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THE UNITED STATES ARMY AND THE ORIGINS OF MODERN MANAGEMENT, 1818 - 1860

The Ohio State University

Ph.D. 1982

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THE UNITED STATES ARMY AND
THE ORIGINS OF MODERN MANAGEMENT,
1818 - 1860

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of the Ohio State University

By

Charles F. O'Connell, Jr., B.A., M.A.

*****

The Ohio State University
1982

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FIELDS OF STUDY

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Studies in American Business History. Professor Mansel G. Blackford

Studies in European Military History. Professor Williamson Murray
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INTRODUCTION

Between 1775 and 1825, the United States Army underwent a process of institutional transformation that suggested, in its general outline, a pattern of organizational development some American businesses would later follow. Although the basic requirements of a national military strategy crystallized rapidly during the republic's early years, a combination of social, political, and economic factors delayed the formation of military institutions equal to the task of implementing national strategic goals. An administrative hierarchy capable of supporting an effective field army eventually emerged, but only after a series of military disasters and near disasters demonstrated the compelling need for such an organization. As the size and complexity of the army grew, its leaders developed organizational and administrative forms that enabled the army to execute its mandated functions with a high degree of efficiency and economy. As a result of these developments, the United States Army pioneered in the development and application of many management techniques that were potentially useful to the nation's business community.

-1-
The War Department was one of the nation's first corporate bodies to attempt to evaluate systematically its own organizational and administrative needs with an eye toward formulating a comprehensive managerial philosophy that shaped specific procedural innovations. American military administrators came to recognize the value of an organizational structure that enabled them to exercise precise centralized control over a wide range of geographically dispersed functional activities through a formal administrative hierarchy. Having arrived at this view, the civilian leaders of the War Department, working in close cooperation with their military subordinates, then created the specific management systems that enabled them to administer rationally and objectively the execution of the nation's military strategy.

As the War Department provided the necessary detailed management procedures, it became one of the nation's first corporate bodies to apply practices that became some of the most widely-accepted conventions of modern business management. The War Department created specialized staff bureaus to provide a variety of complex technical support services. It defined the specific functions, duties, and responsibilities of line and staff officers. An elaborate set of written regulations codified these relationships and established formal guidelines to govern the army's routine activities. Standardized reporting and accounting
procedures provided the central administrative offices with detailed operating information. Carefully defined lines of communication and authority regulated the flow of this information within the army. Finally, the army also made a tentative and ultimately short-lived effort to establish permanent, self-contained, functionally integrated operating units, although the long-term significance of this reform is limited. As a result of these organizational and procedural innovations, the War Department of the mid-1820's represented a complex, professionally competent corporate bureaucracy, functioning efficiently some years before the nation's business community found that its management methods were increasingly unable to cope with the accelerating speed and the growing volume and complexity of its transactions.

These institutional developments would be unremarkable had not the army found itself in a position to offer elements of both its administrative theory and the procedures it adopted to effect organizational goals to the American railroad industry when the railroads faced the task of creating effective management structures between 1827 and 1856. This essay will examine the process by which this transfer of managerial ideology and expertise occurred.

The managerial systems adopted by at least three of the nation's most significant early railroads -- the
Baltimore & Ohio, the Western of Massachusetts, and the Pennsylvania -- were shaped by concepts of military organization and administration as practiced by the United States Army since the end of the War of 1812. Army engineers played a major role in planning and building elements of the nation's eastern railroad network. Having mastered the technical problems of railroad construction, a number of these officers turned to the administrative problems of railroad management. When operational difficulties forced railroad managers to create new business methods, they turned to the United States Army for some of their administrative ideas. Army officers in railroad service, working in concert with their civilian colleagues, applied some of the fundamental principles and procedures of military administration to the railroads. In the process, these officers played a major role in shaping the course of managerial developments in an industry that became the acknowledged leader and trend-setter in the field of business administration during the 19th century.

* * * * *

Historians and economists generally agree that between roughly 1830 and 1890 the railroads fundamentally altered the shape of the American economy. W. W. Rostow suggests that the development of the railroad network
helped push the economy into the period of sustained economic growth that marked the beginning of the transition from a traditional to a mature, modern, mass-market economy.\footnote{1} However, others have noted that the railroads contributed to the nation's economic development in ways beyond those Rostow described. During the three decades preceding the Civil War, the railroads also established organizational and administrative precedents that profoundly influenced later patterns of industrial development.

Alfred D. Chandler demonstrates that between 1849 and 1855, as the railroads began to supplant traditional transportation technologies, railroad pioneers developed new organizational forms that enabled them to utilize effectively the full economic and technical potential of this faster means of all-weather transportation. The safe, regular movement of passengers and freight and the continuing maintenance requirements of a railroad's rolling stock and facilities demanded more complex organizational structures and procedures than those that, for example, contemporary factory managers used to control their firms. The range of a railroad's activities forced one group of executives to concentrate on the supervision of routine operations. A corporate staff of high- and middle-level managers evaluated and coordinated the work of the line officers and also devised new internal administrative
procedures, new accounting methods, and new ways to pass information and directions through the operational chain of command as well as between the line officers and the staff. In addition, the staff also planned long-term corporate strategy and allocated resources to achieve these strategic goals. "Hence, the operational requirements of the railroads demanded the creation of the first administrative hierarchies in American business."²

As the early railroad managers struggled to create usable managerial forms, they found that they had few appropriate models to guide them. John Jacob Astor's American Fur Company and Nicholas Biddle's Second Bank of the United States both adopted elements of the kind of bureaucratic organization that would prove useful in railroad service, but these two enterprises "had little, if any, impact on later development of administrative organization." The railroads might have looked to their early competitors and eventual victims, the turnpikes and canals, but in practice the executives of these firms dealt more with the financial and technical problems of construction and maintenance than with the kinds of continuing operational problems the railroads faced, so their experience was of limited utility as well.³

Since they found little in contemporary business management theory and practice to guide them, it seems reasonable to suggest that the very first railroad managers
were forced to look outside the business community for some of their administrative models. These railroad pione-
eers built very complex business organizations from the outset, and organization building has been described as "the most difficult of all managerial functions" because "it requires a concept of organization and a philosophy of management." If early railroad managers could not use contemporary management techniques, an obvious question remains: where did the railroad's "concept of organization" and "philosophy of management" come from?

The United States Army was one of the organizational models the railroads considered, and army administrative concepts and procedures provided elements of the managerial philosophy the railroads applied when events forced them to make significant organizational reforms between 1827 and 1855. Members of the army's Corps of Engineers served as the primary agents of transfer. Five army engineers occupied positions of administrative authority on three lines that are usually numbered among the most significant management pioneers: Stephen H. Long and William Gibbs McNeill served the Baltimore & Ohio from 1827 to 1830; McNeill, George W. Whistler and William H. Swift worked for the Western Railroad in Massachusetts from 1836 to 1842; and Herman Haupt held several managerial positions on the Pennsylvania from 1847 to 1852. In addition, some of the civilians who later became managers of these
lines also learned army administrative procedures during their service on the National Road project, which the Corps of Engineers supervised for a time. Both Jonathan Knight and Caspar Weaver of the B&O, for example, worked for the Engineer Department on the road.

The army had much to offer the railroads because as similar large-scale enterprises both organizations shared structural attributes and faced similar administrative problems. Both institutions were expensive to organize, build or equip, and maintain. Both had to coordinate the activities of large numbers of employees whose individual energies had to be directed toward corporate rather than personal goals. Both carried on a variety of complex activities over a wide area. Problems of financial accountability and operational coordination and control fostered a growing recognition that both organizations needed to adopt structural forms and administrative procedures that would provide a measure of real-time management within the constraints imposed by contemporary transportation technologies. In this respect the army faced the far more daunting challenge, since the railroads served as their own communication lines even before the telegraph became generally available.

Although other contemporary business organizations possessed one or more of these general characteristics, the railroads were the first commercial enterprises in the
United States to possess all these characteristics simultaneously. As such, they were America's first modern large-scale business organizations, the nation's first "big business" in modern parlance. They were not, however, the nation's earliest large-scale organization, nor were they the only such organization to appear during the first half of the nineteenth century. When the railroads appeared in the 1830's, the army's advanced administrative methods were available to influence the industry's response to the managerial problems it faced as it developed.

The officers who served the railroads were well-acquainted with the military management system, since it controlled how they performed their professional duties on military and civil engineering projects. When the War Department assigned some of these officers to the early railroads, they recognized that military procedures might be applicable to the managerial needs of the railroads. Since early railroad organizers also perceived that the army's management system also had much to offer their firms, the railroads adopted some of the procedures the officers proposed. The army was one of the models the railroad organizers borrowed from as they built the nation's first large-scale corporate organizations. Although other factors influenced the course of railroad management development, for a period of approximately twenty-five to thirty years no single organizational
source influenced railroad administrative development more than the United States Army.

Other firms, for example, adopted administrative procedures similar to those used by the military without any reference to the army or its methods. A number of civilian railroad managers were significant pioneers in their own right, and their contributions must not be overlooked. Events also shaped reform, probably at least as much as any specific management theory, since some of the procedural innovations applied to the railroads can be described as simply a logical response to a particular business problem. In addition, it must also be noted that the railroads made a number of their most significant and far-reaching administrative reforms after the Civil War. Railroad management remained a dynamic, evolving science long after the army's representatives moved on to other pursuits. However, even while acknowledging the alternatives offered by genius, circumstance, and procedural evolution, it remains clear that the United States Army was one of the most useful and most often consulted sources of management theory and procedures before the Civil War.

As early as 1821, the army had a reasonably efficient, carefully planned bureaucracy in place, one of the few such organizations in the United States at the time. Antebellum military administration was not a mature, fully-developed bureaucratic management system, especially by
the standards of the late-19th century business community. In its prime, however, the military bureaucracy of the early 19th century was more advanced and more modern than any contemporary business organization. The railroads were most willing to benefit from its experiences.

* * * * *

Although this essay relies explicitly and extensively on Alfred D. Chandler's pioneering studies of management history in general and of railroad management history in particular, Professor Chandler himself rejects the notion that military procedures influenced railroad administrative developments. In 1965, in "The Railroads: Innovators in Modern Business Administration," Chandler suggested that

It has long been a legend that the prevalence of United States Military Academy graduates in the ranks of early railroad builders and managers was especially significant. The evidence, however, clearly refutes the idea that army administrative procedures influenced railroad practice. Instead, Chandler argues that "a newly emerging group of professional managers," including the New York & Erie's Daniel C. McCallum, Benjamin H. Latrobe of the B&O, J. Edgar Thomson of the Pennsylvania, John B. Jervis of the Michigan Central, and the Illinois Central's George B. McClellan, were the real management pioneers. The management structures they created were essentially unique
because "These men did not borrow; they approached their brand new problems of building an administrative structure in much the same rational and analytical way as they approached that of building a road or a bridge."\(^8\) Furthermore, these innovators made their most significant initial contributions over "a very brief period, specifically 1849 to 1855, [that] can be identified as the time when modern business administration appeared in the United States."\(^9\)

Of course, McClellan and another management pioneer Chandler also cites, George W. Whistler, were Military Academy graduates. They were, however, "the least innovative of the lot."\(^10\) Whistler joins McClellan in this unhappy pairing because neither he nor his civilian associate, George Bliss, "made any attempt to reform a traditional administrative structure [on the Western Railroad in Massachusetts] until the railroad suffered serious operational breakdowns" in the early 1840's.\(^11\)

Chandler has modified this argument slightly in his more recent work, although he repeated the "least innovative of the lot" comment as late as 1977, in The Visible Hand. In the same work, however, Professor Chandler does allow that the military model may have had an "indirect impact" on early business management. While acknowledging that some Military Academy graduates served in the Corps of Engineers and the Ordnance Department, "two of the very few professionally manned, hierarchical organizations in
antebellum America," he continues to argue that their engineering training, which stressed a rational, analytical approach to a problem, was more important in shaping their actions as administrators than their experience as members of the military bureaucracy: there is still "little evidence that military managers copied military procedures." Citing research conducted by Merritt Roe Smith and others, however, Professor Chandler does concede that "Modern factory management (but not it must be stressed, the management of large modern multi-unit enterprises) had its genesis in the United States" in the national armories at Springfield, Massachusetts and Harpers Ferry, Virginia.

Most business historians accept Chandler's basic thesis, although a few modify it somewhat. Thomas Cochran notes the "irony" that the entrepreneurial group that first faced the managerial problems of scale lacked "personal preparation" and was "unable to draw on any trained administrative personnel." Harold Livesay, on the other hand, suggests that "Only one large organization, the military, was experienced in moving large quantities of men and material across long distances," and that "The railroads adopted the military's line and staff organization, often using military nomenclature . . . ." Even Louis Mumford, who otherwise takes a rather dim view of the military ("Fortunately for mankind, the army has usually been the refuge of third rate minds.")}, notes that "The army is in fact the ideal form
toward which a purely mechanical system of industry must tend," a statement Mumford emphasises in his text.17

This essay will examine a number of areas in which Chandler's arguments on the origins of railroad management ideas may be open to revision, without at any point suggesting that his more fundamental insights on the railroads as management pioneers and models for later industrial development are any less valuable or significant. First, the evidence suggests that when Thomson, Latrobe, and McCallum made their most noteworthy innovations, they borrowed extensively, from each other and from the early management forms established on their own and other railroads. Modern management did not "suddenly" appear, more or less fully developed, between 1849 and 1855. The managerial structures the B&O, the Pennsylvania, and the NY&E adopted during these years represented one product of the evolution of management ideology on the railroads, an evolutionary line that, as early as 1827, began to exhibit traits that would later be called modern.

Second, the management history of three of the earliest major American railroads, the B&O, the Western, and the Pennsylvania, seems to suggest that military administrative concepts did influence structural and procedural developments on these lines, both implicitly and explicitly. If the railroads themselves served as models for later industries, it seems reasonable to suggest that the railroads
themselves at least considered the model provided by an existing corporate bureaucracy when events forced them to create their own complex management structures.

Finally, it seems rather unfair to condemn Whistler and his military colleagues for being supposedly less innovative than a number of civilian management pioneers. To return to Chandler's own example, neither Whistler nor Bliss "made any attempt to reform a traditional administrative structure [on the Western] until the railroad suffered serious administrative breakdowns." This is true, but as Chandler himself notes elsewhere, "Historically, administrators have rarely changed their daily routine except under the strongest pressures." Indeed, even the "more innovative" pioneers usually acted only in response to "urgent needs and compelling opportunities."\(^{18}\) They became innovators "not because they were necessarily more perceptive, energetic, or imaginative than other contemporary businessmen, but rather because they were the first to face the challenge of handling efficiently large amounts of men, money, and materials within a single business unit."\(^{19}\) Whistler's Western was one of the first railroads to face a breakdown of its management system because it was, for a time, the longest, biggest, and busiest of the early lines. Until the operational problems became obvious, neither Whistler nor Bliss had any compelling reason to make changes. When the system did break down, however, Whistler's response
was influenced by his experience with the military's administrative methods.

It is worth restating that these remarks are not meant to suggest that the army was the only administrative model available to the railroads, or the only one they examined. There is no intent to denigrate the work done by Thomson, Latrobe, or McCallum, especially since some of their most significant reforms came after the Civil War and after the officers had moved on. In the realm of administrative theory, the army could offer one approach to a problem. Although the army and the railroads were similar organizations they were not identical, and it should come as no surprise that what worked well for one did not invariably work well for the other. The evolution of management theory and practices continued in the corporate community, shaped by and shaping the course of later business development.

However, before the Civil War, and before the limitations of its methods became clear, the United States Army served as a model for the managerial structures erected by some of the nation's earliest railroads. The railroads adopted elements of the army's organizational theory and, perhaps more significantly, many of its administrative procedures. The army showed the railroads one way to organize a large scale enterprise. It also offered them the means to make the organization work. Although other firms exhibited elements of the organizational form the railroads
eventually adopted, no other contemporary organization offered both the structures and the procedures necessary to make an organization as large and complex as a railroad function effectively. Given the railroad's later impact on American social, economic, and administrative development, the United States Army's influence as a source of early organizational and administrative concepts should not be underestimated.
INTRODUCTION -- NOTES


These three lines, plus the New York & Erie, are the railroads Chandler cites as the real pioneers in modern management. The B&O, the Pennsylvania, and the NY&LE are three of the four east-west trunk lines that began offering system-wide service in the early 1850's. The Western became part of New England's regional trunk system, the Boston & Albany Railroad. The fourth major trunk line, the New York Central, plays no part in this story primarily because of the way Cornelius Vanderbilt consolidated the NYC from a network of shorter lines that paralleled the Erie Canal. Chandler says that the NYC "contributed almost nothing to the development of modern management." See Chandler, *The Visible Hand*, p. 99.


Ibid., p. 135.


Chandler, *The Visible Hand*, p. 95. He uses the same terminology in "The Railroads: Innovators in Modern Business Administration," in Mazlish, *The Railroads and the Space Program*, p. 135. The former appeared in 1977, the latter in 1965: Chandler's views on this issue have changed only slightly over time.


14 Chandler, The Visible Hand, p. 95.

15 Thomas C. Cochran, 200 Years of American Business (New York: Delta Publishing Company, 1977), p. 55. He also suggests that some industries tried the army model but rejected it because it was too cumbersome and complicated for their purposes.


18 Chandler, Strategy and Structure, p. 2.

CHAPTER ONE

The Development of a
Modern Management System
in the United States Army,
1775 - 1825

The system of military administration that emerged after the War of 1812 represented an attempt to apply lessons learned since 1775. It took almost fifty years for an effective system to evolve, in part because Congressional factions and a large segment of the public were unwilling to support a potentially tyrannical permanent military establishment. The nation's financial difficulties also delayed the implementation of effective administrative reforms, although paradoxically the same fiscal woes provided some of the impetus for later reform efforts and made the resulting organizational changes more palatable to recalcitrant Congressmen. Although many eventually accepted the argument that the nation's security and its ability to exploit its territorial potential demanded at least a small regular army, the government proved unwilling or unable to maintain the kinds of organizational and administrative forms that would enable the War Department
to manage even this limited force effectively. The War Department did not systematically adopt more efficient managerial techniques until experience demonstrated the strategic and financial costs of attempting to rely on traditional methods to control operating in a non-traditional environment.

* * * *

America did not possess a national military organization before 1775. By 1783, building essentially from scratch and working in the face of intense resistance, the Continental Congress had created a military establishment that was reasonably competent and efficient. The War Department provided centralized administrative control over a collection of staff bureaus that supported a large and scattered field army. While the administrative system that evolved during the war was far from perfect, by 1783 the army was by far the largest, most complex, and most rationally organized corporate body in the United States.¹

During the Confederation period, the nation's political and economic climate were not conducive to the maintenance of either a large standing army or the agencies that supported it. The government hoped to rely on a small regular army backed by the militia and ad hoc administrative
organizations and procedures to handle the nation's military needs. The field force the government created, the 700-man 1st American Regiment, was too weak to awe the Indians when deployed piecemeal on the frontier and too small to worry the British in any event. The two civilian contractors hired to provide the regiment's logistical support proved inefficient and corrupt. The weak, poorly organized, and inadequately supported army of the 1780's seemed to some to symbolize the weakness of the national government.²

From 1789 through 1800, the Federalists tried to build a more effective military organization. On August 7, 1789 Congress established a Department of War to supervise the nation's military affairs. The War Department was initially responsible for all aspects of the nation's land and naval forces, Indian affairs, and military pensions. Having established the department, however, Congress demonstrated less willingness to create the elements of a more complex military administrative hierarchy the Federalists wished to build within the War Department. When Washington and his Secretary of War, Henry Knox, presented the detailed proposals that were part of the administration's comprehensive military program, acrimonious partisan debate began in Congress and throughout the nation. The persistent anti-military bias that shaped some sectors of public opinion reared its head again as opponents of a
permanent military establishment trundled out the hoary spector of a tyrannical standing army to bolster their crusade. Others argued with greater cogency that the new nation's precarious financial situation made it unwise for the government to spend a large part of its limited resources on a military establishment.3

Events forced the government to act. When the Indian campaigns of 1790 and 1791 demonstrated the weakness of the nation's land forces, Congress supported the administration's efforts to make sweeping organizational and administrative reforms. A series of acts passed between 1792 and 1796 revitalized military administration in the United States and established the basic structure of the nation's military organization that lasted for more than a century.

In 1792, Congress authorized the creation of the "Legion of the United States," a 3,000-man force composed of four self-contained, functionally integrated combined arms units called "sub-legions." Although the army reverted to the more traditional regimental organization in 1796, the organizational principles that shaped the Legion became part of the army's collective institutional memory. In France, Lazare Carnot and Henri de Guibert refined the "divisional" concept as they applied it to the French army before and during the Revolutionary and Napoleonic Wars.4
Congress also made changes in the War and Treasury Departments in 1792, changes that created an "Accountant to the War Department" "to countersign all monetary authorizations for salary, subsistence, recruiting, and contingent expenses." The act also authorized the Treasury Department to make all purchases and contracts for supplying the army. Although many military commentators criticized this act for taking the military supply process out of military hands, the reforms did eliminate some of the most serious deficiencies in the logistics phase of military administration. The act represented a step in the creation of a more effective administrative hierarchy because it "introduced for the first time a formal system of accountability in the War Department, a double-check system on virtually all [financial] activities, [and] a rationalization of administration."  

To promote internal order and stability, the War Department issued new regulations in 1796 and 1797. The 1796 volume covered recruiting, post administration, and supply distribution. In 1797 Secretary of War James McHenry added rules and procedures for command and to regulate the normal daily activities of army life. These regulations filled a long-standing void in the development of army internal administrative procedures, since they established formal guidelines to govern the workings of the managerial hierarchy that was gradually replacing
idiosyncratic, ad hoc systems that characterized American military administration since 1783.\textsuperscript{6}

As the army gained institutional confidence, it began to push for revisions of the supply system. The Secretary of the Treasury and the Purveyor of Public Supplies controlled the purchase of military supplies until July 16, 1798, when Congress passed a law that returned the military supply system to War Department control.\textsuperscript{7} The Purveyor now acted under the direction of the Secretary of War, while the Treasury's role was reduced to that of an inspector and accountant. The War Department assumed responsibility for all public business relating to military affairs, and as the volume and complexity of this business increased so did army agitation for the creation of additional staff departments to conduct the War Department's business affairs.

Secretary of War McHenry outlined the problems in a report to Congress in 1798, when he remarked that:

\begin{quote}
A Secretary of War will always find ample employment in the general superintendence and direction of the great operations of his department. If a portion of his time is to be occupied in the details of lesser concern, it is morally certain that the greater must languish or suffer.\textsuperscript{8}
\end{quote}

Congress responded on March 3, 1799 with "An Act for the better organizing of the troops of the United States, and for other purposes." The act authorized the appointment of several additional staff officers, including a
quartermaster general and assistants and several deputy inspectors-general.⁹

By the end of the Federalist era the United States Army had assumed many of the attributes of a modern business organization. It possessed a functioning organizational hierarchy with a carefully defined structure and a regular internal life. As the army internalized (or "institutionalized") a variety of complex, interrelated functions a bureaucratic hierarchy evolved, and as it evolved the bureaucracy assumed a life of its own. It functioned continuously without specific orders and beyond the personal direction of either Congress, the president, or even the secretary of war. As Richard H. Kohn describes it,

The sheer size of the organization, the range of activity, the complexity of vertical and horizontal interrelationships was beyond the direction of a single individual, causing a proliferation of offices and inevitably a decentralization of authority. . . . The flow of paper -- invoices, inventories, musters, reports, warrants, accounts, not to speak of correspondence -- was nearly uncontrollable. Because of the size, complexity, distance, and the difficulty of communication, formal rules became a necessity to keep the institution functioning rationally and efficiently (and to keep track of the public money), especially in a military establishment which included separate institutions like the army and a disparate collection of officials engaged in such varied activities.¹⁰

Although the army had once more achieved a high degree of administrative development and competence by 1800, when power passed to the Jeffersonians the trend of
structural and procedural change again shifted toward a variety of the philosophical model that shaped developments during the Confederation period and that occasionally frustrated Federalist reform efforts. Jefferson reduced the army in 1802 and eliminated many of the staff bureaus established by the Federalists. He also allowed Congress to divide responsibility for military supplies between the War and Treasury Departments. On the other hand, Jefferson established the United States Military Academy at West Point, New York on March 16, 1802 to provide the army with an officer corps able to apply the engineering training it received at West Point to a variety of socially useful projects.11

With the reduction of the staff bureaus, military administration returned to the locally-oriented, decentralized procedures that characterized the army of the Confederation period. The Purveyor of Public Supplies, once again under Treasury supervision, contracted for all military supplies except food, then turned the goods over to the Superintendent of Military Stores in the War Department, who issued them to the troops. Congress eliminated the Quartermaster Department in 1802. In its place, three civilian agents supervised the movement of troops and supplies in their areas. The three agents seem to have done their best, but control over the whole supply system was loose and fiscal accountability difficult to enforce.
The result was wide-spread mismanagement, corruption, and chronic shortages of all types of supplies.

