, concerning the need for Major Echols to use his engineer troops to assist the South Carolina railroad companies in re-building their lines.

47. Kincaid Herr, The Louisville and Nashville Railroad, 1850-1963 (Louisville: Public Relations Department, Louisville and Nashville Railroad, 1943): 35. Herr maintains that Confederate raids were nothing more than nuisances due to the fine work of the Union Construction Corps.

48. General Joseph Johnston used his cavalry in 1862 to turn back General Ulysses S. Grant during the 1862 Vicksburg

Campaign by destroying his base of supplies at Holly Springs. This advantage was not, however, tied to any strategic troop movement where Grant's army, then effectively isolated, would be defeated by superior Confederate troop strength. It did leave General John C. Pemberton free to concentrate at Vicksburg, which he did to some degree. W. J. Tenney, The Military and Naval History of the Rebellion in the United States, With Biographical Sketches of Deceased Officers (New York: D. Appleton and Co., 1866): 331-332.

49. In many cases this was unavoidable. In several cases, specifically in Mississippi in the latter part of 1863, it was gross negligence on the part of the area commander, General Joseph Johnston. At the outset of the war, rolling stock was already a short commodity. Any destruction through negligence was inexcusable. Several letters in RG 107 address the importance of rail supplies to the Confederate cause. See letter from Secretary of War George Randolph to General Faurney, 4 November 1862; and from Mr. Pollard to Secretary of War James Seddon, 12 September 1863. See also Lash, Destroyer, 158, for Johnston's callous disregard of rolling stock in Mississippi. Interestingly, Lash puts forth the theory that Johnston was relieved in August 1864 due in great part to lobby efforts from Mississippi railroad owners who were incensed over the loss of their equipment. There is no evidence of this in Jefferson Davis' papers.

50. Glenn Tucker does an excellent job in showing both the poor shape of the Confederate railroads and the slow nature of the Confederate high command decision-making process during the initial phases of the Chickamauga Campaign. His distances travelled, however, are inaccurate in that Tucker states that Confederate forces would have to travel 1200 miles to re-enforce Braxton Bragg's army. (This was the distance that Union forces travelled to re-enforce Union General George Thomas at Chattanooga.) The maximum distance that Confederate forces travelled was approximately 750 miles. Tucker lists the major problems with the troop movement: gauge changes, poor rolling stock, poor scheduling, "rickety rails," and slow train speed. See Glenn Tucker, Chickamauga: Bloody Battle in the West (Indianapolis: Bobbs-Merrill, 1961): 91-94, 99-100.

51. Herman Hattaway and Archer Jones, How the North Won: A Military History of the Civil War (Chicago: Univ. of Illinois Press, 1983): 449-452. Confederate General Daniel H. Hill called the railroad conditions "wretched" concerning this movement. See Battles and Leaders, 3: 639.

52. Sherman, Memoirs, 891; Tenney, Military History, 459-466. Tenney reproduces the telegrams from General Henry W. Halleck to all subordinate commanders that were within supporting distance of Rosecrans. The Union forces knew as early as 13 September 1863 that Longstreet's corps was moving west. It was with this warning that Rosecrans was able to

pull his far flung corps together to avoid a defeat in detail.

CHAPTER V

CONCLUSION

By 1863 the Southern rail system was no longer able to meet the strategic demands placed upon it. The Confederate high command could no longer depend upon the railroads to support a strategy of concentration against the various Union armies that threatened her existence. Not only was there a dearth of rail resources, most of which had fallen into hopeless disrepair, but there was also an incomplete understanding at the highest levels as to the importance of the Confederate railroad network and how to best utilize it.

Many important military leaders in the Confederacy such as Albert S. Johnston, Joseph E. Johnston, James Longstreet, P. G. T. Beauregard, and Braxton Bragg, recognized the importance of rail transportation and the strategy of concentration along interior lines. What is more, these leaders actively proposed using the rail system to implement such a strategy. In the early part of the war these men were successful in getting the government to support their plans, as evidenced by the movements during the Manassas, Seven Days, Shiloh, and 1862 Kentucky Campaigns. After 1862, there was increasing reluctance on the part of the government to strategically shift major bodies of troops from one theater to another.¹ Once Jefferson Davis finally made the decision

to send James Longstreet's corps from Virginia to reinforce the Confederate Army of Tennessee in September of 1863, the Confederate rail system was unable to support the strategic plan in a timely fashion.