The army suffered at the executive level as well. The military establishment was not in capable hands during the Jefferson and Madison administrations. Jefferson's Secretary of War Henry Dearborn's "most salient characteristic [was] a devotion to government thrift surpassing Jefferson's and approaching niggardliness." Madison's Secretary of War, William Eustis, "was a less capable man than Dearborn and perhaps even more singlemindedly devoted to thrift." The army's ranking officer, Brigadier General James Wilkinson, became involved in many schemes regarding Spain, and seemed more concerned with personal profit than with military administration.

Such was the condition of the military establishment on the eve of the second war with Great Britain. Both the Jefferson and the Madison administrations wanted to avoid war, but many of their actions and pronouncements as the Napoleonic wars raged in Europe did little more than push the nation closer to the brink of either war or economic disaster. Despite the accelerating drift toward war, the nation's leaders did little to improve the administrative situation in the War Department or to prepare the field army for war.

On the very eve of the War of 1812 Congress did authorize some significant changes in military administration,
but they came far too late to be of any real service during the early months of the war. With the War Hawks in Congress pushing for a declaration of war against Great Britain, Congress on March 28, 1812 approved legislation establishing a Quartermaster's Department and a Commissary General of Purchases, at the same time abolishing the office of the Purveyor of Public Supplies and terminating the services of the civilian agents. An act of May 14, 1812 created the Ordnance Department, and on May 16 Congress reestablished the office of the Paymaster General.13

While these reforms were helpful in the long run, the laws did not draw clear distinctions between the operations of the Quartermaster, Commissary, and, in some cases, the Ordnance Departments. According to one commentator, "the downright practical effect of [these laws] was about the same as if it had been a successful measure entitled 'an act for the speedy enrichment of contractors and the periodical starvation of the army of the United States.'" As Georgia Congressman George M. Troup later noted, "In the wretched, deplorably wretched organization of the War Department, it was impossible either to begin the war or to conduct it."14

Nevertheless, Congress declared war on Great Britain on June 18, 1812. The reforms enacted weeks before had no time to coalesce before they were tested by war. The supply services were the staff bureaus Jefferson
reduced most dramatically or eliminated in 1802, and they were the branches of military administration that caused the most trouble during the war. The other staff departments -- the Corps of Engineers and the Adjutant General's and Inspector General's departments -- were somewhat better organized and gave more efficient service, largely because they escaped the attention of well-meaning but misguided Congressional cost-cutters and reformers.

Although the United States managed to avoid losing the war, the War Department's direction of the war effort proved generally inept. Congress authorized a dramatic expansion of the army and volunteers flocked to the colors, but the newly-recruited troops were hardly ready to take to the field to face seasoned British regulars. The failures along the Great Lakes during the first year of the war demonstrated the dangers inherent in pursuing a policy of economy while neglecting many vital aspects of military administration.

The field army had to be organized and trained. When Captain William King inspected the newly-raised 14th Infantry Regiment at Buffalo in October, 1812, he reported that the company officers were "ignorant of their duty," and that the surgeon was "without medicine, hospital stores, and surgical instruments." The government owed the men three months pay, there were no winter clothes on hand, and provisions were bad and in short supply. Under
"Discipline," King noted:

The regiment is composed entirely of recruits. They appear to be almost as ignorant of their duty as if they had never seen a camp, and scarcely know which shoulder to carry a musket on. They are mere militia, and if possible even worse, and if taken into action in their present state will prove more dangerous to themselves than to their enemy.

The staff services were in no better shape. Newly organized bureaus had to procure and distribute supplies to the various field forces deployed along the frontier, a logistical nightmare for inexperienced quartermaster officers. Transportation facilities were primitive. Food and clothing were in chronically short supply. Communication was tenuous and slow. The War Department's official communications were hardly models of clarity in any event, and the Adjutant General's Department had difficulty transmitting them to the commands in the field.

The situation eventually improved, but the improvement was due more to the talents and efforts of individual army officers than to the Madison administration's administrative efforts. Officers taught their troops the rudiments of tactics and military behavior, and in time they created a reasonably competent field force. Staff officers gained experience and learned to cope with the complexities of their positions, but it still took the concerted efforts of officers in the field to create a reasonably efficient regional supply service.
By the time the war ended the army had reabsorbed many of the lessons it learned during the Revolution and Indian campaigns and readopted many of the procedures it practiced in the late 1790's. The cost of a decade of neglect was high, however, and many officers and politicians resolved that the art of military administration would not be allowed to deteriorate again when the wartime army disbanded. Although Congress made some useful changes in military administration during the war -- new regulations in 1813, for example -- the most significant, long-lasting, and effective administrative changes came after the war, especially during John C. Calhoun's tenure as Secretary of War.

* * * * *

While most Americans joined in the popular euphoria that followed President James Madison's announcement of February 17, 1815 that the war with Great Britain was officially over, the nation's political leaders gazed out over the ruins of Washington and paused to consider the lessons of the struggle. The politicians recognized much more clearly than the populace that the United States had come perilously close to disaster during the war. The defeat of Napoleon and the resumption of normal trade with Europe did much to resolve the basic issues that had brought the
United States and the British Empire into conflict, but neither the war nor the peace treaty resolved such broader, long-standing problems as neutral rights or impressment. Canada remained British, Florida Spanish, and the Indians on the frontier were no more willing to give up their land peacefully than they had been for almost 200 years. America's performance in the war did nothing to relieve the anxiety of those who believed that further clashes were inevitable.

The legacy of the war was ambiguous. The subsequent debate over the lessons of the war revolved around results versus means: the United States managed to avoid losing the war, but at what cost? Even so, some points quickly became clear. The war "demonstrated administrative incompetence of alarming proportions." As the House Ways and Means Committee confessed in 1820, "The war pointed our attention to the weak points of the nation."16

At least one faction believed that the most obvious shortcomings could be rectified by prompt and direct action. Men like Henry Clay, William Crawford, and John C. Calhoun, heirs to the party if not the policies of Thomas Jefferson, believed in 1812 that they could make the nation great by war, and their actions in the spring of that year brought the crisis to a head. They were, therefore, stung by the repeated demonstrations of incompetence that plagued the war effort, and they set out after the war to
correct the problems that were solvable through Congressional or executive action.

Perhaps no one felt the humiliation of the war more personally than John C. Calhoun. A native South Carolinian, Calhoun was educated in Connecticut at Yale and the Litchfield Law School. In 1807 his neighbors elected him to the South Carolina General Assembly. In 1810 they sent him to Washington as a member of the House of Representatives. In Washington he became the ally of several of the most prominent western War Hawks, notably Henry Clay of Kentucky, the Speaker of the House. Clay recognized Calhoun's commitment to nationalism and his considerable political talents, and appointed him to the House Committee on Foreign Affairs. On this committee Calhoun became an advocate of military preparedness, and he spoke frequently, eloquently, and passionately in favor of a war with Great Britain. Calhoun subsequently introduced the bill calling for a declaration of war and guided it through the House to passage on June 4, 1812. He remained in the House throughout the war, witnessing at first hand the confusion, incompetence, and impotence that characterized the Madison administration's attempts to prosecute the war.17

During the war Calhoun tried to force the administration to deal with problems that would later concern him when he became Secretary of War. He offered two resolutions on November 10, 1814. The first directed the Committee on
Military Affairs to look into "the expediency of changing the present mode of supplying the Army by contract." The second came from Calhoun's discovery that the United States Army lacked a standardized system of training and discipline. This resolution directed the Secretary of War to report if the army was trained according to one system, if not why not, and if legislative action would help. Secretary of War James Monroe's response on November 22 admitted that there was no uniform system and suggested that Congress authorize a board of officers to consider a new system. Calhoun offered a resolution on December 24, 1814 "That the Secretary of War . . . appoint a Board of Officers, to modify the 'rules and regulations for the field exercise and maneuvers of the French Infantry' by Macdonald . . . ," but the project died when peace came.18

Calhoun's efforts to solve the nation's pressing problems did not cease with the end of the war. He believed that the Treaty of Ghent was no more than a truce, and he feared that the United States and Great Britain would eventually find themselves at war again. He therefore worked to prepare the nation for this clash. Calhoun sensed that the United States had reached a turning point. In 1816, he called on his colleagues in the House of Representatives to act:

> There are in the affairs of nations, not less than those of individuals, moments, on the proper use of which depend their fame, duration, and prosperity.
Such I conceive to be the present situation of this country. . . . The broad question now before this House, whether this government should act on an enlarged policy; whether it should avail itself of the experience of the last war; whether it should be benefitted by the mass knowledge acquired within the last few years; or whether we should go on in the old imbecile mode, contributing by our measures nothing to honor, nothing to the reputation of the country.19

Calhoun focused his energies on an attempt to improve the physical and economic strength of the United States. The nation's fragile economy and the related problems of distance and the lack of an adequate transportation system were the most pressing concerns in the years immediately after the war. Calhoun adopted Hamiltonian expedients to mend these flaws: he sponsored a bill chartering the Second Bank of the United States in 1816, and also presented a bill authorizing the federal government to spend the profits it would garner from the bank to finance internal improvements. Both bills cleared Congress but President Madison, in one of the last acts of his second administration, vetoed the "Bonus Bill." Calhoun's defense of the Bonus Bill on the floor of the House on February 4, 1817, when he called on his colleagues to "bind the Republic together with a perfect system of roads and canals. Let us conquer space . . .," marked the culmination of his legislative career. Madison announced his veto in March; before the next session of Congress Calhoun accepted James Monroe's offer of the War Department portfolio.
Calhoun was not Monroe's first choice as Secretary of War. The War Department's affairs were in such a sorry state in 1817 that Henry Clay, Isaac Shelby, and William Lowndes all declined to accept the post. Monroe did not offer the position to Calhoun until October 10, 1817, and Calhoun then deliberated three weeks before accepting the job.\(^2\) Calhoun finally decided to accept the challenge for a very pragmatic reason: he wanted to dispel any doubts that his administrative talents were any less brilliant than his legislative skills. He knew the War Department was in chaos, and he also knew that anyone who could bring order to the affairs of the Department would be recognized as a first-rate executive. Calhoun thus saw the War Department as a stepping stone to higher office. He was thirty-five when he became Secretary of War, the youngest man to have yet occupied the post. Monroe submitted the appointment to the Senate on December 12. When confirmed by the Senate on December 15, Calhoun had already been working in his department for a week.\(^2\)

Monroe's Cabinet represented a rare gathering of intelligent and ambitious men. Calhoun served with Secretary of the Treasury William H. Crawford, Secretary of the Navy Benjamin Crowninshield (who resigned on October 1, 1818, to be replaced by Smith Thompson), Secretary of State John Quincy Adams, Postmaster Return J. Meigs, Jr., and Attorney General William Wirt. Calhoun, Crawford, and Adams all
harbored presidential ambitions, a situation that would eventually make Calhoun's job in the War Department much more difficult. In 1817, however, all the Cabinet members shared a nationalist philosophy and a willingness to work together to accomplish common ends.23

Calhoun pursued two basic goals during his time as Secretary of War. He wanted to concentrate administrative authority in the secretary's office, which would be supported by a military staff of capable subordinates. He also tried to bring more order to military administration by promulgating regulations that would fix definite responsibility and accountability for all aspects of the daily activities of all members of the army, from the secretary to the most junior private serving at an isolated frontier post. If Calhoun had his way, the days of idiosyncratic, decentralized, ad hoc military administration would end.24

The new secretary harbored no illusions about the difficulties he faced. He knew that the War Department was responsible for more disparate activities than any other organization in the United States, including coast and frontier defense, military pensions, Indian affairs, various surveying and exploring expeditions, as well as other matters. He acknowledged that "little heretofore has been done to give exactness, economy, and dispatch to its monied transaction." He also recognized that tradition suggested that his efforts would be futile. The problems, he wrote, "will be found
difficult to overcome. I cannot flatter myself that I will be more successful than my predecessors." Undaunted, however, he promised "industry and . . . firmness," because

I certainly have the strongest reasons to exert myself, for none felt more deeply than myself that want of preparation which preceded the last war; and which had nearly succeeded by the most disastrous consequences.25

One of Calhoun's first acts as Secretary of War was to contact his ranking military subordinate, Major General Jacob Brown, to explain his goals and his philosophy and to ask for the cooperation of the officer corps. Calhoun told Brown that he took the job because of "a strong desire to contribute as much as possible to the publick [sic.] prosperity, by giving our military establishment the greatest possible utility and perfection" since "however prosperous the country may be in other respects, if its means of defence are inadequate, or the military science unknown, those who are best qualified to judge will readily see that its prosperity is uncertain and insecure." Calhoun noted that "we have, indeed, much to do" and that he expected from "you and the other officers a zealous and enlightened cooperation." Calhoun closed with an appeal to the vanity of the officers. He noted that they too had a great stake in the success of his programs, because their reputations were inextricably linked with the nation's. With hard, unremitting effort the army's memory would be cherished; without it, "indolence and mismanagement cannot fail to obliterate
the deepest impression of gratitude."^{26}

Calhoun was dealing with kindred spirits, although he probably was not yet aware of it. Even as he wrote his appeal to Brown, other army officers sent their own reform proposals to him.^{27} The army was still trying to cope with both the organizational changes made during the war and the extremely drastic reduction of the army that followed it. At its peak during the war the army had a maximum authorized strength of approximately 62,600 men, including forty-four regiments of infantry. The war ended officially on February 17, 1815; on March 3, 1815 Congress authorized a "Military Peace Establishment" of 12,383 men.^{28} Congress did, however, retain most of the staff changes made during the war, albeit on a smaller scale. The staff in 1815 consisted of an Adjutant and Inspector General with six assistants, two Judge Advocates, four chaplains, a Quartermaster with six assistants, an Apothecary General and two assistants, a thirty-two man medical staff (but no surgeon general), a paymaster and four assistants, and a Commissary General of Purchases with twenty-two assistants. Congress also retained a 44-man Ordnance Department and a 135-man Corps of Engineers (113 of whom formed a "Corps of Bombardiers and Sappers."{^{29}

Senator John Williams, chairman of the Senate Military Affairs Committee, offered Calhoun his first opportunity to translate his reform ideas into specific legislative proposals in January, 1818 when he wrote to Calhoun
asking for suggestions on possible staff reforms. Calhoun recommended the creation of a Surgeon General, a Judge Advocate General, and a Quartermaster General. He suggested these changes because, in the case of the two Judge Advocates and the medical staff, they were "without responsibility and must, I conceive, remain so till [their] duties are brought to a center." Calhoun regarded the office of the Quartermaster as the most important and complex branch of the general staff, so important that "none requires more eminently the control of a single and responsible head." He further proposed that all staff officers be required to make quarterly returns "of the manner in which they have performed their duties" so that "important checks [can] be imposed on the improper consumption and waste of the stores."30

Williams responded favorably to Calhoun's advice and informed him that the Senate was prepared to organize a staff along the lines Calhoun suggested. Williams asked Calhoun to prepare a bill embodying the Secretary's ideas and to "please send me the bill tomorrow morning."31 Calhoun forwarded the draft staff bill one week later, on February 16, 1818, and Congress passed "An Act regulating the staff of the Army" on April 14, 1818.32 This act formalized the eight staff departments -- Adjutant and Inspector General's,33 Quartermaster's, Subsistence, Pay, Medical, Ordnance, Judge Advocate General's, and the Corps of Engineers -- that would form the core of the American military staff system for the remainder
of the century.

Even before Congress completed its work on the staff act Calhoun began to fill out the administrative hierarchy it authorized. In early April Calhoun ordered the heads of the various staff departments to establish their headquarters in the Washington area. Calhoun thus organized a staff of capable specialists to provide advice and information who were stationed near at hand where their expertise would be available. Perhaps not coincidentally, Calhoun could also keep a close personal watch on his subordinates as they went about their work.

The Secretary's next step was to put the staff bureaus on a more stable administrative footing. Calhoun contracted the heads of all the departments to explain their duties. He also promulgated revised departmental regulations designed to further his plan to bring the War Department's financial dealings under greater centralized control. For example, on April 17, 1818 Calhoun issued new regulations for the Engineer Department which directed all officers superintending construction projects to forward monthly an abstract of articles purchased (with receipts), an abstract of labor performed (with labor rolls), an abstract of payments made to skilled artisans and mechanics, and an abstract of contingent expenses (also with receipts). The officer also had to certify abstracts submitted by civilian agents and to ensure that they followed departmental
regulations and reporting procedures. On April 18, 1818 the Engineer Department, responding to a directive from the Secretary's office, reminded its officers that they were also to forward an inventory of public property in their charge by the end of the year. Other departments received similar revised regulations and directives. Many of these procedures had been on the books for some time, but the War Department never enforced them so assiduously before.36

Of the three staff departments created by the April bill, none threatened to present more problems than the Quartermaster's Department. The government's success with this branch of the service before 1812 was spotty at best. The expedient it tried most often was to hire civilians to procure and move supplies, but the system frequently broke down in practice. Congress reestablished a Quartermaster Department in March, 1812, but as constituted by that act the department lacked the single responsible head that Calhoun wanted. Congress corrected this deficiency in the April staff bill, but it remained for Calhoun and his choice as Quartermaster General to create a working department. Just as the sorry state of affairs in the War Department made it difficult for President Monroe to find a capable person willing to accept the position of secretary, so too did Calhoun have problems selecting a Quartermaster General. Monroe settled for Calhoun, his fourth choice; Calhoun got his second choice. After being refused by William Cumming of
Georgia, Calhoun offered the position to Colonel Thomas S. Jesup of the Third Infantry on May 8, 1818. Jesup accepted the job and its promotion to brigadier general. He arrived in Washington early in June to take command of his department, a position he did not relinquish until his death in 1860.37

The career of 29 year old Jesup was similar to those of several other young officers who ably assisted Calhoun during his tenure as Secretary of War. He joined the army as a second lieutenant in May, 1808 after a brief job as a clerk at a store in Maysville, Kentucky where, according to his biographer, "he displayed a happy faculty for administration" and a "sensitive conscience" that "exacted too high a standard of morality for the purposes of his employer."

Jesp served as a brigade quartermaster under Brigadier General James Wilkinson near New Orleans, where he clashed with the Accountant of the War Department over who would be charged $79 for some of Wilkinson's expenditures. Secretary of War William Eustis eventually ruled in Jesup's favor. Jesup reportedly spent much of his spare time studying the details of his profession, "determined to become a compleat master of every branch of it."38

The sorry state of the military profession in the United States before 1812 discouraged Jesup. In December, 1812, even while the nation was engaged in a war, he wrote to a friend that he felt inclined "to exchange Ney for Blackstone" because "in the Army the strictest attention to duty,
the most unwearied application to professional studies, and the most scrupulous attention to character and honor, will give me no other advantage than that derived from self approbation." At one point he considered emigrating to South America to offer his services there.39

Jesup's experiences during the early days of the War of 1812 did little to improve his opinion of army life: he became a prisoner of war when Brigadier General William Hull surrendered Detroit without a fight in August, 1812. After being paroled Jesup received the command of the 25th Infantry Regiment, part of Brigadier General Winfield Scott's brigade training at Buffalo. Jesup took part in the subsequent campaigns on the Niagara Frontier, then moved to Brownville, New York where he was serving as Adjutant General of the Northern Department under Major General Jacob Brown when Calhoun selected him to become Quartermaster General.40

Despite the risks involved, he approached his new job with confidence. He knew "that some reputation is risqued in the attempt to give system to a Department which has, hitherto, in our service, been in a state of confusion and disorganization," but he had no doubt that, with Calhoun's support, he would be able to make that Department in our service, what it is in all European services, the first Department of the Army. I wish to give it that character, and those features, which will render it efficient in time of war, and which both in
peace and in war, will insure a strict responsibility in all its branches.\(^1\)

One of Jesup's first actions upon assuming command of the Quartermaster Department was to prepare a new set of rules and regulations for the conduct of the Department's business. On July 17, 1818 Jesup sent Calhoun a "Projet; in relation to the duties of the Q\(^{t}\) Mast\(^{t}\) Dept." In his brief introduction to the proposed regulation, Jesup defined the three "principal objects of the Quarter Master's Department." First, the Department had "To insure an ample and efficient system of supply." Second, it had "To give the utmost facility and effect to the movement and operations of the Army." Third, the officers of the Department had to "enforce a strict accountability on the part of all Officers and Agents charged with monies or supplies."\(^2\)

Jesup spared himself no labor when he defined the duties of the Quartermaster General. The officer, normally stationed in Washington with a staff of one assistant and one clerk, was to control all the correspondence of the department, make himself familiar with the geography, resources, and military forces of all parts of the nation, and with the prices "for all articles of supply and of transportation," and to recommend the construction of barracks, depots, military roads, and other transportation lines to facilitate the movement of troops and supplies. He was also to "prescribe a uniform system of Returns, Reports, Statements and Estimates" for his department.
Finally, he would have "the entire control of the Deputies and Assistants, and generally all Officers and Agents acting or making disbursements on account of the department, in all that relates to the administrative part of their duties, and their accountability," with the line officers retaining authority over the quartermaster officers when they were engaged in purely military matters (an ambiguity that was not unique to the Quartermaster Department).  

Jesup's primary goal was to create an enforceable system of accountability in the Quartermaster Department. Under his system the Quartermaster General would draw funds from the Treasury and distribute them to his subordinate officers as needed. When the field quartermasters returned their receipts, the Quartermaster General would use them to settle his accounts with the Treasury Department, although this opened new accounts between the Quartermaster General and his subordinates within the Department. The whole system would be enforced by military discipline. Jesup was willing to accept full responsibility for the system he proposed and was willing "that his reputation stand or fall with it," but he would not "be responsible for that of another."  

Calhoun gave Jesup a free hand to institute his system, and when Winfield Scott published a new edition of Army Regulations in 1821 he incorporated Jesup's regulations for the Quartermaster Department as one of the articles.
Jesup's system of detailed periodic reports gave Calhoun the opportunity to address another failing in War Department administration. While he was in the House of Representatives Calhoun repeatedly called on the War Department to make more detailed reports so Congress could better judge the desirability of specific programs and appropriations. The Department was hard-pressed to meet his demands because, more often than not, the information Calhoun requested was not readily available. On September 5, 1818, in a circular letter to the chiefs of the military staff bureaus and to the heads of the Land Warrant Bureau and the Pension Bureau, both of which were also Calhoun's responsibility, Calhoun directed the bureau chiefs to submit quarterly and in some cases additional semi-annual reports of their business. Calhoun provided specific instructions for each of the bureaus, although they all followed a similar pattern. For example, he directed the Chief Engineer [Col. Walker K. Armistead] to report quarterly to the Secretary of War, what new works are building, the progress of the works, the state of the appropriation for fortifications, the amount disbursed, and the amount in the hands of each agent unaccounted for, and generally, the manner in which the agents and superintendents of fortifications have performed their duties; and report, annually, the state of fortifications.

Between April and September 1818, John C. Calhoun and a handful of United States Army officers formulated rules, regulations, and administrative procedures that enabled the
Secretary of War, through the chiefs of the eight staff bureaus, to oversee the operations of the War Department in a more comprehensive sense than had ever before been possible. They established functionally organized staff bureaus to supervise military support services. Standardized report forms made it possible for the bureau chiefs to keep a close watch on the affairs of their departments and to compile detailed reports of its operations for transmission to the Secretary of War. Clearly defined lines of communication began to evolve, along with a greater division between the functions and responsibilities of line and staff officers. The management system that evolved by about September, 1818 had not yet been tested in practice on a large scale: indeed, most of the reforms were focused on the Washington offices of the staff bureaus. It would take Calhoun and his subordinates approximately five more years to fashion a fully functioning administrative bureaucracy throughout all segments of the War Department, but in the space of about nine months Calhoun had fostered a revolution in military administration in the United States.

For all of Calhoun's efforts at the bureau level in Washington, however, the army as a whole remained largely untouched by the reform spirit that permeated the central office of the War Department. It remained for Calhoun to expand his innovations to include the rest of the army, especially the field forces. Fortunately, another officer
suggested a project that enabled Calhoun to spread his ideas to the line as well as the staff.

On September 2, 1818 Brigadier General Winfield Scott sent Calhoun a letter in which he proposed to compile a new edition of general regulations for the United States Army. Scott was almost certainly the one officer in the army best qualified to produce such a work. He had spent much of his career trying to deal with problems of military administration, and he had studied the available British and French works on the topic.

Scott's career offers a number of interesting parallels with that of his contemporary, Thomas S. Jesup. Scott joined the army on May 3, 1808 (the same day Jesup enlisted) as a captain in the light artillery. He read law as a young man, but felt that a military career was more to his taste. In 1810 Brigadier General James Wilkinson brought charges against Scott for comments Scott made concerning Wilkinson's activities while in command of the army at New Orleans. The court martial found Scott guilty of conduct unbecoming an officer and suspended him from the army for one year. During that year Scott undertook a systematic study of all aspects of the military art, using a friend's library. He apparently used his time well, if his subsequent career is any indication.

Winfield Scott rose to national prominence during the War of 1812. He commanded elements of the American
forces engaged in the Battle of Queenstown on October 13, 1812, where he became a prisoner of war. After his parole he returned to the Niagara frontier as a lieutenant colonel; promotion to full colonel soon followed. In the spring of 1813 the War Department ordered him to Oswego, New York to serve as chief of staff to Major General Henry Dearborn. Ordered to prepare the army for the summer campaign, Scott first organized a field staff based on a French model. The proposed campaign on Lake Ontario miscarried, so on March 9, 1814 Scott, newly promoted to brigadier general, set out with his brigade for Buffalo.49

The War Department gathered troops at Buffalo to try to reestablish American control on the Niagara frontier, threatened after a British raid in December, 1813, during which they destroyed most American settlements along the river. The army at Buffalo consisted of approximately 3,500 men organized into two regular brigades (Scott's and Eleazer W. Ripley's) and a brigade of New York, Pennsylvania, and Canadian volunteers under Peter B. Porter. Appalled by the condition of the army, Scott established a camp of instruction at Buffalo to train the soldiers. Following the same procedure Steuben used during the Revolution, he trained the officers first, working from his own copies of French tactical manuals. He started with the school of the soldier and then, as the officers and men gained proficiency,
progressed to the school of the squad, company, battalion, and brigade, until the troops could maneuver and fight effectively. He also held classes in military conduct, field hygiene, camp duties, and police, working his troops ten hours a day from March until June. Morale and discipline improved, and when Major General Jacob Brown arrive in June to take command for the summer campaign the army was ready.50

The result was a significant tactical success for the army. The troops displayed unexpected steadiness under fire, supposedly causing British General Riall to exclaim "Those are Regulars, by God!" Scott's brigade was in the van of the advance on the Canadian shore, and he was wounded at Lundy's Lane on July 25, 1814. Reports of the 1814 campaign on the Niagara frontier did wonders for American morale, for the reputation of the United States Army, and, not coincidentally, for the reputation of Winfield Scott, who was rewarded with a brevet to major general. When General Brown became senior officer of the army in 1815 Scott served as a department commander in the Northern Division.51

Calhoun, aware of Scott's reputation and accomplishments, was anxious to have him proceed with the revision of the regulations. On September 22, 1818 Calhoun ordered Scott to Washington for discussions and instructions.52

On July 8, 1819 Scott reported "considerable progress in compiling a military work on service, police, discipline, and instruction . . . [according to] the plan or
outline heretofore submitted." In August he began to submit sections of the new regulations to Calhoun for comment and approval. He proposed changes in the War Department's channels of communication, which he found "circuitous and perplexed" and which involved "great absurdities and great loss of time and labor." Scott also tried to be as specific as possible and to define terms like "discipline," "police," "service," and "administration," even at the risk of appearing too simplistic. He thought it "best to settle with precision, & at once, the meaning of the terms which occur frequently in many parts of the project" because, in his experience, "fixed & distinct ideas do not generally prevail in the army in respect to those terms. They are [thus?] fixed technically, & in contradistinction to each other." In his definition of "administration" Scott summarized what Calhoun, Jesup, and others were trying to establish in their commands:

Administration, in its comprehensive sense, will be understood to mean the just direction and economical application or expenditure of the several sums of money appropriated by Congress for the army or military defense of the country on land. These objects are enforced by a good system of responsibility [Emphasis in original] for the several paying administrative departments, or officers, securing alike fidelity to the troops and to the Government.

Scott informed Calhoun that he planned to have the draft regulations ready for examination by December 1, 1819,
and he began to fret about how the work would be reviewed. Scott suggested that he be allowed to read the draft to the Secretary and to any officers Calhoun chose; he thought it would take about six or eight hours to go over the text. Scott also wanted an immediate decision on any objections that might be raised, "and altho' I do not anticipate a single one of importance, I shall, nevertheless, listen with patience and candor to what ever may be said in the way of animadversion. My replies shall be brief, direct, & respectful."

An unexplained delay followed, for Scott did not complete the draft until April, 1820. Calhoun agreed to receive Scott when the latter visited Washington "at which time, as Congress will have adjourned, I shall have the leisure to attend to the examination of the military work you have compiled." On December 20, 1820, Scott presented "a system of Military Regulations on Police, Discipline, Service, Instruction and Administration." [Emphasis in original.] He arranged to have five hundred copies of the volume published for $480 by the Philadelphia publishing house of Matthew Carey and Sons in mid-March. In mid-May, however, Calhoun ordered Scott to delay publication "in order to insert in it such further regulations as may grow out of the new organization." [i.e., the one authorized by the army reduction act of March 2, 1821.]
On May 19, 1821, Secretary of War Calhoun ordered a board, composed of the bureau chiefs, "to examine the regulations for the government of the several departments of the staff." In the approved version of the regulations, Scott revised and enlarged the articles pertaining to the staff bureaus, but apparently with no regard to the regulations then being formulated by Calhoun and the bureau chiefs. This would have given the bureaus two sets of regulations. To avoid this problem the board, while affirming its confidence that Scott was otherwise competent to complete the work, recommended that the chiefs of the staff bureaus furnish Scott "with a copy of such regulations as have been, or may be approved" for the departments. By June 5, 1821 the new staff regulations were complete. On June 9, Calhoun ordered Scott "to complete the printing of the regulations in the order and with the numbers [as] you have arranged them."

In mid-June Scott reported that "by the 10th of July then the book may be finished, & I relieved from the most tedious and irksome labor, according to bulk, that I have ever had any knowledge of." Then, on July 7, Scott faced yet another delay: President Monroe had not yet finished his examination of the regulations. Monroe finally approved the regulations on July 10, and Scott and Calhoun collaborated on the wording of the order establishing the regulations. Scott began distributing the
regulations on July 16; he asked Calhoun to allow him extra compensation but the Secretary refused, saying that the $2,328 Scott received as extra pay was enough.61

**Scott's Institutes** -- the name Scott preferred to **General Regulations for the Army** -- was the first comprehensive management manual published in the United States. It was a complete, detailed (Scott the attorney made sure of that) compilation of the rules and procedures that would henceforth govern all phases of military life, from the operations of the staff bureaus to the most mundane aspects of cooking, cleaning, and camp police. Scott himself believed that his work was unique:

This was the first time that the subjects, embraced, were ever reduced, in any army, to a regular analysis, and systematized into institutes. . . . But in the Institutes, besides definitions of administration, instruction, service, police, subjects treated of [Emphasis in original.] -- there is a due logical connection and dependence between the parts, not found in the other books mentioned. [i.e., the European and American manuals he consulted.]62

It was certainly unique in American experience. With the new regulations, Calhoun could begin to apply more systematically his reform ideas to the army as a whole.

The regulations were a massive work, running some 400 pages including index. Scott divided the work into seven sections, comprising seventy-nine articles. The first two sections -- "Rank and Command" and "Military Compliments, or Honours" -- dealt with some of the minutia of military
life that was vitally important in a small, intensely rank-conscious army. In one of the few instances where anyone lodged a serious complaint about ambiguities in the regulations, Adjutant General Colonel James Gadsden noted that "the present regulations evidently admit of great latitude in construction, and under them every case of brevet rank in our reduced military establishment may be made to take command or effect."63 This is perhaps less noteworthy when one considers that Scott spent much of the next decade arguing that according to the regulations he was entitled to the pay and emoulments of his brevet rank, major general.

Of greater interest are Scott's standards for establishing the relative positions and duties of line and staff officers. As a general principle, Scott determined that staff officers "clothed with rank assimilated to lineal rank" were to be treated as if their rank was lineal; on the other hand, in departments where the rank was not assimilated, such as the Surgeon General's Department, the rule was that monthly pay determined relative rank.64 However, even though assimilated rank made some staff officers equal to line officers, Scott made certain that there was virtually no chance that staff officers could assume line commands:

1. Staff officers, as such [Emphasis in original.], have no direct command over the troops; they are the organs through which their respective commanders or chiefs communicate orders and instructions, either verbally or in writing;65
Despite these strictures, for many years Secretaries of War had to deal with complaints over relative rank and the right of staff officers to command line units, especially in the case of Corps of Engineers officers who were superintending the construction of fortifications where line units were stationed and assisting in the work.

Sections Three ("Interior Economy of Regiments and companies"), Four ("Economy of Divisions, Departments, and posts"), and Five ("Economy of an army in campaign") are of interest as a source of management ideas. In Section Three Scott described in detail the chain of command within regiments and companies and listed the specific duties of all officers from colonel to subaltern (lieutenant). He also laid out the normal daily activities of units down to the company level while in camp. In most cases Scott goes into the most minute details of cooking, cleaning, personal hygiene ("It is essential to cleanliness and health, that the soldiers should change their linen at least thrice a week in midsummer, and twice a week, (on Sundays and Thursdays,) during the remainder of the year."), care of arms and accoutrements, marking public property, and company and regimental records. Scott prescribed thirteen books to be kept by the regimental adjutant and provided plans for a carrying case whose "door will be made to turn on hinges at the bottom, and thus serve as a portable desk." The regimental quartermaster kept five and the paymaster two additional books, plus
those maintained by the surgeon. Each company commander kept six more books.66

The time and attention Scott lavished on this section reflected both his experiences and his aspirations. He had commanded units of an army that knew virtually nothing about army life, so in his Institutes he made sure that in the future officers would have a manual that told them and their men exactly what to do, how to do it, and frequently when. Scott's work also reflected his acceptance of the political realities that shaped army activities: if politics dictated that the army be kept small and widely dispersed, at least all of its units would be trained and administered according to uniform standards, facilitating cooperation and coordination if circumstances ever brought units of the army together for a campaign. Finally, Scott pursued a single-minded devotion to the principle of accountability. If the officers followed his regulations, there could be little possibility for the loss or misuse of public equipment or money. He repeatedly stressed the value of his complicated system of accountability, both for economic and morale reasons.

Perhaps the key feature of Sections Four and Five was their description of the various chains of command and communication that honeycombed the army. The information recorded at the company and regimental level was of little use unless it could be regularly transmitted to the various
officers whose job it was to compile and process the data. Article 48, "Orders; mode of distribution," discussed both the theory and practice of transmitting information from army headquarters to various sub-units and from the headquarters to Washington and also described the flow of information in the other direction. Scott's attention to detail was again obvious: he described the form orders should take and how they were to be distributed most efficiently. 67

The last section of the 1821 regulations, Section Six, contained under the head "Miscellaneous" nine articles (66-73, 77) of regulations for the staff bureaus, as well as seven articles on other topics. The staff regulations published in this edition were essentially the same as those prepared by Calhoun and the bureau chiefs and forwarded to Scott after the June, 1821 conference. They were at least as detailed as the other sections of the regulations: Article 69, covering the Quartermaster Department, ran almost sixty pages in the final version. The content of all the staff regulations reflected the fixation on accountability that pervaded the upper echelons of the military hierarchy, but since they would undergo yet another revision in 1825, relevant sections of the revised staff regulations, especially Article 67, covering the Engineer Department, will be discussed below.

* * * * *
One other segment of the army underwent a thorough restructuring during Calhoun's years at the War Department. In 1818 the United States Military Academy reflected the problems that plagued the rest of the army. By 1824 the situation at West Point had improved dramatically, following what should be by now a familiar pattern: Calhoun supported a new superintendent, Sylvanus Thayer, in his attempts to create a more rational, better organized administration at the school. The cornerstone of Thayer's reform efforts were a new set of Academy regulations.

Perhaps no single institution in the army reflected the administrative and organizational limitations existing in American society as clearly as the Military Academy. Founded in 1802 under the aegis of Thomas Jefferson, the Academy had not, in the eyes of some observers, lived up to its promise by 1815.

During the first decade of its existence Congress and the War Department made only sporadic attempts to systematize the administration or the course of instruction at West Point. In March, 1812 there were no instructors attached to the Academy. It had, up to then, graduated 88 cadets, ranging in age from 12 to 34. Congress reorganized the Academy in an act of April 29, 1812. This act authorized a larger permanent staff of instructors, fixed a limit of 250 cadets, and set age and intellectual qualifications for admission. Colonel Joseph G. Swift, the first graduate of
the Academy (Class of 1802), served as superintendent from July 31, 1812 to March 24, 1814. Swift considered many reforms for the Academy, but the pressure of the war limited what he could accomplish.

As early as 1808 Swift sketched a plan for the Academy that stressed the need for a military organization for the school "to subject its officers and students to the Rules and Articles of War and Regulations for conducting the Institution." He also favored giving more power to the superintendent "to fix responsibility and authority in one individual, unencumbered by other duties." Swift also proposed that the curriculum include a wide range of subjects because he knew from experience that a military engineer had to be more than just a narrowly trained military technician. Swift worked closely with some of the leaders of North Carolina politics, society, and commerce when he worked on fortifications there, and he felt that officers should be intellectually equipped to move in these circles. When Swift became Chief of Engineers (the statutory head of the Academy) on July 31, 1812, Captain Alden Partridge took his place as superintendent.

Partridge brought more systematic management to the Academy, but it was an idiosyncratic management that the Academy staff did not like. Partridge tried to take personal charge of all phases of instruction at the Academy. He always supervised and sometimes conducted drill and tried to
visit each academic class daily. Unfortunately, the operations of the Academy had grown to the extent that the more time Partridge spent on academic matters, the less he could spend on the administration of the Academy. According to Captain David Bates Douglass, "no orderly books had been kept, or indeed any record of any kind." Partridge tried to carry on the administration of the whole post in his head -- he made all contracts and supply arrangements himself, with no more than perfunctory clearance from Swift. The staff resented Partridge's interference with their assigned duties and launched a barrage of complaints and criticism against him.

Secretary of War William Crawford ordered a Court of Inquiry to convene to investigate Partridge and the Academy in February, 1816. The court sat for a month, from March 15 until April 12. Its report was generally favorable to Partridge: the officers found no instances of personal malfeasance, although they noted a general lack of discipline, a lack of inspection and Partridge's unwillingness to assign duties to his subordinates, and they disapproved of the lack of post records. The report did little to calm the crisis; if anything, it made the personal and philosophical problems even more acrimonious. Partridge threatened to expose the conflict to Congress and the public; Crawford remarked that Partridge's tone exhibited "a serene egotism and arrogance which nothing but a total ignorance of the world palliates."
Captain Jared Mansfield accused Partridge of being a tyrant who violated "the most sacred obligations of man," although Mansfield's motives were not altogether altruistic: he complained after Partridge began teaching special classes for advanced students in Mansfield's specialty, Natural and Experimental Philosophy.70

Crawford eventually tired of the controversy and on July 28, 1817 he appointed Captain Sylvanus Thayer as the new superintendent of the Military Academy. After a comic-opera episode where Partridge refused to relinquish command, then refused to give up his quarters, then returned to reclaim them (unsuccessfully) with a group of sympathetic cadets after his eviction, Thayer settled in to assume command, a position he would hold until July 1, 1833. Crawford gave way to Calhoun late in 1817; on January 25, 1818 Thayer wrote to Calhoun proposing changes in the laws and regulations of the Military Academy. Although he awaited Calhoun's response "with much anxiety," Calhoun approved Thayer's plan. On April 1, 1818 Thayer forwarded a list of the principle amendments he proposed for Calhoun's consideration.71

Thayer organized his reform proposals into twenty-four propositions that systematically and comprehensively covered academic matters (instituting a standard four year curriculum for all students and establishing a merit roll to record student performance, for example), organization, definitions of authority and responsibility on the post and
in the classroom, job descriptions, compensation, and personnel matters. Thayer collected periodic reports from the tactical officers and the academic staff and used these reports as the basis for regulating cadet life at the Academy. He also began to consult more regularly with the faculty and staff on administrative matters. In some ways Thayer's proposed system was as arbitrary as Partridge's had been, but Thayer based his on specific rules of conduct and organizational standards similar to those being applied throughout the army.72

Thayer received unqualified support from both General Swift of the Corps of Engineers and Secretary of War Calhoun. Swift saw Thayer put into practice many of the changes he had been advocating for a decade; Calhoun saw the Academy as a source of technically trained officers who had spent four years absorbing the details of military life and its procedures under Thayer's tutelage. Calhoun frequently suggested additional reforms, especially in regard to the new edition of Academy regulations Thayer was preparing for inclusion in Scott's work.73 These regulations appeared as Article 78 in Scott's Institutes. They generally reflected refinements and amplifications of ideas presented by Thayer, Swift, and Calhoun. As with the rest of the regulations, they were quite detailed, covering all phases of the Academy's organization and operation. Article 78 also gave the superintendent the authority to establish "all necessary regulations
for interior police and discipline;" Thayer then promulgated even more detailed internal regulations for the Academy in 1823. Thayer's regulations controlled the daily life of all cadets during their four years at the Academy. As with so many of the other regulations being produced under Calhoun's auspices, Thayer's for the Academy tried to inculcate values of honor, obedience, respect for authority, responsibility, and accountability in the cadets, values they were expected to carry with them throughout their military careers.74

Calhoun and his subordinates accomplished a great deal between 1818 and 1820. Calhoun had his staff of specialists, the new regulations were nearing completion, and the Military Academy was at least beginning to live up to the high standards its founders set for it. None of these changes occurred overnight: indeed, in 1820 many of them were just beginning to assume something that suggested their final form. It is fortunate that Calhoun and his subordinates acted with such energy and resolve during these years, for forces appeared in 1820 that put severe strains on the restructured War Department. It weathered the crisis of 1821 in part because Calhoun did such a remarkable job in strengthening its organizational and administrative foundation.

*   *   *   *   *
The American economy entered a short but sharp recession in 1819. The resulting dislocation led to calls for reduced government spending. Advocates of governmental economy soon focused their attention on Calhoun's War Department, although all executive departments had their expenditures carefully scrutinized. On May 11, 1820, the House of Representatives passed Henry Clay's resolution directing Calhoun to submit a plan to cut the army in half, to 6,000 men. 75

The May resolution suggests that Calhoun had become a victim of his own success. Observers agreed that his work in the War Department improved his political fortunes, as Calhoun himself had hoped when he took the position. Monroe won reelection in 1820, but the election of 1824 loomed before ambitious politicians who envied Calhoun's success. Calhoun's former mentor, Henry Clay entertained presidential aspirations, as did his cabinet colleagues Secretary of State John Quincy Adams and Secretary of the Treasury William Crawford, who saw the recession as an opportunity to advance his standing as an advocate of governmental economy. Senator John Williams, chairman of the Senate Military Affairs Committee, and Representative William Eustis, a former Secretary of War and now chairman of the House Committee on Military Affairs, were both Crawford partisans. Eventually, of course, Adams won the election of 1824, with Calhoun (who campaigned for the presidency himself) as his vice-president.
In the meantime, the jockeying for advantage did not bode well for Calhoun or the United States Army. 76

Calhoun solicited the opinions of his subordinates in 1820. He began to get advice even before he asked for it: on May 31, almost two months before the House passed the resolution, Quartermaster General Jesup sent Calhoun a report in which he suggested that in the event of a reduction the War Department preserve a judiciously organized staff "at least in miniature" in peacetime because, in the event of war, "to extend would be found an easy & ready task whereas to create would certainly be found a tedious and difficult one." Opponents of the military establishment were already rolling out their old arguments, so Jesup suggested some traditional counter-arguments of his own. He regarded the "threat to liberty" argument "as the miserable cant of more miserable demagogues," an idea kept alive "not from motives of patriotism, but for the purpose of producing temporary effect in small and generally, obscure districts -- not for National but for individual purposes." Jesup himself considered a large peacetime army unnecessary, instead advocating an officer "Corps without troops [,] a part of whose duty it will be to render the militia itself, more efficient." 77 [Emphasis in original throughout].

Calhoun transmitted his own request for advice on July 21, 1820. He professed that he did "not fear a reduc-
tion, notwithstanding the resolution," because "the
disbursements of the Army will, I think at the next Session present a very favorable result," although he was taking no chances. General Brown wanted him to undertake an extended tour of the military establishment, but Calhoun decided not to because

I am still more anxious to present nothing at the next session, which will enable those opposed to our Military institutions to take any advantage. Hence, I review almost everything, & this, with the heavy pressure of going over all the Revolutionary pensions, engross the whole of my time.79

The replies Calhoun received from his request for advice demonstrated a remarkable uniformity of views. Brigadier General Scott's reply was surely the least useful: "I am bound most solemnly to declare it to be my opinion (whether as a citizen or as a soldier) that no material diminution of the Army can be made, without proportionate injury to highly important general interests of our country."80

Major Generals Jacob Brown and Andrew Jackson and Brigadier General Edmund Pendleton Gaines offered more useful advice. They all recommended against reducing the army, but they also recognized that Congress would feel compelled to cut somewhere. They therefore all recommended reductions in the rank and file, leaving a disproportionately large officer corps. The staff would remain as then organized, while the rest of the army would become "the skeleton [sic.] of a force, the body of which may be filled up or reduced as the exigencies of the case may require.81
Calhoun transmitted his "Report on the Reduction of the Army" to the House of Representatives on December 12, 1820. In it he presented a summary of the views of Brown, Jackson, Gaines, and Jesup. Calhoun recommended retaining all the formations, officers, and staff positions as authorized, but called for a reduction in the number of privates and non-commissioned officers. By maintaining the existing number of battalions at a reduced strength, the army could be readily expanded to meet wartime needs. His plan called for an army of 6,316 men, somewhat more than the establishment suggested by the resolution but not, he hoped, too many more than Congress would accept.83

The Secretary believed his report would form the basis of any reduction. He informed General Brown that he was "of the impression that either no reduction will take place, or that it will be on principles, in conformity to those embraced by the report." His hopes probably soared when Kentucky Representative David Trimble asked him to draft a bill that conformed to his report, but they were dashed on March 2, 1821, when Congress passed "An Act to reduce and fix the peace establishment of the United States."84

Congress reduced the army from 12,383 men (674 officers and 11,709 non-commissioned officers and enlisted men) to 6,126 (540 and 5,586 respectively). It cut one line infantry regiment and the rifle regiment and reduced the establishment by one major general and two brigadier generals.
It retained the seven staff bureaus plus the Corps of Engineers, but disbanded the Ordnance Department. 85

The act enraged Calhoun, who placed most of the blame on Henry Clay and his supporters. Writing to Major General Jackson, Calhoun noted

that a few active, but I fear unprincipled men have seized on the embarrassment [sic.] of the moment, not so much to retrench as to disorganize. . . . the disorder is in the House. . . . if anyone, desiring to rise to the head of this nation, has contributed he deserves, and . . . will receive the execration not only of prosperity . . . but the present generation.