If his messages to Congress are any indication of his true thoughts on the subject, Jefferson Davis also recognized the importance of the rail system. Because of his belief in the state's rights system of government, Davis was unwilling to nationalize Southern railroads until the Confederate Congress approved such an action. Davis was unwilling to exert any pressure on the Congress in order to facilitate better control of rail assets.

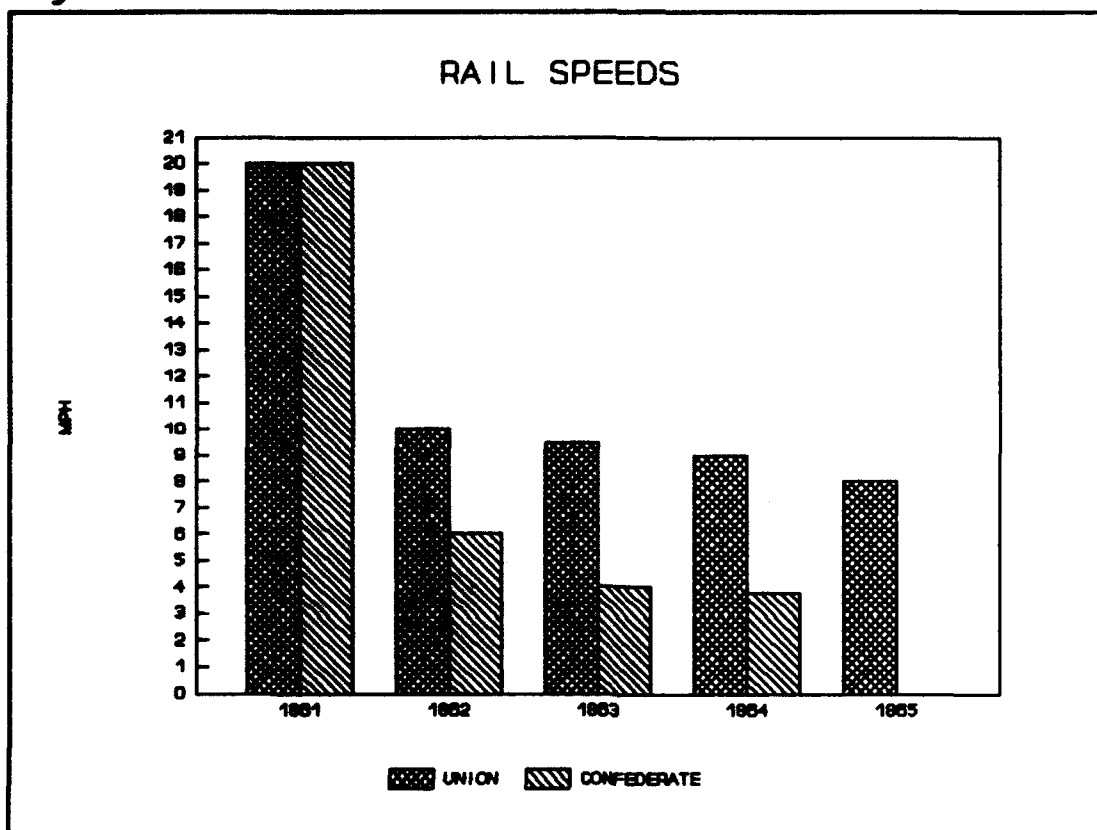
From 1863 to the end of the war, the Confederate government attempted to centralize its control of the railroads. In May 1863 Senate bill 112 was signed into law giving Jefferson Davis the power to nationalize railroads in emergencies. It was not until the end of 1864 that Colonel Frederick Sims attempted to harness the power of Confederate industry in order to attempt to alleviate some of the critical shortages that plagued the railroad system in the way of spare parts, rails, and new boxcars.² In 1865, at the prodding of Robert E. Lee, Congress finally passed a law nationalizing all railroad assets. These efforts were too little and came too late to effectively organize the Southern rail network.

Historians Robert Black and Allen Trelease used the loss

of locomotive thermal efficiency as a sure indicator that the Southern railroads were worn out. The easiest method, however, in viewing the physical decline of the Southern railroad system is through the loss of speed in carrying troops from one theater to another. This method is also particularly germane in assessing Southern ability to utilize their geographic advantage of interior lines. Figure 1 gives an analysis of Confederate railroad speed as compared to Union railroad speeds throughout the war.³ What is readily apparent is that Confederate speeds continued to decline throughout the war while Union speeds leveled off at about 10 mph from 1862 onward. Union speed loss can be attributed to several factors: increased traffic, heavier train loads, and increasing operation on captured lines. The constant train speed from 1862 onward is an indicator of an excellent and repair system.

Confederate speed loss can be attributed to a number of factors: increased traffic, a dearth of spare parts, no new rails, losses in rolling stock and rail lines during the war, and a weak repair program. These factors combined to rob the South of one of its major strategic advantages during the war: interior lines. The year 1863 is the critical one. By 1862 the situation had degenerated on the Confederate railroads to the point where Union forces could move reinforcements much faster than their Confederate counterparts. With the fall of Knoxville and Chattanooga in 1863, the

Figure 4

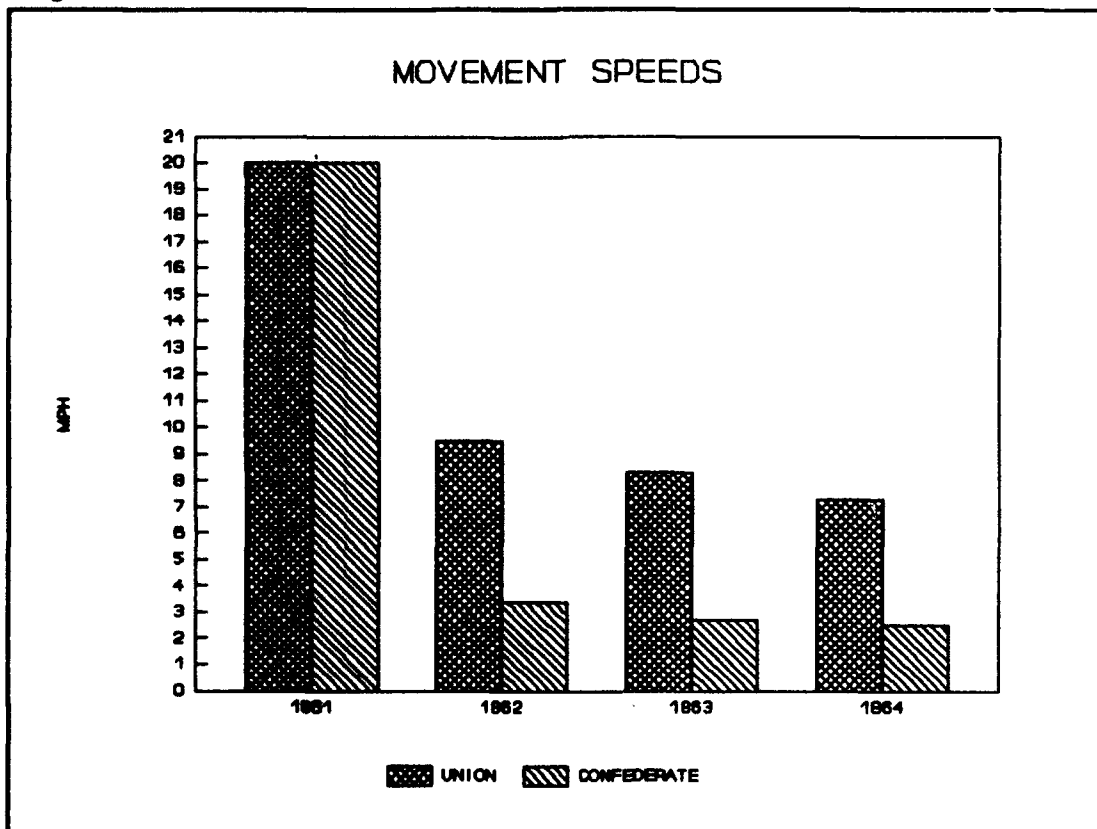


Confederate government would have to use a roundabout route to move forces between its major field armies. This increased distance, coupled with the much slower train speeds, signalled the loss of the advantage of interior lines advantage for the Confederacy. Through an important application of technology, Union forces would be able to overcome a geographical disadvantage and in fact move forces faster than the Confederates who enjoyed the advantage of central position. The Chickamauga Campaign is the primary example of this Union advantage. The performance of the

Confederate rail system, and the corresponding Union response, indicated that the South's one chance for victory using strategic concentration was gone.