[My critics] have many of them been very active to embarass. They have in particular been very pointed in their attacks on me personally. My course is fixed and nothing will turn me from it. The prosperity of the Republick [sic.] is too important to make subordinate to personal aggrandizement or gratification. 86

Calhoun presided over the reduction of the army, despite his anger. Major General Jackson was dropped; Brigadier Generals Macomb and Atkinson accepted reductions to colonel and new positions. Calhoun also ordered Scott to delay the publication of his regulations at this time, to allow the War Department to insert changes made necessary by the reduction. By the summer of 1821 both the reduction and the new regulations were complete. The pace of reform slowed dramatically; the time had now come to show that the new system would work.

The effective end of the period of concentrated change that characterized the first three years of Calhoun's tenure as Secretary of War came in 1821. He accomplished
virtually all he set out to do in late 1817. He spent much of the remainder of his term as Secretary of War trying to make sure that all of the individuals involved with the new management system knew their jobs and obeyed the regulations, and in fine-tuning various elements of the system he created.

The only significant change to emerge between 1821 and 1825 was another revision of the General Regulations of the Army. The act of March 2, 1821 had made Scott's Institutes the official version of army regulations. In May, 1822, Virginia Representative John Floyd noted discrepancies between the published edition and the draft approved by Congress. As it turned out after a Congressional investigation, the differences occurred because Alexander Smyth of the House Military Affairs Committee neglected to add some changes made by Scott and approved by the committee to the version approved by the House. On May 7, 1822 Congress repealed the section of the act of March 2, 1821 that adopted the regulations. President Monroe continued the regulations in effect by a General Order of May 2, but Calhoun directed Scott to make revisions in both the regulations and the army's infantry tactical manual.87

The project got underway in earnest in 1824. Calhoun ordered Scott to West Point to work on both the regulations and the tactical manual. Calhoun asked the bureau chiefs to suggest any changes they would like to see made in their bureau regulations. Scott received and incorporated these changes,
which were generally minor (except for the Engineer Department regulations, which were thoroughly revised and enlarged to cover contingencies that developed as its work on internal improvements projects grew). The revision of the tactical manual went well too, although this project took much more of Scott's time. 88

After the election of 1824, when Calhoun was elected Vice-President of the United States, Calhoun began to push Scott to get both the projects completed by March 4, 1825. Scott submitted a revised draft of the regulations on December 15, 1824; Calhoun returned the copy with his approval and President Monroe's sanction on January 5, 1825. On the same day the president also gave his approval to Scott's Tactics for the Infantry of the United States Army. The order establishing the 1825 revision as the official regulations of the United States Army was dated March 1, 1825. 89

On February 28, 1825 Calhoun's personal and official staff bid farewell to their departing chief in a testimonial letter in which they thanked him for making "the burden of details with which the undersigned are charged, comparatively light." In closing, they offered him "their best wishes for your prosperity and happiness; you will carry with you their prayers that you may long live to adorn the nation whose honor has been the theme of your eloquence; and to whose prosperity you have so largely contributed." 90
The letter "deeply affected" Calhoun. His reply was typically stiff and formal, but it serves as a fitting valedictory for his administration. Calhoun noted with pleasure that those who, from their station, are most capable of forming a correct judgement [approved of his work].

Believing that the utility of a military establishment depended much more on organization and science, than on numbers, my efforts have been directed to give ours the best possible organization, and the highest degree of science; to which I endeavored to add the most exact accountability and rigid responsibility in the disbursements, as being indispensable to the morality and efficiency of the Army.91

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Calhoun, ably assisted by his military subordinates, did a remarkable job in creating and implementing a coherent theory of military administration in the United States. He faced Congressional hostility, personal jealousy, and political infighting. Despite these obstacles, Calhoun managed to push forward the frontiers of administrative science in America. His reforms shaped the structure and the administrative processes of the United States Army for more than eighty years. The institution he took over in 1818 reflected the chaotic situation in society as a whole; the army he left in 1825 was a modern, fully-functioning corporate bureaucracy, far more advanced and better organized than
any other social, political, or business organization in the United States.

Even as the army emerged from its period of reorganization it began to expand its non-military operations. Calhoun, like Jefferson, believed that the army should contribute to socially useful projects needed to promote the development of the nation. Congress continued the fortification program, first authorized in 1794 and the traditional province of the Corps of Engineers, even as it assigned the military engineers to other projects, less directly military, perhaps, but deemed no less vital to the security of the nation. The Corps of Engineers refined its business practices on these projects, and at the same time it began to pass some of these same practices on to the burgeoning business community.
CHAPTER ONE -- NOTES


3 Kohn, Eagle and Sword is the best discussion of Federalist military policy, although Weigley, Prucha, Ingersoll, and Jacobs also cover the same ground. The act establishing the War Department is 1US 49; the legislation cited is either reproduced or extracted in John F. Callan, The Military Laws of the United States (Baltimore: John Murphy & Company, 1858); and U. S. Adjutant General's Office, Legislative History of the General Staff of the United States, 1775-1901, compiled by Raphael P. Thian (Washington: -77-


5The act is 1 US 279; the commentary is from Kohn, Eagle and Sword, p. 124.

6Kohn, Eagle and Sword, pp. 187-188.

71 US 610.


91 US 749.

10Kohn, Eagle and Sword, p. 291.


12Weigley, History of the Army, pp. 107, 112.


14Ingersoll, History of the War Department, pp. 45, 40.

16White, The Jeffersonians, pp. 9, 11.


18PJCC, I, pp. 262-263; Monroe to House Committee on Military Affairs, November 23, 1814, in PJCC, I, p. 273.

19Capers, Calhoun, p. 47.

20PJCC, I, p. 401.

21Capers, Calhoun, p. 61; PJCC, I, pp. 418-419.

22Capers, Calhoun, pp. 61-62; Heitman, Register, I, p. 16; Calhoun to Monroe, November 1, 1817, PJCC, I, pp. 418-419; PJCC, II, p. xi.

23PJCC, II, xl-xl1; White, The Jeffersonians discusses the individuals and their accomplishments in detail.


25Calhoun to Charles Ingersoll, December 14, 1817, PJCC, II, pp. 16-17.

26Calhoun to Brown, December 17, 1817, PJCC, II, pp. 22-23.
27 See, for example, Brig. Gen Winfield Scott to Calhoun, December 16, 1817, PJCC, II, p. 21.

28 Heitman, Register, II, pp. 576-579.

29 Ibid.; also see Callan and Thian.

30 Calhoun to Williams, February 5, 1818, in National Archives Record Group 107, Records of the Office of the Secretary of War, "Reports to Congress from the Secretary of War," Microcopy 220, Roll 1, Vol. 1, p. 436. [Hereafter cited as "Reports to Congress," RG 107, M-220.]


32 3 US 426.

33 The duties of the two offices were so different that the department was effectively split in practice. The A & IG Department was renamed the Adjutant General's Department in 1821, but the Inspector General languished in limbo until 1874, when Congress created a separate department. In practice the army recognized that it was a separate department, and it was so treated in the regulations. See Ingersoll, History of the War Department, pp. 139-146.


35 Calhoun to Swift, April 7, 1818, PJCC, II, p. 232; Calhoun to Swift, April 7, 1818, "Engineer Orders and Circulars," RG 77, Box 1, pp. 24-25.

36 Engineer Department Circular, April 18, 1818, "Engineer Orders and Circulars," RG 77, Box 1, pp. 26-27.


38 Kieffer, Maligned General, pp. 2, 4-6.

39 Ibid., pp. 14, 6.

40 Ibid., pp. 6-27.


43 Ibid., pp. 390-391.

44 Jesup to Calhoun, July 20, 1818, PJCC, II, pp. 405-407. Risch, Quartermaster Support, pp. 184-186 discusses the same material.

45 Wiltse, Calhoun, pp. 136-137.

46 Calhoun to Brig. Gen Daniel Parker, Adjutant and Inspector General; Brig. Gen. Thomas S. Jesup Quartermaster General; Callendar Irvine, Commissary of Purchases; Joseph Lowell, Surgeon General; Col. Walker K. Armistead, Chief of Engineers; Robert Brent, Paymaster General; Col. Decius Wadsworth, Chief of Ordnance; Mr. Cutting of the Land Warrant Bureau; and Mr. Edwards of the Pension Bureau; September 5, 1818, in National Archives Record Group 107, Records of the Office of the Secretary of War, "Letters Sent, Military Affairs, 1800-1861," Microcopy 6, Roll 10, p. 137. [Hereafter cited as "Letters Sent, Military Affairs, RG 107, M-6."]

47 For Scott's letter to Calhoun, see ASP/MA, 2, pp. 199-200.


50 Scott, Memoirs, I, p. 120; Elliott, Scott, pp. 144-152; Mansfield, Scott, pp. 100-110; Weigley, History of the Army, p. 129.

52. Monroe to Calhoun, September 17, 1818, PJCC, II, p. 137; Calhoun to Monroe, September 19, 1818, PJCC, II, pp. 141-142; Calhoun to Scott, September 22, 1818, PJCC, III, p. 151; Calhoun to Brown, September 23, 1818, PJCC, III, p. 151; Calhoun to Scott, August 20, 1819, PJCC, IV, p. 261.

53. Scott to Calhoun, July 8, 1819, in National Archives Record Group 107, Records of the Office of the Secretary of War, "Letters Received by the Secretary of War, Registered Series, 1801-1860," Microcopy-221, Roll 87, S-5(13). [Hereafter cited as "Registered Letters Received," RG 107, M-221.]

54. Scott to Calhoun, August 29, 1819, "Registered Letters Received," RG 107, M-221, Roll 87, S-40(13).

55. Ibid.

56. Scott to Calhoun, August 29, 1819, "Registered Letters Received," RG 107, M-221, Roll 87, S-78(13); Calhoun to Scott, September 5, 1819, PJCC, IV, pp. 300-301; Scott to Calhoun, November 13, 1819, PJCC, IV, pp. 405-407.

57. Scott to Calhoun, April 25, 1820, in National Archives Record Group 107, Records of the Office of the Secretary of War, "Registers of Letters Received by the Secretary of War, 1800-1860," Microcopy 22, Roll 3, p. 350 [Hereafter cited as "Registers of Letters Received," RG 107, M-22.]; Calhoun to Scott, April 28, 1820, "Letters Sent, Military Affairs," RG 107, M-6, Roll 11, p. 29; Scott to Calhoun, December 22, 1820, PJCC, V, p. 507; Scott to Calhoun, March 2, 1821, "Registered Letters Received," RG 107, M-221, Roll 91, S-134(14); Calhoun to Scott, March 10, 1821, "Letters Sent, Military Affairs," RG 107, M-6, Roll 11, p. 158; Scott to Calhoun, March 13, 1821, "Registered Letters Received," RG 107, M-221, Roll 91, S-158(14); Calhoun to Scott, May 16, 1821, "Letters Sent, Military Affairs," RG 107, M-6, Roll 11, p. 203.


59. "Report of Board of Officers to Examine Staff Regulations, formed May 19, 1821," May 23, 1821, PJCC, VI, pp. 144-145.

60. Calhoun to Scott, May 25, 1821, PJCC, VI, p. 146; Calhoun to Scott, June 2, 1821, "Letters Sent, Military Affairs," RG 107, M-6, Roll 11, p. 219; Calhoun to Scott, June 5, 1821, "Letters Sent, Military Affairs," RG 107, M-6,
Roll 11, p. 221; Calhoun to Scott, June 9, 1821, PJCC, VI, p. 178.

Scott to Maj. Christopher Vandeventer, June 18, 1821, PJCC, VI, p. 200; Calhoun to Scott, June 29, 1821, "Letters Sent, Military Affairs," RG 107, M-6, Roll 11, p. 242; Calhoun to Scott, July 7, 1821, PJCC, VI, pp. 248-249; Calhoun to Scott, July 7, 1821, "Letters Sent, Military Affairs," RG 107, M-6, Roll 11, pp. 249-250; Calhoun to Scott, July 10, 1821, PJCC, VI, p. 252; Calhoun to Scott, July 12, 1821, PJCC, VI, p. 256; Scott to Calhoun, July 21, 1821, PJCC, VI, pp. 269-270.

Scott, Memoirs, p. 206.

Col. James Gadsden, Adjutant General, to Calhoun, October 23, 1821, PJCC, VI, p. 457.

"Systems of Martial Law, and Field Service, and Police," Article 2, paragraphs 4-6, in ASP/MA, II, p. 201. This "System of Martial Law" is virtually identical to the 1821 General Regulations. It was submitted to Congress in December, 1820 for consideration. The following discussion of the regulations was drawn largely from the ASP/MA version. For the staff regulations discussed later, the published regulations, cited as General Regulations, 1821 or 1825 were used since they contain the revised staff regulations.


"Systems of Martial Law," Section 3, Articles 16-37, in ASP/MA, II, pp. 206-214. The quotes are from Article 28, paragraph 2, p. 210; Article 35, paragraph 2, p. 212; and Article 37, paragraph 13, p. 213. The information recorded in the books mentioned is described in Section 3, Article 37.


Denton, "Formative Years of the USMA," pp. 121, 134, 155.
70Ibid., pp. 135-138, 140-141, 158.


73Denton, "Formative Years of the USMA," pp. 90, 118; Lieutenant J. L. Smith to Thayer, October 7, 1820, Thayer Papers, Vol. 3, n. p..

74For Academy regulations prior to the Thayer reforms, see U. S. Military Academy, Regulations of the United States Military Academy at West Point, New York, 1802-1816 (West Point: USMA Press, n.d.), in the Academy Archives. The quote is from General Regulations, 1825, Article 78, paragraph 129, p. 347. Thayer's 1823 regulations are in U. S. Military Academy, Regulations for the United States Military Academy at West Point, New York, 1823, in the Special Collections of the Academy Library.

75PJCC, V, pp. xiii, xx.

76For a discussion of the problems caused by the factions in Congress and the Cabinet, see W. Edwin Hemphill's comments in PJCC, VII, pp. xi-xxxii, as well as his introductions to succeeding volumes.

77Jesp to Calhoun, March 31, 1820, PJCC, IV, p. 748.

78Calhoun to Generals Brown, Jackson, Scott, Gaines, and Atkinson, July 21, 1821, PJCC, V, p. 274.

79Calhoun to Brown, PJCC, V, p. 274. The last sentence suggests that the staff was still not working at full efficiency, although Scott was able to "review" what previous secretaries had to do for themselves.

80Scott to Calhoun, August 20, 1820, PJCC, V, p. 334.

81Jackson to Calhoun, August 9, 1820, PJCC, V, pp. 317-319; Gaines to Calhoun, July 27, 1820, PJCC, V, p. 378; Brown to Calhoun, October 6, 1820, PJCC, V, 378; and Jesup
to Calhoun, December 1, 1820, PJCC, V, p. 464.

82 Calhoun to Samuel D. Ingham, November 6, 1820, PJCC, V, pp. 925-926; Calhoun to Brown, November 12, 1820, PJCC, V, p. 452.


85 Heitman, Register, 2, pp. 580-581.

86 Calhoun to Jackson, March 7, 1821, PJCC, V, pp. 662-663.

87 Scott to Calhoun, June 19, 1822, PJCC, VII, p. 169; Calhoun to Scott, August 11, 1824, PJCC, IX, pp. 277-278; Elliott, Scott, pp. 229-230.

88 Macomb to Thayer, July 8, 1824, Thayer Papers, Vol. 4, n. p.; Calhoun to Brown and the chiefs of the staff bureaus, July 22, 1824, "Letters Sent, Military Affairs," RG 107, M-6, Roll 12, p. 72; Order # 50, establishing the Tactical Board, July 16, 1824, PJCC, IX, pp. 245-246; Calhoun to Scott, August 11, 1824, "Letters Sent, Military Affairs," RG 107, M-6, Roll 12, p. 76; Paymaster Nathan Towson to Calhoun, September 13, 1824, PJCC, IX, pp. 315-318; Christopher Vandeventer to the chiefs of the staff bureaus, September 14, 1824, PJCC, IX, pp. 318, 321; Scott to Calhoun, September 21, 1824, PJCC, IX, p. 323; Vandeventer to Scott, November 6, 1824, PJCC, IX, pp. 373-374.

89 Van deventer to Scott, November 6, 1824, PJCC, IX, pp. 373-374; Scott to Calhoun, December 15, 1824, PJCC, IX, p. 446; Calhoun to Scott, January 5, 1825, PJCC, IX, p. 478; Calhoun to Scott, March 1, 1825, PJCC, IX, p. 607.

90 Major General Jacob Brown, Commanding General of the army; Alexander Macomb, Corps of Engineers; Isaac Roberdeau, Topographical Engineers; Thomas S. Jesup, Quartermaster; George Gibson, Subsistence; Nathan Towson, Paymaster; Charles J. Nourse, Acting Adjutant General; Joseph Lowell, Surgeon General; George Bomford, Ordnance; Christopher Van deventer, Chief Clerk; Thomas L. McKenney, Pension Office; William M. Stuart, Bounty Land Office; and William Lee, Second Auditor, Treasury Department; to Calhoun, February 28, 1825, PJCC, IX, pp. 599-600.
Calhoun to Brown et al. [for other addressees, see note 90], March 3, 1825, *Fed. Doc.* IX, p. 615.
CHAPTER TWO

The Military Management System in Practice, 1820 - 1830

Although logistical problems lay at the root of many of the administrative reforms made by the War Department between 1812 and 1820, the Corps of Engineers actually transferred some of these advanced management techniques to American business. The Quartermaster Department and the Commissary of Purchases, the two branches of the military staff that had the most in common with contemporary corporate enterprises, had relatively little contact with the nation's business community. The Corps of Engineers, on the other hand, was involved in a range of projects that brought engineer officers into frequent and extended contact with businessmen in many areas.

The Corps of Engineers was the smallest of the War Department's agencies, but the most visible branch of the United States Army in the years between the end of the War of 1812 and the beginning of the Civil War. While the rest of the army languished in isolated frontier garrisons, the Corps' work on seacoast fortifications and later on
internal improvements projects brought engineers to work in or near many of the nation's largest cities, where suppliers and contractors learned to work with, if not enthusiastically accept, the War Department's business practices. As engineer officers became more familiar with the business methods of the civilian sector they began to criticize some of its traditional ways of doing business and to suggest alternative methods, based on the military's administrative system, to their civilian colleagues. Businessmen rarely accepted this advice before the late 1820's because they had as yet no pressing need for a management system as complex as the one employed by the War Department. It was not until the beginning of the engineers' involvement with the Baltimore & Ohio Railroad in 1827 that their suggestions began to be heard by a more receptive audience. Nevertheless, the Engineer Department's early work on the fortifications and internal improvements projects gave it an opportunity to test and refine its own administrative practices.

The Corps of Engineers managed to avoid most of the organizational and operational difficulties that plagued the staff bureaus before 1818. Perhaps because the Corps remained a small, recognizably specialized branch of the service, Congress generally left it intact when it made other reductions in the military establishment. There were engineer officers available to the Continental Army during
the siege of Boston and the early campaigns, although the Continental Congress did not authorize a specially organized body of engineers until March, 1779. Brigadier General Louis LeB. Duportail commanded the war-time engineers, most of whom were former British or French officers. The engineers disbanded with most of the rest of the Continental Army in November, 1783. In March, 1794 Congress appropriated funds for fortifications on the Atlantic Coast, and it authorized a "Corps of Artillerists and Engineers" to build and man them in May, 1794. Lieutenant Colonel Stephen Rochefontaine became the Corps' first commander in 1795, to be succeeded by Lieutenant Colonel Henry Burbeck in 1798.¹

Congress reorganized the Corps of Engineers in 1802. An act of March 16, 1802 authorized the President of the United States to establish a corps of engineers consisting of five officers (one major, two captains, and two second lieutenants) and ten cadets, with the statutory authority to expand the corps to no more than twenty officers and cadets. The act directed that the officers and cadets were to be stationed at West Point, New York to constitute a military academy, although they were liable "to do duty in such places and on such service as the President . . . shall direct." The chief engineer became the superintendent of the school.² Lieutenant Colonel Jonathan Williams became Chief Engineer and superintendent of the Military Academy on July 8, 1802. The engineer officers
who were supposed to act as instructors at the Academy spent most of their time on the fortification program, to the detriment of military education and discipline. This state of affairs continued until the spring of 1812, when Congress made further provisions for both the Corps and the Academy. 3

The Corps of Engineers assumed the shape it would hold for many years during the War of 1812. On April 29, 1812, Congress increased the authorized strength of the Corps to twenty-two officers. It also directed that the War Department attach a 94-man "Company of Bombardiers, Sappers, and Miners" to the Corps of Engineers. The act of April 29 also made significant changes in the Military Academy. It increased the academic staff and the Corps of Cadets (to a maximum of 250), set standards for admission and graduation, and appropriated $25,000 for new building and equipment. On March 3, 1813 Congress added eight topographical engineers and eight assistant topographical engineers to the Corps of Engineers. Congress made no provision for the topographical engineers when it reduced the army after the war, although the Corps of Engineers retained its wartime establishment. The General Staff Act of April 24, 1816 returned the topographical engineers to the service when it provided three topographical engineers and two assistant topographical engineers for each of the two divisions of the army. A General Order of July 2, 1818 established a Topographical Bureau in the Engineer Department, headquartered
in Washington, later Georgetown. 4

The decision to establish a semi-autonomous Topographical Bureau within the Engineer Department is yet another manifestation of John C. Calhoun's reform goals. Recurring debates over the relation of the topographical officers to the line and questions of rank and command forced Calhoun to establish the position of the topographical engineers within the War Department's evolving administrative hierarchy. Having done this, Calhoun found that he could then more effectively control and efficiently employ the topographical officers. A separate bureau also fostered Calhoun's cherished goal of accountability. The chief of the bureau, Major Isaac Roberdeau, became the curator of the Topographical Bureau's growing collection of charts, reports, and maps produced by officers in the field. He was also responsible for the surveying and drawing instruments they used. Roberdeau prepared semi-annual consolidated returns of the instruments, books, maps, and charts in the hands of engineer officers. Neither Major Roberdeau nor his successor, Major John J. Abert, approved of the Topographical Bureau's subordinate position in the Engineer Department. Abert complained that he was little more than a "subordinate clerk to the Chief Engineer." Both recommended the establishment of a separate Topographical Bureau, responsible, like the other staff bureaus, directly to the Secretary of War. The chief of the Topographical
Bureau gradually assumed more independent power until Secretary of War John H. Eaton made the Topographical Bureau an independent office in the War Department on June 22, 1831.  