Figure 5 shows the movement speed for both sides. Unlike Figure 4 which factored in eight hours per day of rescheduling time, Figure 5 is based upon 24 hours of continuous operations. This takes into account all variables that affect the movement of troops by the railroads: scheduling, interconnection problems, crew fatigue,

Figure 5



recalcitrant owners, and governmental control.

The relative trends for Figure 5 are the same as for Figure 4. Both figures point to serious weaknesses in the Southern rail network. Both tend to support the contention that not only was the Confederate rail system falling apart by 1863, but that Southern control of its rail assets was also as incomplete as its ability to maintain its physical integrity. This supports the view that the South lost its interior lines advantage much earlier than previously believed.

ENDNOTES

1. Thomas Connelly and Archer Jones, The Politics of Command: Factions and Ideas in Confederate Strategy (Baton Rouge: Louisiana State Univ. Press, 1973): 177. Connelly and Jones maintain that the basic pattern of Confederate strategy from 1861-1863 was to use the railroads to affect a surprise concentration against unsuspecting Union forces.
2. Dew, Ironmaker to the Confederacy, 270.
3. Movement speed is a function of both the speed travelled by trains and scheduling. The speeds shown in the figure are movement speeds which take into account scheduling difficulties by using the total distance travelled divided by the time it took for the movement to be completed.

BIBLIOGRAPHY

Primary Sources: Autobiographies

Early, Jubal Anderson. Lieutenant General Jubal Anderson Early, CSA: An Autobiographical Sketch and Narrative of the War Between the States. Philadelphia: J. B. Lippincott, 1912.

Grant, Ulysses S. Personal Memoirs of U. S. Grant. 2 vols. New York: Charles L. Webster and Co., 1885.

Haupt, Herman. Reminiscences of General Herman Haupt. Milwaukee: Wright and Joys, 1901.

Johnston, Joseph E. Narrative on Military Operations Directed During the Late War Between the States. New York: D. Appleton, 1874.

Longstreet, James. From Manassas to Appomattox: Memoirs of the Civil War in America. Bloomington: Indiana Univ. Press, 1960, [1896].

McClellan, George. McClellan's Own Story: The War For the Union. The Soldiers Who Fought It. The Civilians Who Directed It, and His Relations to It and Them. New York: Charles L. Webster and Co., 1887.

Meade, George. The Life and Letters of George Gordon Meade, Major General United States Army. 2 vols. New York: C. Scribner's Sons, 1913.

Sherman, William T. Memoirs of General W. T. Sherman. New York: Literary Classics of the United States, 1990,

[1885].

Primary Sources: Edited

The American Railroad Journal. Edited by Henry Poor. New York: J. M. Schurtz and Co., 1832-1886.

Battles and Leaders of the Civil War. 4 vols. Edited by Robert Johnson and C. C. Buel. New York: Thomas Yoseleff, 1956.

De Bow's Review. Edited by J. B. D. De Bow. New Orleans: Office of De Bow's Review, 1850-1862.

The Industrial Resources, ETC. of the Southern and Western States. 3 vols. Edited by J. D. B. De Bow. New Orleans: Office Of De Bow's Review, 1853.

Lee's Dispatches: Unpublished Letters of General Robert E. Lee, CSA to Jefferson Davis and the War Department of the Confederate States of America, 1862-1865. Edited by Douglas Southall Freeman and Grady McWhiney. New York: G. P. Putnam's Sons, 1957.

The Messages and Papers of Jefferson Davis and the Confederacy, Including Diplomatic Correspondences, 1861 to 1865. 2 vols. Edited by James Richardson. New York: Chelsea House, 1966, [1905].

Primary Sources: Other

Journal of the Confederate Congress of the CSA: 1861-1865. 7 vols. Washington, D.C.: Government Printing Office,

1904.

Record Group 92: Records of the United States Army Quartermaster Office, 1798-1916. "Operational Reports on Military Railroads, 1863-1864." National Archives, Washington, D.C.

Record Group 107: Official Confederate War Records. Selected volumes; "Confederate Railroad Bureau Papers," "Confederate Engineer Bureau Papers," "Correspondence Records of the Office of the Secretary of War." National Archives, Washington, D.C.
Richmond Enquirer. Richmond, Virginia, 1860-1865.

The War of the Rebellion: A Compilation of the Official Records of the Union and Confederate Armies. 128 vols. Washington, D.C.: Government Printing Office, 1880-1901.