The topographical engineers shared similar but officially differentiated functions with their colleagues in the Corps of Engineers, a situation that bred animosity within the Engineer Department. Engineer officers (usually referred to in correspondence as "military engineers," who also added "CE" after their name) served primarily as builders, with the fortification program as their main responsibility. When the War Department assigned an engineer to a fort, it provided him with a site plan and elevations for the work he was to build. These preliminary plans usually came from an ad hoc board of fortifications that selected the site and determined the type of work the government would build there. The engineer's job was to superintend the construction of the project. Normally his planning and design functions were limited to contingencies that developed as the work progressed. The engineer was also responsible for producing a plan and elevation of the finished work.

Topographical engineers, on the other hand, served primarily as surveyors and mapmakers. Their duties remained largely the same as those set out when Congress first authorized topographical engineers in 1813:
to make such surveys and exhibit such delineations as the commanding general shall direct; to make plans of all military positions which the army may occupy and of their respective vicinities, indicating the various roads, rivers, creeks, ravines, hills, woods, and villages to be found therein; to accompany all reconnoitering parties sent out to obtain intelligence of the movements of the enemy or of his positions; to make sketches of their routes, accompanied by written notices of everything worthy of observation therein; to keep a journal of every day's movement when the army is in march, noticing the variety of ground, of buildings, of culture, and distances, and the state of roads between common points throughout the march of the day; and lastly, to exhibit the positions of the contending armies on the field of battle, and the dispositions made, either for attack or defense. 6

Both sides believed that their specialty required unique talents and training (although all engineers took exactly the same four year course at the Military Academy) and that they had little in common with the other. Commenting on a proposal to increase the Corps of Engineers, Sylvanus Thayer expressed the view of many members of the Corps when he wrote:

As a member of the Corps I object to uniting our fate with theirs [i.e., the topographical engineers]. I know they wish to identify themselves with the Corps. I have no serious objection to their wearing our uniform as they are much pleased with it & I do not complain that the Company of Bombardiers has been sacrificed for their preservation but I would thank them to sink or swim by themselves & not hang as a millstone about our necks. It is time to say hands off. 7

Despite the internecine squabbling, the two branches of the Engineer Department seem to have cooperated with relatively little friction when they had to. There was a
regular and harmonious exchange of information which grew as the Topographical Office added materials to its files and became a major repository of information. In any event, the military engineers had little choice but to cooperate with their topographical colleagues, since they remained under common leadership. The traditional division of labor remained when the Corps of Engineers became involved with internal improvements in the mid-1820's: topographical engineers made the route surveys for various canal and railroad schemes, while the military engineers built specific projects like breakwalls and lighthouses when the federal government began to sponsor river and harbor improvements.

Despite the wide range of its functions the Engineer Department operated under a single set of regulations throughout the period. Like the other staff bureaus, the Engineer Department in the 1820's used regulations drawn up as part of the Calhoun reforms between 1818 and 1825. The department prepared the regulations submitted to Scott in June, 1821 under the direction of Colonel Walker K. Armistead, Chief Engineer. Colonel Alexander Macomb replaced him on June 1, 1821, and was therefore responsible for the revisions made for inclusion in the 1825 edition of the regulations. The Engineer Department regulations -- Article 67 in both the 1821 and 1825 editions-- were not especially noteworthy when compared to the regulations of the other staff bureaus, but since they served as the
specific model for the first generation of American business management manuals they warrant detailed examination.

The body of regulations that had evolved by 1825 reflected the experience gained not only from Calhoun's efforts since 1818 but from more than thirty years of operational testing as well. The major feature that sets the 1825 edition apart from its predecessors is stylistic rather than substantive: by 1825 the Corps of Engineers had become actively involved in internal improvements projects, so the newer edition specified that its provisions applied to military engineers employed on both civil and fortification projects. The regulations described in detail how the officers and civilian agents were to conduct their business affairs. They also reflected the larger concerns of Calhoun's War Department: authority, economy, accountability, and the utility of standardized reports flowing along carefully defined lines of communication.

The chief engineer, aided by the chief of the Topographical Bureau and a small office staff in Washington, directed the activities of the Corps of Engineers, the topographical engineers, and the Military Academy, of which he was the inspector. The officially prescribed duties of the Engineer Department included

---reconnoitering and surveying for military purposes and for internal improvements, together with the collection and preservation of topographical and geographical memoirs and drawings referring to those objects; --the selection of sites, the
formation of plans and estimates, the construction, repair, and inspection of fortifications, and the disbursement of the sums appropriated for the fulfillment of those objects severally, comprising those of the military academy. Also, the superintendence of the execution of the acts of Congress in relation to internal improvements by roads, canals, the navigation of rivers, and the repairs and improvements connected with the harbors of the United States, or the entrance into the same, which may be authorized by Congress, with the execution of which the war department may be charged.9

The chief engineer kept track of the officers under his control through monthly reports of their past and current activities, "their station, movements, and general occupation." The officers also kept a journal of their efforts, and they filed monthly abstracts of its contents.10

Engineer Department operations usually began when either the Board of Engineers for Fortifications or the Board of Engineers for Internal Improvements [both discussed below] undertook a project, either as part of their normal activities or in response to a special request from Congress or a private commercial venture. The board involved prepared a preliminary plan and estimate of the project, filed periodic reports while they were on duty, and then presented a full report when they completed their survey. In addition to these specific project reports the boards also filed annual reports that the Engineer Department used to schedule future operations. The annual report, besides summarizing the board's work for the past year, also included the board's suggestions for the next years.
surveys, with an estimate of how long each would take and what it would cost. As Engineer Department operations expanded these boards came to serve an important screening function, since their decisions determined the effort the Corps of Engineers would expend on a given project. They also relieved the chief engineer of some of his duties, leaving him free to watch over construction and survey projects in progress.

Focusing specifically on a proposed fortification project, once the Board of Engineers for Fortifications completed its survey and prepared a tentative plan and elevation of the new work and the War Department received funding from Congress, the chief engineer assigned the project to one of his officers. At this point the scope and complexity of the Engineer Department's business methods begins to unfold.

The Engineer Department furnished the supervising engineer with plans and general instructions. Since Congress had appropriated funds based on these plans and estimates, the department held its officer responsible "for the faithful execution of the work in strict conformity to them." The officer's first job on the site was to draw the trace on the ground and to make tests to ensure that the ground would support the work. If, when he compared his test results to the plan, he found that circumstances dictated a change in the design, he was enjoined
to report this immediately to the department, at the same
time transmitting his own revised plan. Having finalized
the trace, the engineer set to work "to ascertain the best
means of procuring the various kinds of materials, labour,
and workmanship" and to prepare "a minute estimate of the
expense of constructing the work and procuring the site."
The pre-construction phase of his labors ended when the
engineer prepared

a project for carrying on the work, exhibiting a
full view of the contemplated operations in their
progress from the commencement to the completion
of the work, in which he will unfold, in detail,
not only the means to be applied, but the manner
of applying them to the construction, together
with the order in which he may propose to carry
on the several parts of the construction, . . .

In this regard, the regulations directed the engineer to
build permanent barracks first, "in order that the expense
of temporary buildings for the accommodation of workmen
and other purposes may, as far as practicable, be avoid-
ed."12

The Engineer Department, like all the other agen-
cies of the War Department, went to great lengths to see
that its officers exercised great care when they disbursed
public funds. The superintending engineer maintained de-
tailed accounts of his transactions and operations through-
out the course of construction. These accounts served as
the basis for monthly, quarterly, and annual reports he
had to file with the central office. The department sup-
plied its officers with seventeen standardized forms,
sixteen of which the engineer used while superintending fortification projects. (The seventeenth was a field book used by topographical officers on survey projects.) Although engineers began following complex reporting procedures, at the insistence of Congress, during the Revolution, Calhoun and Swift expanded the system. Its primary purpose was to ensure accountability for public funds.

Each officer maintained a daily journal and ledger, from which he compiled a monthly progress report, which included an inventory of construction materials on hand (Form 2), an estimate of the funds he planned to spend in the following month (Form 10), the payroll, which listed each employee, his term of service, his rate of pay, his gross pay, deductions and why the deductions had been made, his net pay, his signature, and the signature of a witness, certifying that the worker received "the amounts hereunto set opposite [his name], in full payment of our services for the time specified" (Form 12), and his own monthly per diem claim form (Form 15 -- each officer superintending the construction of a fortification received, in addition to his regular pay, a per diem allowance of two dollars, provided his total per diem claim did not exceed two and one half percent of the total sum he disbursed). 13

His monthly reports served in turn as the basis for a more detailed set of quarterly returns which were the cornerstone of the Engineer Department's business methods and
system of accountability. An engineer's quarterly returns included a summary progress report and inventory (Form 3), an inventory of "Equipage & Appurtenances" (Form 4), an account of funds expended for provisions (Form 5) and forage (Form 6), with copies of the receipts (Form 11), an abstract of his "accounts current," showing the total amount of public funds he received, spent, and still had in his local account (Form 14), an account of other disbursements (Form 13), also with receipts, an estimate of the funds he planned to spend in the following quarter, including a plan of how he would spend them (Form 9), and a return of instruments, books, maps, and charts in his custody. (Form 16).

The engineer's annual reports were fewer in number but no less complex. When the Engineer Department informed him exactly how much money Congress had appropriated for his particular project, he submitted a detailed estimate of how he proposed to spend that sum. When the Engineer Department approved his estimate it determined the course of his year's work, since the regulations stipulated that the estimate "will not be departed from without special authority," except in an extreme emergency. His official annual reports included a detailed report of the work completed during the year and an estimate of the work planned for the next year (Form 1), accompanied by a detailed cost estimate (Form 7) and work schedule (Form 8). It is safe to suggest
that each superintending engineer maintained accounts that were at least as detailed as those maintained by the most meticulous businessman of the time.\textsuperscript{15}

Although preparing his journals, estimates, and accounts undoubtedly took up a large part of the engineer's duty hours, the paperwork was only one part of his responsibilities. The engineer was also the government's contracting agent, subject to procedures laid out in the regulations. He had to solicit bids through the local press and to certify to the Engineer Department that all contracts had been made "on the most reasonable terms that could be procured." As a check, each disbursing agent forwarded a "price current, or a newspaper containing one" to the department, plus copies of his request for bids, all proposals received, and a copy of the final contract. As the work progressed, the engineer spent more of his time weighing, measuring, and inspecting construction materials and the finished product. When contractors delivered their supplies, the engineer was required to inspect, or cause to be inspected, the quantity, quality, and price of all materials delivered for the fortification, or other work under his superintendence, and to receive or reject them accordingly as they may, or may not, be approved.\textsuperscript{16}

The Engineer Department carefully checked the accounts and the work of its officers. It "minutely examined with respect to prices, and the object and character of the disbursements" all the accounts it received; to facilitate
this inspection the engineer provided additional "information of the current value, . . . of the materials, labour, and workmanship that may be required." The Department was not reluctant to return accounts "for explanation and correction" if it objected to the facts, figures, explanations, or mode of presentation. Similarly, the Department held the engineer personally responsible for the public property in his possession. If he could not satisfactorily account for each item, he was "charged with the value thereof."17 The Board of Engineers for Fortifications and the Engineer Department both made periodic inspections of the work, including an on-site inspection of the engineer's books. When the Board visited a fortification under construction, the regulations directed it to inspect it as thoroughly as the time that can be spared from other duties will allow and to report to the engineer department their opinion as to the quality and price of the materials and workmanship embraced in the work executed; the fitness and economy of the arrangements under which it was executed; whether its execution was in conformity to plans; and, whether its extent is in due proportion to its cost: also, whether the plan of administration and other existing or contemplated arrangements are well adapted to the further prosecution of the work, and if not, what modification or alteration would be necessary to make them so.18

When the superintending engineer reported the work finished, it underwent a final inspection by a specially-detailed engineer officer who, furnished with a copy of the plans and labor applied, reported on "the manner in which the work may have been executed."19
Assuming that the final inspection went well, the War Department then certified the job complete and assigned troops to the new fort. But even then the engineer's job was not quite finished: he still had to complete detailed drawings of the finished work, close out his accounts, and transmit "the letter book, the books of registry of materials received and services performed, the journal of the progress of the operations, and all other books, together with all drawings of the details of the several parts of the work, and all papers belonging to the work" to the Engineer Department archives. Then, usually after a furlough, the officer began the process again at another project.

After 1824, the Topographical Engineers worked from plans formulated by the Board of Engineers for Internal Improvements. They adopted essentially the same reporting procedures as the engineers, although the nature of their work necessitated some minor changes in the frequency and form of their reports. Topographical officers conducting survey projects usually worked in teams called "survey brigades," composed of one or more topographical officers plus officers detailed from the line to do duty with the Engineer Department. Since Military Academy graduates officered the army, and since all Military Academy graduates were trained engineers, the Engineer Department adopted the policy of using line officers as needed, "whereby the junior officers of the army, possessed of the requisite qualifications, will
be afforded opportunities of participating in the advantage of becoming instructed in topographical duties." Line commanders complained that this policy robbed their units of some of the most promising officers and disrupted training, but the policy persisted for many years.

When a survey brigade began operations, the team leaders submitted a plan and estimate. As work continued he filed the same monthly and quarterly reports, returns, and estimates as the officers superintending fortifications. Upon the completion of the field work at least part of the team repaired to a convenient workplace where they prepared the detailed maps and reports that then went into the Engineer Department's files. They also filed Form 17, their field books. Regardless of the nature of the project, the records, reports, and maps became the property of the department, available to others only with special permission from the Engineer Department.22

The regulations of the Engineer Department prescribed a complex, comprehensive business system, one designed to promote the efficient completion of the department's tasks while providing the means to ensure that the public money was spent wisely and only for the purposes for which Congress had appropriated the funds. They worked well despite the amount of work involved in following them because the Engineer Department enforced them rigorously. Engineer officers were free to complain about the amount of
work they faced and they did, regularly. But even as they complained they obeyed the regulations because their career depended upon their obedience. The army was developing both a system and an ethos that were unique in the business environment of early 19th century America.

* * * * *

The Army Corps of Engineers did virtually all of its work prior to 1824 on the nation's fortification program. This program was yet another aspect of defense planning that Congress conducted largely on an ad hoc basis before the Monroe/Calhoun administration initiated a number of significant changes. Funding for the fortifications was sporadic and depended almost entirely on the current perception of the immediate military situation of the nation. Although the fortification program became one of the cornerstones of national defense policy, it suffered from a lack of direction and funds for many years.23

After the War of 1812, Congress placed the fortification program in the hands of a Board of Engineers for Fortifications. The board examined the Atlantic and Gulf coasts and recommended sites for fortifications. Attached topographical engineers made a detailed survey of the position and its environs and executed a general plan for the fortification the board proposed for the site. This plan and survey
then went to the superintending engineer, who made more
detailed plans as needed, estimated the cost, and super-
vised construction. Initially, private contractors built
the work under the direction of civilian agents, with the
engineers serving as roving inspectors, responsible for the
funds expended and for the quality of the finished product.
In 1820, however, the War Department abolished the position
of the civilian agents because Calhoun believed "that the
duties of the superintendent can be performed by the super-
intending Engineer and his assistants, with such assistance
as may be derived from the employment of skilled mechanicks
[sic.] as Inspectors, overseers, &c." Calhoun also felt

that the useless multiplication of agencies is
highly prejudicial, tending to diminish responsi-
bility and retarding the progress of any extensive
undertaking, and that an officer evinces his effi-
ciency and soundness of judgement by such judicious
organization as dispenses with agents as that might
otherwise be necessary.24

As the work progressed Calhoun and Colonel Alexan-
der Macomb, Chief Engineer vice Colonel Armistead as of
March 31, 1821, continued to demand strictest adherence to
War and Engineer Department regulations. The Corps of
Engineers acted according to the precepts of the same "cult
of accountability" that pervaded the rest of the War Depart-
ment. Leaders of the Corps and the War Department knew that
Congress watched their activities very closely. Congress
valued economy and demanded that the War Department (and
in fact all government agencies) demonstrate that it spent
its allocations prudently. It wanted to know exactly where and how the department spent the public's money. The War Department's internal accounting and reporting procedures allowed Calhoun to provide that information. The system also made it more difficult for individuals to misuse public funds. Although the department had some discretion in applying general appropriations to specific projects, individual officers and agents had to account for every dollar they received.

In the field engineers were exposed to many types of businessmen and to many kinds of business practices, and they exhibited little reluctance to criticize either. Their experiences reinforced their belief that Engineer Department business methods were far superior to contemporary business management techniques. Although many officers at one time or another complained about their contractors or their workers, none was more persistent or vituperous in his comments than Captain James Gadsden.

Throughout 1819 and 1820 Gadsden, who supervised a number of fortification projects on the Gulf Coast, sent in a series of scathing denunciations of the people he worked with and the business methods they used. Although Gadsden was most bitter about the contractors and their attempted frauds and inability to fulfill their contracts on time, he also criticized some of the methods the Engineer Department used. He repeatedly complained that the department
expected its officers to do too much and that they could not be everywhere at once. He advocated greater delegation of authority and the appointment of lower-ranking officers to oversee individual projects. In essence, he proposed using the army's hierarchical structure to overcome managerial problems.\textsuperscript{26} Gadsden complained so much that he eventually felt compelled to write to Colonel Armistead:

\begin{quote}
I presume that it is distinctly understood by you that all my communications to the Engineer Department, in which the inequalities, mismanagement, and personal characters of the Contractors for the Public Works on this frontier are treated, are of a confidential character.\textsuperscript{27}
\end{quote}

Armistead may have passed Gadsden's complaints on to Calhoun, because in June, 1820 Calhoun dismissed the civilian agents. However, Calhoun's new system gave the supervising engineer even more to do. For Gadsden, perhaps the cure seemed worse than the disease.\textsuperscript{28}

Without making any attempt to excuse the contractors for their malfeasance, it is only fair to state that they had their own complaints with the government and its way of doing business. Although the Engineer Department tried to settle its accounts promptly, the contractors could never be sure that funds would cover all they had contracted for. In at least one instance, an officer informed his contractors that although he was without funds, he expected that Congress would provide more money eventually. He asked them to keep working in anticipation of an additional appropriation.\textsuperscript{29}
Another officer, Lieutenant Colonel Charles Gratiot, applied some of the more detailed management techniques then being tried throughout the War Department to his command. Gratiot decided that the work on a number of fortification projects in New York could be done more efficiently if his civilian work force had a better grasp of what their jobs were and exactly what was expected of them. Accordingly, he promulgated a set of written rules and regulations for his command that detailed lines of authority and communication and defined the duties of all workers. He also organized a small staff to assist him in his supervisory and inspection duties and to keep him informed on the progress of the work in their areas. Gratiot seems to have been the only engineer to have tried these techniques on his command. In light of Calhoun's comments when he dismissed the civilian agents, Gratiot's approach to the problem seems to have been exactly what Calhoun had in mind. 30

As work on the fortification program continued, the Engineer Department noted with pride that its officers were doing a credible job of fulfilling all their various duties honorably and efficiently. Large sums of money changed hands, but the accounting system worked well and engineer officers avoided any taint of serious financial misconduct. However, several officers proved to be somewhat lax in the prosecution of their duties, something that did not long escape the notice of the central office. In 1824 Major
Samuel Babcock survived a Court of Inquiry, despite Colonel Macomb's view that Babcock was "incompetent to perform the duties of his station as a field officer of the Corps of Engineers." Babcock's assistant, Lieutenant Hippolite Dumas, also received some scathing criticism from Macomb, who claimed that Dumas had rendered "no satisfactory duty" since he joined the Corps of Engineers and that "he has been a deadweight on the Corps from the day he entered it . . . and . . . an obstacle to the advancement of meritorious officers." Macomb wanted both dismissed, or at least given the opportunity to resign. Macomb wanted to make an example of Babcock and Dumas:

In the present state of service and of the Engineer Department in particular it is essential to the publick [sic.] interest that an example should be made of such a want of attention to detail, in order to warn the officers of the Corps of Engineers of the consequences resulting from any neglect or inattention on their part.

With the exception of the two officers above mentioned the Corps of Engineers is highly respectable and efficient. The demand for the services of the Corps is increasing, and considering the small number of officers composing it, the inefficient members must not only retard the public service but tend to diminish the elevated character of the Corps ought to sustain.31

Despite Macomb's arguments, however, Babcock remained in the service. Dumas resigned, effective January 1, 1825.32

As Macomb noted, the demands for the services of the Corps of Engineers were increasing, because not long before he recommended the dismissal of Babcock and Dumas Congress had added another wide range of projects to those handled by
the Engineer Department. In April, 1824, Congress directed the War Department to make the services of its engineers available to various public and private internal improvements projects.

The fortification program gave the War and Engineer Departments an excellent and extended opportunity to test their administrative practices, but the lessons gained from the experience remained within the Engineer Department, at least for a time. During their work on the fortifications, engineer officers dealt with supply and construction contractors throughout the nation, and this experience exposed them to a range of civilian management practices which the officers generally found primitive and fraught with possibilities for fraud. The army engineers forced the local contractors to meet their procedural demands and in so doing they exposed the contractors to the army's detailed management procedures. There is no evidence, however, that these contractors manifested any desire to learn more about army practices or to suggest why they would want to. The contractors had only to supply stone, wood, supplies, or provisions to one fortification project in their home district. Most of the contracting firms appear to have been small operations with few employees, run by one man or a partnership.

The army, on the other hand, was trying to control a far larger and more expensive operation spread over a much wider area. The information it needed to conduct its
affairs efficiently greatly exceeded anything a local quarry owner and his helpers needed to carry on their business. Once the army became involved with internal improvements projects, however, the relationship between the Corps of Engineers and the firms it was assisting began to change. A canal, and to a much greater extent a railroad company, faced managerial problems that were similar to, if more limited and less complex, than those faced by the army. The distances were longer, the work forces larger, the operations controlled by the company more varied, and the funds involved much greater than in other contemporary business enterprises. Army management practices would naturally appear far more useful to the managers of these firms. They were, therefore, much more likely to request and accept organizational and administrative advice from their military assistants.

* * * *

The War of 1812 was responsible for federal interest in internal improvements. Many Americans, including John C. Calhoun, believed that some of the nation's difficulties in the war were caused by the problems the government experienced in trying to gather troops, furnish supplies, and maintain communications with the frontier. To correct these deficiencies Calhoun became an advocate of federal
sponsorship of a variety of internal improvements projects. According to Calhoun, "good roads and canals, judiciously laid out" were the only remedy to the problems, which he claimed were rooted in the fact that "we occupy a surface prodigiously great in proportion to our numbers."

Since the remedy was obvious, Calhoun believed that the federal government had a duty to support a program of internal improvements. He rejected the argument "that internal improvements may be wholly left to the enterprise of the States and individuals" with the claim that

many of the improvements contemplated are on too great a scale for the resources of the States or individuals; and many are of such a nature as the rival jealousy of the States, if left alone, would prevent. They require the resources and the general superintendence of the Government to effect and complete them.33

Calhoun carried these beliefs with him when he left the House of Representatives and moved to the War Department. On April 4, 1818 his former colleagues in the House resolved

That the Secretary of War be instructed to report . . . a plan for the application of such means as are within the power of Congress to the purpose of opening such roads and Canals as may require the aid of the government, with a view to military operations in time of war, the transportation of munitions of war, and the more complete defence of the United States; and also, a Statement of the works of the nature above mentioned, which have been commenced, the progress which has been made, and the means and prospect of their completion, together with such information as, in the opinion of the Secretary, shall be material in relation to the objects of this resolution.34
The resolution gave Calhoun the opportunity to prepare yet another critically important state paper in which he could expound his ideas on what projects were needed and how the government could most efficiently accomplish them.

On January 7, 1819, Calhoun completed his "Report on Roads and Canals," also frequently referred to as his "Report on Internal Improvements," which he transmitted to the House on January 14, 1819. At the outset Calhoun announced a theme that presented a broader view than that requested by the resolution:

A judicious system of roads and canals, constructed for the convenience of commerce, and the transportation of the mails only, without any reference to military operations, is itself the most efficient means for 'the more complete defence of the United States.' Without adverting to the fact, that the roads and canals which such a system would require are, with few exceptions, precisely those which would be required for the operation of war, such a system, by consolidating the Union, and increasing our wealth and fiscal capacity, would add greatly to our resources in war.35

But, since Calhoun believed that a consideration of the "intimate connection" between defense and general economic prosperity was beyond the purview of the report, he concentrated on an examination of "a good system of military roads and canals," which was "indispensable" to the United States.36

Calhoun returned to the point he made in the House two years before: the most serious defensive problem facing the United States was the disparity between the size of the country and its limited population. The nation's size was
a mixed blessing, because while it made the nation difficult to conquer it also made it difficult to defend. Although the first line of defense would be the navy and the coastal fortifications, if the nation was going to rely on the militia for its land forces the government had to create the means that would enable it to shift its forces to the theater of operations with a minimum of delay, confusion, expense, "and the debilitating effects of long marches." Calhoun anticipated that the enemy would concentrate on either nuisance raids or on a campaign of conquest. To fight the former, the Americans would have to rely on the forces serving in the tidewater and on a north-south transportation system. For the latter, the United States would have to mobilize all available forces, and most of the movement would be across the mountains on an east-west system. Calhoun reported that the states and local interests were beginning to develop the east-west lines, and that the government should offer what assistance it could. The north-south system, on the other hand, involving, by Calhoun's estimate, about one hundred miles of canals, was more properly the province of the federal government.37

After describing the chain of works then underway or proposed, Calhoun suggested one possible way the federal government could promote the work. He believed that a first step would be the preparation of surveys, estimates, and maps, a project of "inconsiderable expense" because "the
army can furnish able military and topographical engineers," and all that would be necessary would be to hire "one or more skillful civil engineers to be associated with them. By their combined skill, an efficient system of military roads and canals would be presented in detail, accompanied with estimates of expenses as may be relied on." If Congress opted to actually build some or all of the proposed roads and canals, Calhoun recommended that the government direct that the army "be brought in aid of the moneyed resources of the country" because "labor adds to its usefulness and health. A mere garrison life is equally hostile to its vigor and discipline; both officers and men become the subjects of its deliterious effects." However, he noted, the army was so small that to concentrate a part of it to build a road or canal would involve exposing some part of the frontier. In any event, Calhoun believed it proper that "the disbursement of the sums appropriated for the purpose might be made by the Department of War" and that "the work ought to be done by contract, under the superintendence and inspection of officers of the engineer corps, to be detailed for that purpose."38

Calhoun attempted to show that economic prosperity, defense, and internal improvements were interrelated. Roads built for purely commercial reasons would be militarily useful, and commerce would invariably flow on military roads. He was also undoubtedly aware that the Board of Engineers
for Fortifications was also becoming increasingly cognizant of the necessity to tie the fortification system it was considering together with a system of internal transportation as well. By 1821 Calhoun could present to Congress plans for a comprehensive security system that would provide a surer means of defense and simultaneously promote the economic development of the nation, which would in turn further contribute to the nation's security. It was not the first time an American statesman had proposed such a system: Secretary of the Treasury Albert Gallatin discussed a similar program in his 1808 "Report on Roads and Canals." It was, however, the first time an individual with these ideas could present them as part of a comprehensive proposal that had a reasonable prospect of receiving favorable attention in Congress. It was also the first time any private or governmental organization possessed the technological wherewithal to prosecute its programs on such a scale. Calhoun proposed a civil and military engineering project of unprecedented magnitude, but in the military and topographical engineers the federal government possessed a technical resource of great potential. For at least twenty years members of the Corps of Engineers would figure prominently in all federally sponsored or supported internal improvements projects, and in many more private projects that utilized the services of these officers as part of the government's support of transportation development.
Congress began to appropriate funds for some of the projects Calhoun proposed almost immediately. On April 14, 1820, for example, Congress appropriated $5,000 to enable Brigadier General Bernard and Colonel Totten of the Board of Engineers for Fortifications to make a survey of the Ohio and Mississippi Rivers with an eye toward improving transportation on them. Their report recommended a number of canals and other river improvements projects, including the removal of many rafts and snags that blocked the rivers in spots. The survey work grew as time went on, especially in the Great Lakes basin, where Army engineers made detailed surveys of the region for the first time and planned harbor improvements, although the army engineers did not ignore the Atlantic and Gulf coasts. The progress of the Erie Canal, a state project built without any significant assistance from the federal government or its military engineers, generated a canal mania that eventually involved army engineers when states and private corporations began to request technical assistance from the federal government. Finally, Congress decided to formally authorize the continued employment of military engineers on private projects.39

On April 30, 1824, Congress passed the General Survey Act, officially "An Act to procure the necessary Surveys, Plans, and Estimates, upon the subject of Roads and Canals," which authorized the President of the United States
to cause the necessary surveys, plans, and estimates, to be made of the routes of such Roads and Canals as he may deem of national importance, in a commercial or military point of view, or necessary for the transportation of the public mail; designating, in the case of each canal, what parts may be made capable of sloop navigation; the surveys, plans, and estimates, for each, when completed, to be laid before Congress.

(Sect. 2) And be it further enacted, That, to carry into effect the objects of this act, the President be, and he is hereby authorized to employ two or more skillful civil engineers, and such officers of the corps of engineers, or who may be detailed to do duty with that corps, as he may think proper; and the sum of thirty thousand dollars be, and the same is hereby appropriated, to be paid out of all moneys in the treasury, not otherwise appropriated.40

In May, Chief Engineer Alexander Macomb began appointing civilians and military officers to the "Board of Engineers for Internal Improvements" that President Monroe and Secretary of War Calhoun decided would oversee the operations authorized under the act. On May 17, 1824 Macomb informed James Shriver, a civilian engineer, that the president had selected him to head a "brigade" of six civilians (Shriver and five assistants) who would work under the direction of the board. On May 24, after considering applications from a number of noted civil engineers, Macomb wrote to John L. Sullivan and William Howard that they too had been selected to work with the new board, and on May 31 Macomb informed Sullivan, Brigadier General Bernard, and Lieutenant Colonel Totten that President Monroe had appointed them "as a board of Internal Improvements to superintend the execution of the provisions" of the General
Survey Act. The order establishing the board also attached to it two "brigades" of military engineers, under Major John J. Abert and Captain William Gibbs McNeill, both of the Topographical Engineers, each consisting of five lieutenants (all graduates of the Military Academy) detailed from the line, and Shriver's "brigade" of civilian engineers. Macomb also directed the members of the board and those attached to it to obey all departmental regulations pertaining to the disbursement of public funds and in making periodic reports of their activities.41

Various Congressional delegations began requesting surveys in their states almost immediately. As early as June 8, 1824 the board and its survey brigades were conducting surveys for canals to connect the Potomac and the Ohio River, the Ohio and Lake Erie, Pittsburgh and the Susquehannah/Schuylkill, and the Delaware and Raritan, forcing Secretary of War Calhoun to inform the Massachusetts delegation that although President Monroe had authorized the board to examine the route of a canal to connect Barnstable Bay and Buzzard's Bay, the project would probably be the first one the board undertook the following season.42 The teams worked through the summer and early fall. By mid-November all the teams were in winter quarters drawing their maps and preparing their reports, while the members of the Board on Internal Improvements returned to Washington to plan the next year's work.
With a year's experience to guide it, the board established a survey program according to the terms of the General Survey Act of 1824, and by 1825 the work followed a general pattern. Requests for surveys normally came from three sources, and the Board on Internal Improvements established a policy of ranking the projects according to the source of the request. The board first scheduled surveys ordered by law, then those ordered by Congressional resolution, then those "of a national or highly interesting commercial character applied for by States or incorporated companies." Having prepared the schedule, the board, under the supervision of the Engineer Department, then prepared the official instructions it would issue to the survey brigade leader. Colonel Macomb directed the board to specify that the brigade was to "combine in the greatest degree the important essentials of directness, practicability, and facilities for, together with cheapness of, construction" when they drew their maps and prepared their recommendations and estimates. Macomb also repeatedly advised the board to remember that its operations were governed as much by political as military and commercial considerations. Writing to the board in 1824 about the projected survey of the route for a road from Washington to New Orleans, he noted that "policy ... as well as the national interest directs the attention of the Department"
to the project, and that

it is desirable that the southern portion of the Union should not only see but feel some of the benefits which will result from a system of Internal Improvements. This is more important at this time, as there seems to be a doubt in the minds of the southern people as to the support which they ought to give to the system.45

The Board on Internal Improvements prepared the instructions and sent them to Macomb, who in turn forwarded them to the engineers. The orders were invariably quite detailed and those sent to the topographical engineers reminded the officers that "you will be governed as you have heretofore been by the regulations in rendering reports, returns, estimates, &c. and keeping and rendering your accounts." The officer then copied the instructions and returned the copy to the Engineer Department offices, as per the regulations.46 The board itself occasionally forwarded its instructions directly to the brigade of civil engineers under James Shriver. The tone of these communications was somewhat less harsh than the tone Macomb used when he addressed his officers, but the instructions were no less detailed and the civilians were expected to follow exactly the same accounting and reporting procedures the military engineers used.47 The board and the Engineer Department also used the regulations to govern the activities of civilian agents hired to supervise specific projects, especially improvements on the Ohio and Mississippi rivers in the 1820's. In this case the agents did not have
to prepare the usual monthly reports, but the department
did demand quarterly accounts and returns of machinery and
material and an annual summary of the work accomplished. 48

The survey brigades in the field were generally
given a free hand to conduct their operations as they saw
fit, subject of course to the regulations and the direc-
tions of the Engineer Department. The department provided
its brigades with blank survey books and returns, and di-
rected them to "use the same scales, the same measures,
and preserve the same arrangement in their maps, profiles,
and memoirs." To further promote uniformity, the Board on
Internal Improvements issued pamphlets like "General In-
structions for the Surveys of Canals" and "Instructions for
the Measurement of Streams." Also, "in order that the opin-
ions of the board under circumstances not materially vary-
ing may be as far as practicable uniform and consistent,"
the Engineer Department tried to provide the brigades with
copies of earlier surveys of similar projects. 49

To support themselves in the field, the brigade
leaders submitted their monthly estimates to Colonel Macomb,
who passed the request on to the Secretary of War for final
approval. Macomb then forwarded the funds to the officer,
in care of a bank in a nearby city. 50 Funds were always
tight, and Macomb repeatedly advised his officers in the
field to exercise "the utmost economy" and to be sure that
"no expense what ever be incurred which is not absolutely
necessary to the prosecution of the duties assigned to
them."51 Macomb occasionally had to resort to some minor
financial legerdemain to keep his brigades supplied with
funds, as when he advised Secretary of War James Barbour to
credit the internal improvements fund with the value of in-
struments bought out of that fund and charge the amount to
"repairs and contingencies of fortifications." Macomb
assured the Secretary that the Corps of Engineers would use
the instruments on the forts eventually.52 When the instru-
m ents needed repairs and adjustments the field officers sub-
mitted an estimate which the department usually approved,
although occasionally it suggested that the officer "pro-
cure estimates from other instrument makers before you decide
upon having the repairs made, as it is understood that
W. Patton altho' considered the best workman in New York
is sometimes very extravagant in his charges."53

Macomb seems to have spent an inordinate amount of
his time going over accounts submitted by officers and agents
in the field. He showed no reluctance to return vouchers
for fuller explanation, as was his perogative. The military
officers were no less likely to have their returns rejected
than their civilian colleagues who were initailly less familiar
with the system, although generally after the engineers
learned what Macomb expected the complaints became less
frequent. Some forms did not "designate the survey upon
which they were respectively employed" and they were returned
to have this filled in. Occasionally an officer had all his vouchers returned for additional information, as when Macomb directed Colonel Stephen H. Long to attach a statement of what services had been rendered, for what purposes, and that the work had been completed. Sometimes the officers did not furnish the forms in duplicate, and Macomb referred them "to the 897 paragraph of the general army regulations, to which you will be pleased to attend." Macomb summarily rejected requests for extended deadlines and occasionally refused to approve vouchers for purchases that he deemed unnecessary, which meant that the officer bore the cost himself. Macomb eventually worked out a system where final declarations of non-approval appeared on the voucher in ink, while a pencilled rejection returned to the officer gave him the opportunity to "furnish the required explanations respecting those or any others of the items specified."

Thanks in no small part to Macomb's constant attention during the first years of operations under the General Survey Act, the brigades completed their surveys, generally within their budgets and on schedule. They returned to Washington (later Georgetown) to prepare their reports, which contributed greatly to the store of knowledge available on the geography and natural resources of the United States. These reports exhibited a careful consideration of the many factors that would influence the decision to
construct a project on a particular route. Some of the reports, including those submitted by Colonel Long and Captain William Gibbs McNeill, also mentioned the possibility of building railroads along parts of the routes. Eventually many of the officers found themselves assigned to railroad surveys, where they became avid proponents of that form of transportation. Lieutenant Colonel Paul Perrault claimed that if locomotive engines performed as promised, "all difficulties in the way of transportation would disappear at once."58

Internal improvements projects under the direction of the Engineer Department increased in number very rapidly. In 1828, Colonel Charles Gratiot, Chief Engineer vice Macomb, who resigned on May 28, 1828 to assume command of the army,59 reported that engineers were at work on thirty-seven civil construction projects, eight special surveys authorized by special Congressional appropriations, twenty surveys under the General Survey Act (one of which was for the Baltimore & Ohio Railroad), and fourteen fortifications, while the Board on Internal Improvements was completing five survey reports.60 In 1829, the total included no less than 105 projects.61 The Corps of Engineers had assumed a role in promoting internal improvements that it has never relinquished.

While all the surveys and river and harbor improvements were in progress, Congress also assigned the
construction of the western segment of the Cumberland Road to the Corps of Engineers. When the Corps took over the road, it immediately applied its management system to that project, and when it did it began to introduce another group of civilian engineers to the techniques of modern management. Included in this group were men who would become actively involved with United States Army engineers on the Baltimore & Ohio Railroad in the late 1820's. It will be useful to examine this phase of their careers, because the nature of their work on the Cumberland Road would become a significant and divisive issue on the B&O.

Congress authorized the construction of a national road between Cumberland, Maryland and the Ohio River in 1806. Initially, the Treasury Department supervised work on the road. The road reached Wheeling in 1818, and two years later Congress appropriated $10,000 to survey a route for the road from Wheeling to the Mississippi River. The War Department assumed control of the project early in 1825 "from the circumstance that every other object of internal improvement was under the direction of their Department." Secretary of War James Barbour set the Engineer Department to work on the road "in the strong hope of causing such a road to be constructed as would realize the hopes of my Western brethren; and produce some reputation to this Department."
The Engineer Department retained Caspar Wever as superintendent and Jonathan Knight, formerly a surveyor under the Treasury Department, became the commissioner of the fourth section of the road. The department informed both men that operations would continue as before, but now they would follow standard War Department procedures. Army engineers made the surveys, plans, and estimates for the work, which was then done by civilian contractors subject to army inspection and approval. According to one source, army engineers surveying the extension of the road were not well received by the inhabitants of Ohio as they pushed the road through the state. Lieutenant F. Dutton "was specific, in a hard Army fashion, about what he wanted done." Dutton warned land owners to remove fences and barriers so that his team might work quickly. The farmers "thought first of their crops and were little given to receiving criticism placidly from Army officers. The Army was all right in its place, but on the frontier brass buttons rubbed people the wrong way."

In any event, work on the road continued. In June, 1825 James Shriver of the Board of Engineers for Internal Improvements led his survey brigade into west central Ohio. When the new Field Book appeared as part of the 1825 regulations, Shriver reported that his team found it impossible to use. Macomb told him that the official forms were "conceived to be more full and distinct, and consequently
better adapted to the fulfillment of the purposes for which they are intended" than the specimens which Shriver forwarded, but he authorized Shriver to use what he could of the new system to keep the work going, while noting that the Department "desired that those prescribed may be adopted as soon as they shall be understood." Macomb also had some trouble getting Knight, Weyer, and Shriver (but especially Weyer) to follow the department's accounting regulations. He informed Weyer that

"None of your accounts correspond with the forms prescribed by the regulations, altho' they are made out with as much distinctness probably as is customary with accounts relating to ordinary transactions of a private nature. It would be desirable, however, that they should be made here-after agreeably to the forms prescribed." Macomb continued to be far less harsh in his comments regarding civilian practices than he was with his officers. As late as a year after being directed to use the official forms, Weyer still received at least one set of his quarterly vouchers back with instructions to provide "more certification." The civilians learned, however, and soon they too were using the army's management system as efficiently as most officers, if somewhat less enthusiastically.

In August, 1826 the Engineer Department demonstrated to a group of its civilian employees how its system fostered stability when James Shriver fell ill in Indiana. Shriver's chief subordinate, Asa Moore, informed Macomb that Shriver was sick and asked for advice. Although Macomb learned of
Shriver's sickness "with regret," he hoped that Moore would "prosecute the service and fulfil [sic.] as far as possible the instructions which Mr. Shriver has received, with the means left at your command." "Should anything serious befall [sic.] Mr. Shriver," Macomb advised Moore to "secure the public property and do all in your power to complete the surveys as ordered." On August 26, Macomb informed Secretary of War Barbour that Shriver was dead and that Asa Moore would assume command of the brigade. Moore learned quickly that in a bureaucracy, the work went on. Macomb immediately ordered him to assume full control of the brigade. Funds formerly charged to Shriver were transferred to Moore, and he was directed to close out Shriver's accounts with the Engineer Department. On September 5, Macomb told Moore that "a copy of the Regulations forwarded herewith will enable you to ascertain the mode of doing business with the Department in relation to the duties you have in charge." The survey continued.

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By at least 1826 the United States Army had created a fully functioning corporate bureaucracy that could economically and efficiently coordinate many different types of operations over a wide geographic area. The Engineer Department alone handled business amounting to hundreds of thousands
of dollars annually without any serious taint of corruption. Army engineers were not just a source of technological expertise: they were also fast becoming highly skilled practitioners of a very advanced form of corporate management. When these officers began to work with civilian entrepreneurs on several internal improvements projects, they began, perhaps unwittingly at first but later with greater purpose, to transfer some of the management techniques they were familiar with to civilian corporate enterprises. The civilians, on their part, began to see the officers as one possible answer to the management problems their firms were beginning to face. In 1827, President Philip E. Thomas of the Baltimore & Ohio Railroad Company requested government assistance in the form of military engineers for his line. The active transference of managerial techniques and ideology began on the B&O soon after.
CHAPTER TWO -- NOTES

1 For the early history of the Corps of Engineers, see U. S. Army, Corps of Engineers, Letter from the Chief of Engineers to the Secretary of War, Containing a Historical Sketch of the Corps of Engineers and Remarks Upon Its Organization and Duties (Washington: Government Printing Office, 1876); U. S. Army Engineer School, The History and Traditions of the Corps of Engineers, Engineer School Special Text ST 25-1 (Fort Belvoir, Va.: Engineer School, U. S. Army, 1953); L. D. Ingersoll, History of the War Department of the United States (Washington: Francis B. Mohun, 1879).

2 US 132.


U. S. War Department, General Regulations for the Army; or, Military Institutes, revised by Major General Winfield Scott (Washington: Davis & Force, 1825), Article 67, paragraphs 887, 914, pp. 167, 176. [Hereafter cited as General Regulations, 1825. All references, unless otherwise specified, are to Article 67, which comprises paragraphs 887 through 923, inclusive.]

General Regulations, 1825, para. 888, p. 167.

Ibid., paras. 909-910, pp. 175-176.

Ibid., paras. 906-907, pp. 174-175.

Ibid., para. 889, pp. 167-168.

Ibid., paras. 891, 893, pp. 169-170.

Ibid., paras. 891, 897, 915, pp. 169-172, 177.

Ibid., paras. 890-891, pp. 169-170. Blank copies of the forms themselves are pp. 179-199. The monthly reports were to be mailed on the first of each month. Quarterly reports were mailed on January 1, April 1, July 1, and October 1. The annual reports and estimates were due at the Engineer Department on November 1. All forms were submitted in duplicate. See para. 891, footnote, p. 170.


Ibid., paras. 892, 898, pp. 170, 172.

Ibid., para. 908, p. 175.

Ibid., para. 901, p. 173.

Ibid., paras. 902-903, p. 173.

Ibid., paras. 911-913, p. 176.
22Ibid., paras. 904-905, pp. 173-174.

23For more information on the fortification program, see Willard B. Robinson, American Forts: Architectural Form and Function (Urbana, ILL: University of Illinois Press, 1970).


25In fairness to the contractors, it must be noted that the officers were dealing with very small firms that would have no real need for more complicated management methods. The managerial system then in use in the textile industry, for example, was far more complex than the methods the officers were exposed to. They never appreciated the vast differences in scale when they criticized their contractors.

26Gadsden to Armistead, August 16, 1818, September 24, 1819, and October 11, 1819, all in National Archives Record Group 77, Records of the Office of the Chief of Engineers, "Letters Received, 1819-1825," Box 2, Ltrs. 186, 224, and 228.

27Gadsden to Armistead, December 20, 1820, "Letters Received, 1819-1825," RG 77, Box 4, Ltr. 534.

28Calhoun to Armistead, June 16, 1820, "Letters Sent, Military Affairs," RG 107, M-6, Roll 11, p. 55.


30Gratiot to Armistead, January 1, 1820, "Letters Received, 1819-1825," RG 77, Box 2, Ltr. 227 (11 pp.).

31Macomb to Calhoun, June 28, 1824, PJCC, IX, pp. 183-185.

32Heitman, Register, 1, pp. 178, 387.


37 Ibid., pp. 41-50.

38 Ibid., pp. 50-53.


42 Calhoun to Massachusetts Congressional Delegation, June 8, 1824, PJCC, IX, pp. 142-143.

43 Annual Report of the Secretary of War, 1835, Report of Lt. Co!. John J. Abert, Topographical Engineer, November 2, 1835, ASP/MA, V, p. 713. [Annual reports of the secretary are hereafter cited as AR/SW.]

44 Macomb to Bernard, August 9, 1826, "Letters Sent,
Internal Improvements," RG 77, p. 300.

Macomb to Board on Internal Improvements, October 2, 1824, "Letters Sent, Internal Improvements," RG 77, pp. 34-35.


Macomb to Kearney, July 26, 1825, and Macomb to Barbour, July 26, 1825, "Letters Sent, Internal Improvements, 1824-1830," RG 77, M-65, Roll 1, pp. 174-175.


Macomb to Abert, December 14, 1824, "Letters Sent, Internal Improvements," RG 77, p. 44.


Engineer Department Order, May 28, 1828, "Engineer Orders and Circulars," RG 77.


Macomb to Barbour, March 15, 1825; Macomb to Knight, March 29, 1825; Macomb to Wever, April 9, 1825, all in "Letters Sent, Internal Improvements, 1824-1830," RG 77, M-65, Roll 1, pp. 103, 120-121, 128-131.

Jordan, National Road, p. 93. Jordan apparently is referring to George Dutton, an engineer officer.


Macomb to Wever, December 16, 1825, "Letters Sent, Internal Improvements, 1824-1830," RG 77, M-65, Roll 1, p. 251. Also see Macomb to Knight, January 22, 1826, Ibid., p. 251, and Macomb to Shriver, July 5, 1825, "Letters Sent,
Internal Improvements," RG 77, p. 94.