Secondary Sources

Articles

Bogle, James. "The Western and Atlantic Railroad--1864." Atlanta Historical Journal 25 (Summer 1981): 45-72.

Campbell, E. G. "Railroads in National Defense, 1828-1848." Mississippi Valley Historical Review 27 (December 1940): 361-378.

Fishlow, Albert. "Antebellum Interregional Trade Reconsidered." American Economic Review 54 (May 1964): 352-364.

Hermon, Murphy. "The Northern Railroads and the Civil War."

Mississippi Valley Historical Review 5 (June 1918-March 1919): 324-338.

Jones, Archer. "Jomini and the American Civil War, A Reinterpretation." Military Affairs 34 (December 1970): 127-131.

Lash, Jeffrey. "Joseph E. Johnston and the Virginia Railways, 1861-1862." Civil War History 35 (March 1989): 1-33.

Price, Charles. "The United States Military Railroads in North Carolina, 1862-1865." North Carolina Historical Review 53 (July 1976): 243-264.

Ramsdell, Charles. "The Confederate Government and the Railroads." American Historical Review 22 (July 1917): 794-810.

Sutton, Robert. "The Origins of American Land-Grant Railroad Rates." Business History Review 40 (Spring 1966): 66-76.

Ward, James. "A New Look at Antebellum Southern Railroad Development." Journal of Southern History 39 (August 1973): 404-419.

Monographs

Alexander, Edwin. Civil War Railroads and Models. New York: Fairfax Press, 1989.

Alvarez, Eugene. Travel on Southern Antebellum Railroads, 1828-1860. University: Univ. of Alabama Press, 1974.

- Beringer, Richard, et al. The Elements of Confederate Defeat: Nationalism, War Aims, and Religion. Athens: Univ. of Georgia Press, 1988.
- Black, Robert. The Railroads of the Confederacy. Chapel Hill: Univ. of North Carolina Press, 1952.
- Brown, Cecil. A State Movement in Railroad Development: The Story of North Carolina's First Effort to Establish an East-West Trunk Line Railroad. Chapel Hill: Univ. of North Carolina Press, 1928.
- Catton, Bruce. Grant Moves South. Boston: Little Brown and Co., 1960.
- Connelly, Thomas, and Jones, Archer. The Politics of Command: Factions and Ideas in Confederate Strategy. Baton Rouge: Louisiana State Univ. Press, 1973.
- Conrad, Bryan, and Eckenrode, H. J. James Longstreet: Lee's Warhorse. Chapel Hill: Univ. of North Carolina Press, 1986, [1936].
- Dew, Charles. Ironmaker to the Confederacy: Joseph R. Anderson and the Tredegar Iron Works. New Haven: Yale Univ. Press, 1966.
- Dodge, Theodore. Great Captains: A Course of Six Lectures Showing the Influence of the Art of War on the Campaigns of Alexander, Hannibal, Ceasar, Gustavus Adolphus, Frederick, and Napoleon. Boston: Houghton Mifflin, 1898.
- Eaton, Clement. A History of the Southern Confederacy. New

- York: Macmillan and Co., 1954.
- Estaville, Lawrence. Confederate Neckties: Louisiana Railroads in the Civil War. Ruston: McGinty Publications, 1989.
- Fitch, Roger, and Duncan, Major. The Supply of Sherman's Army During the Atlanta Campaign. n.p.: The Army Services School Press, 1911.
- Goff, Richard. Confederate Supply. Durham: Duke Univ. Press, 1969.
- Hagerman, Edward. The American Civil War and the Origins of Modern Warfare: Ideas, Organization, and Field Command. Bloomington: Indiana Univ. Press, 1988.
- Hattaway, Herman, and Jones, Archer. How the North Won: A Military History of the Civil War. Chicago: Univ. of Illinois Press, 1983.
- Henderson, G. F. R. Stonewall Jackson and the American Civil War. New York: Da Capo Press, 1988, [1943].
- Johnson, James H. The Western and Atlantic Railroad of the State of Georgia. Atlanta: Georgia Publishing Service Commission, 1932.
- Johnston, Angus. Virginia Railroads in the Civil War. Chapel Hill: Univ. of North Carolina Press, 1961.
- Jones, Eliot. Principles of Railway Transportation. New York: Macmillan and Co., 1931.
- Lash, Jeffrey. Destroyer of the Iron Horse: General Joseph E. Johnston and Confederate Rail Transport, 1861-1865.