70 Macomb to Barbour, August 26, 1826, "Letters Sent, Internal Improvements," RG 77, p. 308.

71 Macomb to Moore, August 26, 1826, "Letters Sent, Internal Improvements," RG 77, p. 308.

CHAPTER THREE

The Genesis of Railroad Management Practice:
The Baltimore & Ohio Railroad, 1827 - 1830

The United States Army had developed an advanced managerial system by the mid-1820's, but until 1827 this development occurred in a vacuum as far as the nation's business community was concerned. Contact between the army and business was limited, and business had little use for the military's complicated and time-consuming procedures. The situation changed in 1827, when army engineers entered the service of the Baltimore & Ohio Railroad. The railroad, initially baffled by the scope and complexity of its operations, and lacking any appropriate commercial precedent, willingly accepted the managerial advice offered by some of its military associates. After the railroad's management adapted the military system to its own needs, other railroads began to copy the B&O's procedures. In this way, concepts of military organization and administration began to work their way into the expanding American business community.

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The business leaders of Baltimore recognized that the time for decisive action was at hand. The city's port brought the merchant's prosperity for decades, and the nation's expanding import and export trade seemed to bode well for the future, but a potentially devastating problem loomed. The city found its commerce and its prosperity threatened by its aggressive northern neighbors and competitors, New York and Philadelphia. Businessmen in those cities were also quick to perceive the potential offered by the development of the west, and politics and geography combined to give both cities potentially decisive advantages over Baltimore. The Hudson and Mohawk River valleys provided relatively easy access to the interior of New York State, and the completion of the Erie Canal in 1825 gave the state a link to the Great Lakes and the Ohio and Mississippi valleys that it would use to great advantage. The port of New York thrived. Pennsylvania faced a more daunting geographic challenge, but it too was engaged in an effort to tap the western trade by linking Pittsburgh and Philadelphia. New York and Philadelphia grew at the expense of Baltimore.

The Maryland government was aware of the problem, but the solution it advanced offered little to benefit the state's largest city. The governments of Virginia and Maryland succumbed to the canal mania that was sweeping the nation and joined in chartering the Chesapeake and
Ohio Company, Virginia in 1824, Maryland in 1825. The C&O Canal was to run from Georgetown, District of Columbia, to Cumberland, Maryland and to connect the National Road with the head of navigation on the Potomac River. The Maryland legislature approved the charter with the provision that the company build a canal to link Baltimore and the Potomac, but the contractor did little work on the Baltimore connector. The C&O Canal threatened to isolate Baltimore near the head of Chesapeake Bay, so the city's commercial interests began to meet to consider their options.

The merchants debated and rejected a proposal to build a canal to the Susquehanna River through York, Pennsylvania. Eventually, they began to consider the possibilities offered by a new and largely untried transportation technology, the railroad. On February 12, 1827 the merchants formed a committee chaired by Philip E. Thomas to draw up a report on the feasibility of a railroad from Baltimore to the Ohio River. In its report, submitted one week later, the committee recommended "without hesitation, that immediate steps be taken to construct, by the most eligible and direct route, a 'double [track] railroad' between the city of Baltimore and some suitable point upon the Ohio River." The merchants adopted the report and drew up a charter which they submitted to the state for approval. On February 28, 1827 the Maryland legislature passed an act incorporating the Baltimore and Ohio Railroad Company.
As word of the venture spread, the Board of Directors found themselves bombarded with requests from amateur engineers who saw the railroad "as a subject of vast importance" that "could be improved upon and rendered more useful" by their suggestions. Most of the contributors recognized the limits of their talents and asked only that if the board did not use their suggestions, "thee will do me the favor to excuse my freedom, & not expose my weakness." Others felt more sure of their capabilities. One forwarded plans for a system of inclined planes and wondered if it would "be improper for me to look for a trifling reward for the hint." He "would also be glad for a moderate compensation to undertake the superintendence of their construction and preparation." As a goad to the railroad he told the board that he had other useful ideas that he was holding back and that he planned to make the same information available to other railroads and canals.

The board, however, "duly impressed with the importance of securing the services of scientific Engineers ... of competent talents and experience," turned to the War Department. On April 27, 1827, Maryland Governor Peter Little wrote to Secretary of War James Barbour, advising him of the "contemplated project of a Rail Road from Baltimore to the Ohio" and asking for information on what kind of assistance the railroad company could expect from the federal government. Barbour replied on May 2,
1827. He told Little that President Adams considered the project "an enterprise of great importance to the interests of the people who may be effected by it" and that the War Department was prepared to "afford every facility in aid of the execution of it" that it could under the terms of the General Survey Act of 1824. Barbour told Little that the Engineer Department would immediately assign Dr. William Howard and his "brigade" of U. S. civilian engineers to the project and promised that the department would also assign "two officers of much experience in Topographical operations, now at the head of their brigades," later in the season to assist in the work.5

Little passed Barbour's letter on to Philip E. Thomas, now president of the railroad company, who immediately wrote to Barbour to express the company's thanks and to request that the department order the teams to Baltimore as soon as possible so that the work could begin.6 The War Department initially appeared to be in no particular hurry to rush its forces to Baltimore, but Thomas persisted in his efforts to get the survey work started.7 Finally, in mid-June, Major General Alexander Macomb, Chief Engineer, told Thomas that Howard would be available in late June and that the two officers assigned to the project, Lieutenant Colonel Stephen Harriman Long and Captain William Gibbs McNeill, could be expected by mid-July. Thomas was also pleased to learn that since the proposed railroad "is
considered not merely of great local but of national importance, . . . the expenses incident to the operations of the United States officers who may be engaged in making reconnaissances and surveys relating to it, will be charged to the public appropriation for Internal Improvement." Macomb did, however, request that the company observe rigid economy in its survey operations, since public funds were limited.  

From the three survey brigades assigned, the B&O could call on the talents of fourteen government engineers, three civilians (Dr. Howard, William B. Guion, and William Harrison) and eleven officers including Lt. Col. Long, Capt. McNeill, and Lieutenants Joshua Barney, William Cook, John N. Dillahunt, John M. Fessenden, Walter Gwynn, Richard E. Hazzard, William B. Thompson, Isaac Trimble, and George W. Whistler. All the officers except Long were graduates of the Military Academy. Critics of the Academy claimed that, while its graduates were highly skilled theoretical engineers, the curriculum at West Point left them little time to practice their art. Calls for an additional "school of practice and application" went unanswered, and the Academy graduates were forced to learn their trade in the field under the tutelage of experienced officers. The B&O thus became the school of practice for a number of military engineers who later went on to serve with other railroads, either as members of survey parties under
government auspices or as employees of the railroads themselves. The experience these officers gained on the B&O was to have a profound influence on their work as engineers and managers on other lines.\textsuperscript{10}

In Lieutenant Colonel Long, the railroad gained the experience of one of the nation's pre-eminent explorers, surveyors, and engineers. Long was a graduate of Dartmouth College who entered the Army in 1814 as a lieutenant of engineers. He taught at West Point for two years, then transferred to the Topographical Engineers. He served in this branch until his death in 1864. Between 1817 and 1827 he gained wide-spread fame for his work on expeditions to explore the upper Mississippi (1817), the Rocky Mountains (1819-1820), and the northern boundary of the United States in Minnesota (1823).\textsuperscript{11} Captain McNeill had less field experience, but he was still a highly skilled topographical officer. He graduated from West Point in 1817, served with the United States Coast Survey in the south, then on General Andrew Jackson's staff during Jackson's campaign in Florida. He then conducted a number of canal surveys in the region between Chesapeake Bay and the Ohio River.\textsuperscript{12}

The B&O was also interested in other individuals then employed by the federal government on other engineering projects. President Thomas of the B&O asked Secretary of War Barbour if the government would have any objection to the railroad inquiring as to the availability
of Jonathan Knight, then supervising work on the National Road in Ohio and Indiana. The railroad wanted to send Knight to Europe to gather information on railroads there, especially in England. Barbour told Thomas that the railroad could solicit Knight's services and that Knight was free to act as he saw fit. The government was willing to allow the private venture to "raid" its own technical specialists because

The successful introduction of railroads into this country is viewed by this Department as of great National importance; . . . and which communications, while aiding in the advancement of commercial enterprise, offer the most sure and economical means to the government to convey, to the different parts of the Union, the means of defence, in the transportation of men and munitions to the seat of war, wherever it shall exist."13

General Macomb subsequently informed Knight that the B&O was interested in his services and that Knight was "left at perfect liberty to use your own discretion in regard to the object of the company." Macomb did request that Knight inform the Engineer Department of his decision as soon as he made it.14 Knight soon after told the department that he had refused the B&O's request "for the present."15

The three government survey teams were ready to begin their work in July, 1827. From the outset, although the brigades were working for a private venture, they used the Engineer Department's accounting and reporting procedures. Since the federal government was paying for the work and the officers maintained their connection with the
army, this is not unusual. It is noteworthy, however, that the very first management procedures adopted in the B&O service were based on military practices. The officers made the decision from habit. They wanted some system that would enable them to account for the company funds they expended, and since the company itself offered no other options they used the procedures they were most familiar with. The Board of Directors neither questioned nor challenged the decision.\textsuperscript{16}

The survey teams pushed westward throughout the summer and early autumn of 1827. They prepared their reports and maps during the winter, and on April 5, 1828 the engineers presented the \textit{Report of the Engineers, on the Reconnaissance and Surveys, made in Reference to the Baltimore & Ohio Rail Road} to the Board of Directors. This report, the first submitted by army engineers that was devoted solely to railroad construction, served as the model for similar reports submitted by other survey teams assisting other railroads over the next decade. The engineers described their surveys and discussed a number of possible routes. The survey report presented options: the Board of Directors would choose the route it preferred.\textsuperscript{17}

With the preliminary surveys completed, the Board of Directors moved to create a body that could competently consider the various options the engineers presented and offer the board professional advice before it made a final choice
for the route. On April 6, 1828, the day after the engineers submitted their report, the Board of Directors appointed Colonel Long and Jonathan Knight, who had since left the National Road project, "Engineers of the Baltimore & Ohio Rail Road Company." They, with company president Philip Thomas, who served ex officio, constituted the "Board of Engineers of the Baltimore & Ohio Railroad Company." Knight joined the Board of Engineers on April 12, 1828, when it assembled for the first time. On that day the Board of Engineers, acting on the glowing testimonial made by Knight, appointed Caspar W. Wever as Superintendent of Construction of the B&O. Wever worked with Knight on the National Road, where both became acquainted with Engineer Department business practices. 18

Wever notified Thomas that he would accept the position on April 17, 1828. He noted that

The fact that my friends Col. Long and Jonathan Knight are to be the active engineers is one of the strongest inducements to enter the service of the board. With them I hope, nay I believe, that I can proceed in the execution of the duties assigned to me with perfect harmony and satisfaction. 19

"Perfect harmony and satisfaction" prevailed on another front as well. On May 6, 1828, Chief Engineer Alexander Macomb addressed a letter to Jonathan Knight in Baltimore. Macomb felt it to be

but an act of justice on my part to declare to you the perfect satisfaction of this Department
with the manner in which you have fulfilled the object of your appointment and that it is with much concern that consent was given to your withdrawing from the service of the United States; yet, as you have in view in so doing the furtherance of another object of great National interest, we have every reason to hope that the Baltimore and Ohio Rail Road company will reap great benefits from your skill, industry and honest endeavors in their service.20

The B&O did in fact "reap great benefits" from Knight's "skill, industry and honest endeavors." He was to serve as Chief Engineer of the B&O from 1830 to 1841. However, the intervening nineteen months (from June, 1828 to January, 1830) marked a period of both great progress and bitter personal clashes in the management of the B&O.

The Board of Engineers faced a number of immediate challenges. There was still a substantial amount of survey work to be done, especially within the city of Baltimore itself, work that the board had to supervise. The Board of Directors expected the Board of Engineers to make its decision on the choice of routes, and the engineers also had to begin staffing the supervisory positions in the Engineer Department. The Board of Engineers admitted its concern that it had little time to give to organizational and administrative problems and noted that the press of other duties so engrossed the engineers "as to prevent them from maturing and adopting a system of operation complete in all its parts," but they also remarked that their tentative efforts did enable them to fashion some "economical
and efficient" means of supervising the work. The army
engineers, especially Captain McNeill, were the driving
force behind the Board of Engineer's efforts to create a
complex management system.

McNeill discussed the railroad's managerial prob-
lems with Thomas in April, 1827. McNeill convinced Thomas
that the road needed formal written regulations, although
Thomas probably had no inkling as to the form these regu-
lations would take until McNeill submitted a draft in early
May. In his proposal, McNeill remarked that

"Your suggestion that in the varied and ex-
tended operations of the Baltimore and Ohio Rail-
road Company, some system of direct and frequent
accountability should obtain for the correct appli-
cation of the funds of the Company, has received
my serious consideration; and agreeably to your
request I now have the honor to submit as the
basis [emphasis in original] merely of a system
the following regulations, which are similar to
those which govern generally in the U. S. En-
gineer Department."

The similarity was more than superficial, since McNeill
later noted that "when I thought them applicable, I have
transcribed literally from the printed regulations for the
government of the U. S. Engineer Department."

It would be most interesting to have more detailed
knowledge of what transpired during meetings between
McNeill and Thomas where they discussed these ideas. The
notion that Thomas suggested the need for "some system of
direct and frequent accountability" is especially in-
triguing. Thomas was a banker and a man deeply interested
in Quaker missionary work among the Indians. He had little experience in the management of a concern as large and complex as the railroad. One historian of the B&O notes that Thomas's "fortune and position in the community" were the result of "his self-possession, his energy, his clearness of perception, . . . his rare judgement," and "the calm serenity of [his Quaker] religion." Thomas also repeatedly demonstrated a willingness to accept ideas from other sources, especially the army, as the railroad searched for a viable management system.

It is possible to speculate that McNeill discussed elements of the army's administrative system, possibly without directly acknowledging the source of these ideas, with Thomas, and Thomas then used McNeill's ideas and terminology when he in turn suggested that McNeill prepare a set of draft regulations. The terminology is telling, since it so clearly harks back to the ideas Calhoun and his subordinates first discussed almost ten years earlier. McNeill could well have planted the idea with Thomas, then given Thomas credit for the idea in an effort to insure that his draft would receive a favorable hearing before the Board of Directors, which was ultimately responsible for accepting or rejecting the proposal.

In any event, Thomas was obviously intrigued by the possibilities of the McNeill regulations, since on May 17, 1828, he addressed a letter to Chief Engineer Macomb in
which he requested information as to "what course the Rail
Road Company should pursue to [record?] the amount advanced
on account of services, &c." In his response Macomb
offered a concise summary of the army's management ideology,
at least as it related to the army's financial affairs. It
was the second lesson in the techniques of modern management
that Thomas received from an army officer in less than a
month. Macomb wrote:

I have the honor to acknowledge the receipt of
your letter of the 17th instant, and according to
your request, I send [on May 20] herewith a copy of
the Regulations by which persons who disperse the
funds placed at the disposal of the Department are
regulated. In conducting a work of such magni-
tude and importance as the Baltimore and Ohio Rail
Road, it is proper that each agent charged with
either a survey or a part of the construction should
in the first place furnish estimates as much in de-
tail as possible, of the probable cost of the work
with which he is charged and in case of deviation
from this previous estimate he should furnish satis-
factory reason for it. That in examining the ac-
counts of expenditures, all extravagant or unneces-
sary charges should be stopped at the outset, and
to prevent this kind of evil from increasing to an
injurious extent, frequent settlements should be
made with the agents in whose hands the funds are
placed (say one each month,) their accounts ex-
amined and passed to their credit if correct and
if not satisfactory it will be in the power of the
Directors to exercise their authority before any
serious loss should have occurred. By attending
to these precautions on the part of the Directors,
they will insure strict accountability and economy
on that of their disbursing agents, and will at
all times have the means of judging accurately of
the state of their affairs and the progress of
their work.26

Thomas was impressed by what he learned from Macomb
and McNeill. In early June he directed the Board of
Engineers to establish a "code of regulations" to govern the operations of the Engineer Department. These regulations represented the railroad's first attempt to formulate and codify its operating procedures. They would also establish organizational and administrative precedents that would shape later managerial developments on the B&O and other railroads.

The Board of Engineers assigned Captain McNeill the task of preparing the new regulations. On June 10, 1828, the Board of Directors adopted McNeill's "Regulations for the Engineer Department." Not surprisingly, in light of McNeill's earlier efforts, the new regulations corresponded "as nearly as the nature of the two services would admit, to those adopted in the United States' Engineer service." The B&O Engineer Department followed the form and drew heavily on the content of army regulations, specifically Article 67 of the 1825 edition of General Regulations. Its new regulations established the composition of the Engineer Department and defined the duties and responsibilities of each of its officers. The regulations gave the Board of Engineers "control of all operations relating to ... the formation of plans and estimates, and the receiving [of] proposals and concluding contracts for the construction of the road, or any of the works pertaining to it," and "the construction of the Rail-road, and the works appurtenant thereto." Despite its wide range of powers and
responsibilities, the Board of Engineers was still "subject in all cases to the Board of Directors." 29

The superintendent of construction occupied a position roughly analogous to an army engineer supervising a fortification project. The Board of Engineers supplied him with "plans and instructions for his guidance," and he was held "responsible for the execution of the work, in strict conformity to them." Here, McNeill quoted directly from Article 67, paragraph 889. The regulations also directed the superintendent "to make . . . such stated reports, returns and estimates as shall hereinafter be mentioned."
The system of personal and financial reports was in all major respects identical to the system used by the Corps of Engineers. In fact, McNeill's regulations, acknowledging that the railroad was at this point completely without any alternative management structure or procedures, directed that "all returns and estimates, with the vouchers for disbursements (until other forms shall be prescribed) shall conform, as nearly as the nature of the two services will admit, to those prescribed in the regulations for the United States Engineer Department." McNeill also copied directly from the army's standards of accountability for property. Finally, the Board of Engineers was enjoined to make the same type of annual report the army's Board of Engineers for Fortifications and Board of Engineers for Internal
Improvements filed.\textsuperscript{30}

Despite the similarity of the two sets of regulations, Colonel Long opposed the adoption of McNeill's regulations "on account of their not having been sufficiently explicit on the subject of forms for accounts, abstracts, contract, &c., &c., which in the opinion of that officer [i.e., Col. Long] ought to have been incorporated with the regulations." Long withdrew his objection when his associates on the Board of Engineers pointed out that the board had the right to prescribe additional forms as it saw fit and that until the board itself made such changes the railroad would continue to adhere to the forms used by the Corps of Engineers.\textsuperscript{31}

McNeill's "Regulations for the Engineer Department" marked the first attempt to transfer army administrative procedures directly to a private commercial venture. McNeill, it seems, acted almost instinctively. From his perspective, Article 67 of the General Regulations was perfectly well-suited to the B&O's immediate organizational needs. The B&O could conduct its surveys in exactly the same way the Engineer Department handled its business under the General Survey Act because both operations were directed toward identical technical goals. When McNeill came to consider the techniques necessary to supervise the construction of a railroad, he could again draw on the Engineer Department's experience with a similar project,
the National Road. He assumed that there was no reason why the procedures that served to keep the road project functioning efficiently and economically could not do the same thing for the B&O. When it came to coordinating purely technical activities, McNeill, the Board of Engineers, and the Board of Directors all recognized that army procedures offered a uniquely well-suited model for the railroad's construction activities.

However, McNeill's effort was not without its flaws, although these were not immediately obvious. The regulations were written in haste, reflecting the desire of all parties to get the project started with dispatch. They were not based on any detailed, rational examination of all the many factors that would in time influence the railroad's activities. From a narrow technical perspective, the regulations seemed completely appropriate. They were perhaps less well-equipped to allow for the range of social, political, aesthetic, and psychological imperatives that also influenced the railroad's route and the design and construction of its physical facilities. McNeill assumed that the same factors that shaped his work as a military engineer would also invariably influence railroad decisions. But utility, economy, and accountability, although generally desirable goals, would occasionally assume positions of secondary importance when the railroad made decisions. The administrative theory that shaped the regulations allowed for little freedom of
entrepreneurial action.

A procedural flaw compounded this theoretical limitation. It is rather surprising that Long and McNeill accepted without demur the notion of a "board" of engineers, given the military's proclivity to create administrative bodies under a single administrative head. Perhaps the composition of the Board of Engineers served to dispel any doubts they may have harbored about the the arrangement, since two of the three members of the board (Long and Knight) and their chief subordinate, Caspar Wever, all had experience with the army procedures that shaped the B&O regulations. Perhaps Thomas's apparent willingness to defer to the judgement of his military associates also helped to allay their fears. However, the Board of Engineers soon split on the issue of how it would apply and enforce the regulations.

* * * * * *

On July 4, 1828, much of the city of Baltimore turned out for the B&O's groundbreaking and cornerstone-laying ceremony. Charles Carroll of Carrollton, "the last surviving signer of the Declaration of Independence," turned over the first spade of dirt, and Baltimore's Masons laid the large block of granite that served as the railroad's cornerstone. On July 7, Capt. McNeill, assisted by
Lieutenants Cook, Dillahunty, and Hazzard, began the detailed surveys that laid out the exact route the railroad would follow. On July 28, the Baltimore Gazette reported that "the actual commencement of the grading and preparation of the first twelve miles [from the outskirts of Baltimore to Ellicotts Mills] of the Baltimore and Ohio Rail Road took place this morning." The railroad was on its way, but troubles were already brewing within the Board of Engineers.

Wever and Long disagreed from the outset. Wever demanded that the Board of Engineers give him essentially full control of all construction activities, including the right to make contracts, hire assistants, and change the location of the road, all without having to obtain board sanction for his activities. As he viewed his position, the Board of Engineers could issue general instructions on where and how it wanted the road built. After Wever built it, the board would inspect his work and accept it. Long, on the other hand, believed that the B&O's Engineer Department Regulations were explicit on all these points: Wever was subordinate to the board, not a semi-independent agent as Wever claimed. Long opposed giving in to Wever's demands.

Thomas and Knight tended to side with Wever. They wanted work on the road to begin immediately, and they feared that a divisive power struggle between the Board of Engineers
and the Superintendent of Construction might compromise the road's activities. They were especially fearful that the clash might become public and affect sales of company stock. They found it difficult to explain why Long was so resolutely committed to the regulations and the chain of command they set out. As businessmen they had routinely settled policy questions through discussion and face-to-face negotiations, and they believed that the same methods would work for the B&O.

Thomas and Knight refused to accede to Long's demand that the Board of Engineers fire Wever, although they attempted to placate Long by allowing him to prepare Wever's official instructions, which the Board of Engineer's unanimously approved on July 22, 1828. The instructions re-stated the limitations placed on the superintendent's actions by the department regulations, but Wever knew that he had highly placed allies who would support him if he tried to evade his instructions. 34

Long quickly developed an intense antipathy toward Wever. Long's military career had instilled in him a strong belief that obedience to regulations and to the orders of superiors was vital to the effective operation of the army. He transferred this belief to the railroad company, the engineer department, and its regulations. Now a subordinate challenged the regulations and the authority they represented. In the army such impudence would have led
to a quick court-martial, but on the B&O the challenge enjoyed the support of some powerful allies. Long lashed out, later writing that he was not aware at the time that Wever's reputation was due "exclusively to his superiors at Washington, who furnished him in detail, with all the information and instructions, necessary to the guidance of any one gifted with an ordinary understanding and capacity." Wever's success on the National Road "did not result from the judicious instructions that were issued from time to time, by the Engineer Department, and from the rigid manner in which an observance was enforced." Long later found that Wever had questioned his instructions from the Engineer Department and proposed to adopt unauthorized measures, "but ... he was ... often arrested in these measures, and preemptorily required to comply literally with his instructions."³⁵

Long gained a potential ally on October 6, 1828 when President Thomas announced that the Board of Directors had appointed Captain McNeill to the Board of Engineers. He also informed his colleagues that the Board of Directors had decided to send Knight, McNeill, and Lieutenant Whistler to England to gather information about railroads. On October 20, Thomas resigned from the Board of Engineers to devote his time to less technical matters. Two days later, the B&O party left for England. While they were gone, Long became the self-styled "President of the Board of Engineers." In fact, he was the only member of the board still in the
United States. Long and Wever clashed repeatedly while the other members of the Board of Engineers conducted their examinations in England. Long objected to the contract and report forms Wever prepared, but Thomas directed Long to accept them with minor revisions. Wever submitted his reports late, when he submitted them at all. Long claimed the reports were too vague to be of any use. Long issued instructions which Wever ignored. Long recommended that the railroad build economical wooden bridges; Wever preferred and the Board of Directors authorized more expensive stone viaducts. Long believed that the Board of Engineers (i.e., Long) had the right to design the bridges, but the Board of Directors sided with Wever when he asked to be allowed to design them. A similar debate occurred over the question of a tunnel. Long wanted to go over or around an obstruction, but Thomas, Wever, and the Board of Directors wanted to go through it. The Board of Directors told Wever to build a tunnel. Long was philosophical about this particular defeat, "inasmuch as all parties concerned appeared desirous of witnessing the successful accomplishment of a structure so novel and unprecedented in the public works of the country." 