- Kent: Kent State Univ. Press, 1991.
- Licht, Walter. Working For the Railroad: The Organization of Work in the Nineteenth Century. Princeton: Princeton Univ. Press, 1983.
- McPherson, James. Battle Cry of Freedom: The Civil War Era. New York: Oxford Univ. Press, 1988.
- McWhiney, Grady. Braxton Bragg and Confederate Defeat: Field Command. New York: Columbia Univ. Press, 1969.
- Mordecai, John. A Brief History of the Richmond, Fredericksburg, and Potomac Railroad. Richmond: Old Dominion Press, 1941.
- The Official Atlas of the Civil War. Edited by Thomas Yoseloff. New York: Thomas Yoseleff, 1958.
- Philips, Ulrich, B. A History of Transportation in the Eastern Cotton Belt to 1860. New York: Columbia Univ. Press, 1908.
- . The Life of Robert Toombs. New York: Burt Franklin, 1913.
- Piston, William. Lee's Tarnished Lieutenant: James Longstreet and His Place in Southern History. Athens: Univ. of Georgia Press, 1987.
- Poor, Henry. Manual of the Railroads of the United States for 1868-1869. New York: H.V. and H. W. Poor, 1868.
- Pratt, Edwin. The Rise of Rail Power in War and Conquest, 1833-1914. Philadelphia: J. B. Lippincott and Co., 1916.

- Smith, Alfred. Economic Readjustment of an Old Southern State: South Carolina, 1820-1860. Columbia: Univ. of South Carolina Press, 1958.
- Starr, Stephen. The Union Cavalry in the Civil War. 2 vols. Baton Rouge: Louisiana State Univ. Press, 1979, 1981.
- Steele, Matthew. American Campaigns. 2 vols. Washington DC: United States Infantry Association, 1943, [1903].
- Stone, Henry. "The Atlanta Campaign." in The Mississippi Valley, Tennessee, Georgia, Alabama, 1861-1864: Papers of the Military Historical Society of Massachusetts. vol. 8. Boston: Historical Society of Massachusetts, 1910.
- Stovall, Pleasant. Robert Toombs: Statesman, Speaker, Soldier, Sage. New York: Cassell Publishers, 1892.
- Stover, John. History of the Illinois Central Railroad. New York: Macmillan Publishing Co., 1975.
- Taylor, George, and Neu, Irene. The American Railroad Network, 1861-1890. Cambridge: Harvard Univ. Press, 1956.
- Tenney, W. J. The Military and Naval History of the Rebellion in the United States: With Biographical Sketches of Deceased Officers. New York: D. Appleton and Co., 1866.
- Thomas, Emory. The Confederacy as a Revolutionary Experience. Englewood Cliffs: Prentice Hall, 1971.
- Thompson, William. Robert Toombs of Georgia. Baton Rouge:

- Louisiana State Univ. Press, 1966.
- Tratman, E. E. Russell. Railway Track and Track Work. New York: Engineering News Publishing Co., 1897.
- Trelease, Allen. The North Carolina Railroad, 1849-1871, and the Modernization of North Carolina. Chapel Hill: Univ. of North Carolina Press, 1991.
- Tucker, Glenn. Chickamauga: Bloody Battle in the West. Indianapolis: Bobbs-Merrill Co., 1961.
- Turner, George. Victory Rode the Rails: The Strategic Place of Railroads in the Civil War. Indianapolis: Bobbs-Merrill Co., 1953.
- Vandiver, Frank. Mighty Stonewall. New York: McGraw Hill, 1957.
- . Their Tattered Flags: The Epic of the Confederacy. New York: Harper's Magazine Press, 1970.
- Ward, James. That Man Haupt: A Biography of Herman Haupt. Baton Rouge: Louisiana State Univ. Press, 1973.
- Weber, Thomas. The Northern Railroads in the Civil War. New York: King's Crown Press, 1952.
- Williams, T. Harry. P. G. T. Beauregard: Napoleon in Gray. Baton Rouge: Louisiana State Univ. Press, 1954.
- . "The Military Leadership of North and South." Why the North Won the Civil War. Edited by David Donald. New York: Macmillan Publishing Co., 1979.
- Wilson, William. A Few Acts and Actors in the Tragedy of the Civil War in the United States. Philadelphia:

Published by Author, 1892.

Yearn, Wilfred. The Confederate Congress. Athens: Univ. of Georgia Press, 1960.

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