By now, both tempers and patience were wearing thin. Long felt that only he had the "education and protracted experience" that enabled him to make judgements on
engineering matters, but Thomas "was ever more ready to admit his incompetency as an engineer than to relinquish his favorite plans of engineering." Thomas accused Long of acting vindictively. Long thought of authority, efficiency, and economy; Thomas was more interested in public opinion and the progress of the work. He "dreaded the evil consequences to which disagreement . . . might lead." Despite assurances that he would "use his utmost endeavors to prevent all future acts of disobedience . . . on the part of the Superintendent," Thomas usually sided with Wever and became increasingly impatient with Long's complaints. By now even the Board of Directors was beginning to express growing dissatisfaction with Long's plans and suggestions, find them "onerous and unnecessarily expensive."

Long had his revenge in February, 1829. Early in that month, the Maryland legislature asked for a report "on the progress made in the surveys and construction of the Baltimore and Ohio Railroad, and of the expense accruing therefrom, prior to the 1st of January, 1829." This request presented something of a problem: the Board of Engineers provided the Board of Directors with all the necessary material on the surveys, but it could provide the directors with little information on construction activities, since the uncooperative superintendent had not seen fit to file the reports he was supposed to. Thomas
"made a forcible appeal" to Colonel Long for help. Thomas "set forth in glowing colours the evils that were to be apprehended from a failure to meet the demand of the Legislature, and give them all the information required." In response to this appeal, Long rather smugly observed "that the system he had been labouring to introduce, would have kept the board in constant preparation for any emergency of this kind." Long again laid out his theories and plans, and "so far convinced Mr. Thomas of the propriety of such a course, that [Thomas] voluntarily laid himself under a promise that he would do anything in his power to introduce such a system, if Col. Long would help him out of his present difficulties."39

Long began to prepare the report. Wever was on an extended leave of absence at the time, so Long turned to the field officers, including Lieutenants Cook, Gwynn, and Dillahunty, now serving as assistant superintendents of construction, and Robert Wilson, the superintendent of masonry. Long discovered that these men had kept copies of all the reports they had filed with Wever, as directed by the regulations. Long compiled a report that was acceptable to the Maryland legislature from their files.40

In April, 1829, Long again tried to force Wever to submit to his supposed superiors on the Board of Engineers. Long refused to accept Wever's accounts for the last quarter of 1828 and the first quarter of 1829. Finding them
"defective and unsatisfactory . . . incomplete and objectionable in every item exhibited," Long passed Wever's reports on to Thomas, who called a meeting of the Board of Director's Committee of Accounts to consider the matter. Thomas wanted to accept the reports as submitted. He believed Long's objections were based more "on account of their not having been rendered agreeably to certain forms than on account of any suspicion that the funds had been improperly expended." Wever claimed that he rendered his accounts in the same manner that he had on the National Road. Long doubted that the Engineer Department would accept reports as Wever submitted them. The Committee of Accounts sided with Wever, since it believed that

Col. Long's education and pursuits [emphasis in original] had no doubt induced him to be more particular in matters of this sort, than the welfare and interests of the Railroad service required, and that in the present case the rigid formality he wished to observe might be dispensed with.\(^41\)

Although he considered resigning from the Board of Engineers at this point, Long accepted his defeat because he knew that Knight, McNeill, and Whistler were due back from England soon. Both sides in the dispute eagerly awaited their return, since all believed that the reconstituted Board of Engineers would resolve the dispute. Knight and his companions returned on May 22, 1829 and walked straight into a hornet's nest of discord.
Knight and McNeill toured the road on their return and complained about the excessive embellishments added to some of the work, which they saw as proof of "bad taste and want of judgement." On May 25, the two formed a committee to revise the regulations of the B&O's Engineer Department. McNeill himself expressed a willingness to modify the existing regulations, but "without impairing the strict system of accountability which was thought indispensable." Thomas, Wever, and several members of the Board of Directors all requested that Knight and McNeill make major revisions in the regulations, but despite their pleas the committee decided to leave the regulations as they were written. McNeill believed that the regulations were fine; what was lacking was a "rule of official conduct to exact obedience to the regulations by those subject to them." Their decision vindicated Col. Long, and McNeill's comment gave him an opportunity to press his apparent advantage and launch a counter-attack against Wever's recurrent insubordination.\(^{42}\)

On September 24, 1829, Long presented a draft of a set of by-laws for the railroad's engineering department. Long hoped that the by-laws would resolve the question of subordination, since they were a "partial exposition of various leading requirements embraced in the regulations which had hitherto been either disregarded, or misunderstood and neglected."\(^{43}\) For the most part, the new
by-laws reinforced certain provisions of the regulations, especially those dealing with the duties of the Board of Engineers and the responsibilities of a variety of subordinate corporate officials. The net effect of the by-laws was to establish unequivocally the pre-eminent position of the Board of Engineers in the operational hierarchy of the company. None of this was new, but there was one provision of the by-laws that represented an obvious attempt to limit Wever's powers and perogatives. Article 11 provided that the Board of Engineers, not the superintendent of construction, would, after October 10, 1829, become the disbursing agent for construction funds. At least once a month one member of the Board would go out on the road and make payments on construction accounts authorized by the Board of Engineers. By now Knight had sided with Thomas and Wever: the Board of Engineers adopted the by-laws by a majority vote.\footnote{44}

Thomas, despite his promise to Long that he would use his influence to promote the refined system, refused to have anything to do with the new by-laws. Thomas claimed that the "exigencies of the service" required a more flexible system. Thomas also feared that the new by-laws might lead to the resignation of Wever, and he advised the Board of Engineers not to take any step that might deprive the road of his services. Long wanted the "better and safer system of administration" in force when
the railroad began its new fiscal year on October 1, but Thomas was able to convince the Board to delay implement-
tation of Article 11 until January, 1830.45

The Board of Engineers planned to discuss its problems with Wever in its annual report for 1829, but Thomas begged them not to air the corporate dirty linens in public. The Board toned down its report in return for a promise that Thomas would support the Board of Engineers in its efforts to remedy the problems caused by Wever's insubordination. The Board of Engineers settled for a bland disclaimer concerning "the introduction of embellishments that were merely ornamental" since "they have uniformly regarded simplicity, neatness, firmness, and stability as the only requisites." Even this met with resistance: McNeill claimed that the Board of Directors had "virtually . . . suppressed" the report.46

In October, 1829, Colonel Long retired from the fray, his place in the line of battle taken by Captain McNeill. Long recognized that his actions throughout the past seventeen-odd months had completely alienated Thomas and Wever; McNeill would be working with a much cleaner slate. His withdrawal left the Board of Engineers fragmented and frequently arrayed against the Board of Directors. Long and McNeill voted together; Knight generally opposed them. Knight, however, had powerful allies in Thomas and the Board of Directors. The civilian leadership
of the Baltimore & Ohio Railroad had grown tired of the actions and the attitudes of their military colleagues, and began to take steps behind the scenes to reorganize the Engineer Department to limit the power of the Board of Engineers. The engineers attacked first, however, although their actions played directly into the hands of the B&O "reformers."

The Board of Engineers decided to confront Wever at a meeting held on October 12, 1829. McNeill charged that Wever told the contractors to "go ahead and build the work in the best manner, and to keep an accurate account of their expenses, and they should be paid whatever it might cost, and be liberally rewarded for their services." The Board of Engineers was unwilling to accept this "cost-plus" method of construction, and asked Wever why he either refused to submit estimates or submitted very vague estimates. Wever replied that "he never had been accustomed to estimate so nicely." Wever also admitted that he had not signed contracts for several phases of the work and that he disregarded instructions from the Board of Engineers on other occasions, arguing that he was acting in the best interests of the company by attempting to use less complicated methods.47

McNeill was appalled by Wever's actions and statements. On October 13, 1829, he informed Thomas that he had "determined tomorrow to move for the suspension (at
least) of the Superintendent from his present duties, until he should have the opportunity to explain the motives of his conduct." McNeill wanted to limit the inquiry to the Board of Engineers, but Thomas grasped the opportunity. He asked McNeill to appear before a special meeting of the Board of Directors to explain his charges. The directors refused to suspend Wever, and warned McNeill that the Board of Engineers had no right to suspend him without the approval of the Board of Directors. Now that the lines were clearly drawn, McNeill decided to press for a final decision. On October 16, McNeill informed Wever that he was going to prefer charges against the superintendent. McNeill submitted his charges to Thomas and the Board of Directors on October 31.48

McNeill levelled three charges against Wever. First, he accused him of "conduct unbecoming his official station, and calculated to render the Board of Engineers instrumental in deceiving the Company and the public." The second charge was for "gross violations of the trusts reposed in him, and neglect of duty." The third accused him of repeatedly disregarding or disobeying the instructions of the Board of Engineers. McNeill claimed that Wever was incompetent and recommended his immediate removal and replacement by one of Wever's assistants, including either Lieutenants Cook, Gwynn, or Dillahunty,
none of whom had shown any inclination to question the orders of their military and corporate superiors. 49

The Board of Directors appointed a five-member committee "to investigate the official conduct of the Superintendent of Construction" on November 2, 1829. The board also tried to generate public support for Wever. On November 6, an editorial in the Baltimore Federal Gazette called upon the public to "cherish and sustain" the railroad's intelligent and indefatigable Superintendent, C. W. Wever, Esq., a man whose peculiar habits of business and sterling integrity, fit him especially for such work." 50

McNeill's appearance before the committee on November 17 and 18 was a stormy affair. Alexander Brown, a member of the committee, opened the proceedings by remarking the he found it strange that the Board of Engineers presumed to act in opposition to the President and Board of Directors. When McNeill noted that he acted as an individual, Brown stormed

Well, Sir - you have put yourself in opposition to us, it's a pretty business - you, a young man, the youngest of the Board - choose, without even the concurrence of the other members, to take the lead in this business; don't you know, Sir, that the Board of Directors have a right to do as they please, they are supreme in this Company, Sir, - they can even dismiss you or the whole Board of Engineers! 51

McNeill replied that he had already offered to resign from the board and act solely as a topographical officer,
but Thomas refused his offer. Thomas, an *ex officio* member of the investigating committee, corroborated McNeill's statement, adding that McNeill was too valuable to lose. Thomas continued: "Capt. McNeill is a young man, and impetuous in his feelings - sometimes [he] says things hastily, which he afterwards regrets, but he is always willing to apologize." Thomas continued to try to elicit an apology from McNeill, but McNeill refused to apologize or drop his charges, because "he believed nothing had escaped him, requiring explanation, and far less apology." ⁵²

McNeill based his presentation against Wever on grounds similar to those used by Colonel Long in criticizing Wever's behavior. McNeill saw no reason why the system that worked so well for the Corps of Engineers could not be made to work for the Baltimore & Ohio Railroad. Wever continued to argue that in his railroad work he followed the procedures that he had used on the National Road. Long, in an earlier controversy, suggested that the management check the records; McNeill did in fact "read a portion" of the correspondence between Wever and the War Department, and he could

perceive a marked distinction between Mr. Wever's course when under the wholesome discipline of the Government, and that which he has so uniformly pursued under the (in his apprehension,) doubtful authority of the Board of Engineers. ⁵³

The Investigating Committee concluded its work on November 24, 1829 and released its report on January 4, 1830.
Its report exonerated Weaver, clearing him on all three of McNeill's charges. The committee found Weaver a "faithful, devoted, and efficient servant," and thanked McNeill for bringing charges, since "it has given an opportunity to the Superintendent to advance such proof as with the Committee clearly exculpate him for the intention of deceiving."

The committee was blunt in justifying its decision:

> At an early period it was discovered that a race for popularity was to be run with our more favored rival [the C&O Canal]. Public confidence and the countenance of the general government was the prize in view. It was believed to be vitally important to complete a portion of the work and illustrate its superiority - to attain this, expedition was consulted more than economy.54

McNeill later wrote a scathing denunciation of the report; the best thing he could find to say about the committee was that it had been "singularly inconsistent."55

The denouement of the affair occurred at the same time the Investigating Committee announced its decision. On October 5, 1829, the Board of Directors had appointed a committee to examine the operations of the Company. Among other matters, the committee was to report "whether ... any improvement can be made in the organization for carrying on the business of the Company, or in the administration of its affairs."56 Neither Long nor McNeill knew of the existence of this committee, which is not surprising since on January 4, 1830 it recommended "the immediate dissolution of the Board of Engineers" and "an entire
change in the organization of that branch of the service." The committee also recommended "the repeal of all the rules and regulations heretofore adopted . . . for the government of the Engineer Department." McNeill and Long were to be eased rather ungracefully out of the management of the Baltimore and Ohio Railroad. By coincidence, the internal struggles reached their climax just when the railroad reached a milestone: on January 7, 1830, the B&O opened for business, its horse-drawn coaches hauling passenger excursions from the Mt. Clare Station on Pratt Street in Baltimore to the Carrollton Viaduct about one-and-one half miles away.

The company moved quickly to redefine its relationship with the military officers in its service. In January, Thomas sent President Andrew Jackson a glowing testimonial "to the zeal and efficiency of the officers who have been detailed to assist the company in their important enterprise." Soon after, Thomas informed the War Department that it no longer needed both of the survey teams still attached to it. Although Thomas requested that McNeill's team remain attached to the railroad, General Charles Gratiot, Chief Engineer, informed McNeill that since Long was the senior officer, Long would remain with the railroad and that McNeill and his assistants would be reassigned. Long, however, "stated to the Department that, for reasons of a personal character (which
are not given)," he wished to be relieved and reassigned. Gratiot therefore later notified McNeill that he and his assistants (Cook, Dillahunty, Thompson, and Whistler) would remain attached to the B&O. 59

McNeill then told Thomas that he would be happy to assist the company in something resembling his former capacity as a member of the Board of Engineers. Thomas responded that Jonathan Knight, who had become the railroad's chief engineer when the Board of Directors dissolved the Board of Engineers, would decide how McNeill would be employed. McNeill refused to "consent to take a situation inferior to that I occupied before the dissolution of the Board of Engineers; and therefore, it is impossible for me to accept any service which shall be at all dependent upon a consultation with, or the opinions of Mr. Knight." The Board of Directors determined that McNeill's conditions were "incompatible with the existing regulations of the Company;" McNeill refused to submit, and asked the War Department to reassign him. On June 10, 1830, the Engineer Department assigned McNeill and his team to the Baltimore & Susquehanna Railroad survey. 60

* * * * *

June 10 marks the end of the Corps of Engineers' direct assistance to the Baltimore and Ohio Railroad.
The first twelve mile section of the road, from the Pratt Street Station to Ellicotts Mills, opened for passenger business on May 24, 1830, so the departure of the military engineers coincided with the completion of the first phase of construction, although the work was far from finished. The bitter feelings generated by the contest between Long and McNeill and Thomas, Knight, Wever, and the Board of Directors persisted for some time, with occasional flare-ups as one side or the other attempted to get in the last word. McNeill remained in Baltimore while he worked for the Baltimore & Susquehanna, and he seems to have fired the last full broadside in the war of words. Time, distance, and the continuing success of the B&O helped to heal old wounds, and by early 1831 the contest was largely behind all the parties involved.

In its Annual Report for 1830, the Board of Directors summarized its view of the controversy. The Board professed that it was never entirely satisfied with the concept of a "board" of engineers from the outset, but it could not find "one individual, who had experience in the construction of Rail Roads." Under these perplexing circumstances, the Board found it "impossible to pursue any rigid system for the government of the agents in its service, which it should not be at liberty to modify and depart from, as exigencies might arise." Long and McNeill believed that the modified army system would work;
the directors were less sure. However, by 1830 the Board of Directors had finally secured "the service of officers, in whose experience, skill and judgement the Board placed entire reliance."

... a satisfactory organization has also been in effect, in the Engineer Department, and, in the opinion of the President and Directors, a well digested plan for the future government and regulation of all the operations of the company may now, and should without delay, be adopted, in which shall be clearly defined, the duties and responsibilities of the officers and agents employed in its service. 64

In 1830 the Board of Directors adopted new by-laws and rules and regulations for the B&O. These new regulations, primarily the work of Chief Engineer Knight, owed much to their army and B&O ancestors. They contained provisions that would undoubtedly have pleased Long and McNeill, since the regulations formalized a system of responsibility and accountability that resolved many of the conflicts that had plagued the operations of the Board of Engineers. Furthermore, the railroad now possessed a more rational executive chain of command. The board was gone, replaced by a single Chief Engineer who directed "all the operations of the company, relating to the location, construction, moving power and machinery on the road." Caspar Wever remained superintendent of construction, with no more power than he had under the Board of Engineers. All the officers of the company had to file monthly reports and estimates that were patterned
quite clearly on army procedures. They also settled their accounts quarterly, and made quarterly returns of company property in their hands. Although the railroad simplified its organizational structure, the administrative system it adopted was more complex, as befit the growing complexity of railroad operations.65

Although Knight's Rules and Regulations did not specifically acknowledge its debt to McNeill's "Regulations" or Article 67, its parentage is unmistakable. The B&O borrowed elements of the organizational and administrative philosophy that shaped army regulations and freely used parts of the earlier B&O regulations themselves to describe the specific duties and responsibilities of officials within the corporate chain of command. As the railroad gained a more accurate picture of the specific financial and operational problems it faced, it came to appreciate the potential of the military system, especially its ability to offer specific administrative procedures capable of providing the means to coordinate and control the railroad's activities. Although other businesses could offer elements of a useful management system, only the army could offer a more or less complete approach to a unique set of managerial problems. The military-based system served the B&O well until the 1840's, when operational problems became more significant than technical questions.66
The B&O was as proud of its new system as the army had been with the results of the Calhoun-era reforms. In 1831, the Board of Directors could report that "the system organized for the regulation of the business of the Company, and for the government of its agents, has, in its operation, been found to be . . . efficient and practical, clearly defining the duties of the several officers and maintaining a strict responsibility in every department." The board could also "inform the stockholders that notwithstanding the complicated operations of the Company requiring numerous agents, whose duties rendered it necessary they should be dispersed over an extensive district of country," harmony, honesty, and fidelity prevailed in the operations of the company.67

Knight revised this management system in 1834, and it proved capable of handling the railroad's business until 1847, when Benjamin H. Latrobe, the line's chief engineer, and his associates again restructured the B&O's management. After examining the management systems then in use on other lines, Latrobe created an administrative structure that divided responsibility for the road's activities between an operating and a financial department.68

The new organizational manual, approved by the B&O Board of Directors on February 10, 1847, is usually seen as the first significant step in the process of
administrative reform on the trunk line railroads during that critical period in the late-1840's and early 1850's when they emerged as the nation's first big business. Professor Chandler calls the B&O's new organization "one of the very first functionally departmentalized, administrative structures [created] for an American business."

While it "would be expanded and refined as the railroads grew, it remained essentially the organization by which American railways were to be administered."

How new was the organizational format the B&O adopted? In the business community it was a novel approach to a managerial problem, but the notion of functionally differentiated administrative departments was not unique. Even so, there is no evidence that the B&O looked directly to the military for its organizational model in 1847. Instead, the railroad's actions at this time were based on a systematic examination of its immediate structural needs, plus an awareness of the course of managerial developments on other lines, especially the New England railroads. However, when the B&O looked north it was examining railroad organizations that owed much to the army directly and to the early B&O itself (and thus to the army more indirectly). Army procedures shaped early B&O developments, the B&O and the army both shaped New England railroad growth, and the B&O turned to the northern lines for information in 1846.
Although the direct links to the army as an organizational model may have become rather tenuous by the late-1840's, the military's role as a source of procedural techniques, especially in the area of financial and operational reporting, seems much more direct. The B&O used a complex system of accountability from the outset, a system that McNeill copied from the army. Later railroads relied extensively on these procedures. Many of the reforms that followed, on the B&O and on other railroads, were enacted because managers possessed detailed, current operating information. The knowledge this information provided was vital to the eventual success of the B&O and its contemporaries, since it enabled managers to spot potential problem areas early, occasionally before a crisis occurred. From this perspective, it is possible to suggest that Latrobe's real contribution was his ability to recognize the problems, analyze the situation, create a rational response to the difficulties, and force the existing bureaucracy to adapt itself to the new forms and methods. The army's procedures gave the railroads some of the tools needed to make this new, complicated business organization function. The military system was far from being the final answer to the problems of railroad management, but it offered a model that the railroad's managers could and did follow in later years.
The problems that developed on the B&O were not rooted in any fundamental flaws in the army's management system. Rather, they grew out of differing perceptions of the exact administrative needs of the B&O, and disagreements on how elements of the military system could best meet these needs. Long and McNeill believed that the B&O needed the military's strict accounting system from the very beginning of construction operations. As members of the Board of Engineers, they were placed in a position that required them to disburse large sums of the company's (ultimately the public's) money. Long and McNeill believed that army accounting procedures would provide a suitable check on the financial activities of their subordinates. These procedures would also ensure that the Board of Engineers could always explain how it spent the funds allotted to it, even though, in the early days, no one seemed really interested in such information. They repeatedly warned that the Board of Engineers would bear the ultimate responsibility for the cost of construction. Although either the Board of Engineers or the Board of Directors could attempt to abrogate their responsibility by weakening the system of accountability, such policies could prove detrimental to the corporate image.

The civilians viewed the situation differently. They were used to less complicated accounting and managerial procedures, and Wever convinced them that the officer's
accounting system would unnecessarily delay the course of the work. Although the officers refused to accept the notion that their system was too cumbersome, the Board of Directors believed Wever. Within the limited context of the B&O between 1827 and 1830, Wever had a valid complaint, although he undoubtedly over-stated the damage the military accounting system would cause. The B&O was not yet as large as the National Road or any of the Engineer Department's other projects. Wever was only controlling construction activities on a limited but growing route. Long and McNeill seemed to have worked hard to install an administrative system that was potentially too complex for the immediate (but not, it must be stressed, the long range) needs of the railroad. Military techniques were not applied piecemeal. McNeill presented a fairly well-developed management system as early as 1828. His civilian colleagues, unused to the methods and especially the paperwork it entailed, could convince themselves, with some justification, that they had no need for such complicated procedures. In time they would change their minds.

The officers were also so used to working within the economic constraints imposed by the army's financial situation that they were blinded to another fundamental factor that poisoned their dealings with their civilian colleagues. They seem to have never recognized that political, social, and perhaps psychological factors influenced the
design of the railroad at least as much as did the economic factors that so concerned them. The railroad became "a combination of commercial artery and eternal monument." Thomas, Knight, and Wever were initially less concerned with cost than the pace of construction and the monumental quality of the work they built. Long and McNeill were blind to this facet of their work.

One additional point must be mentioned. The B&O was very much the key railroad laboratory in the United States before about the mid-1840's. Other railroads frequently adopted technical and managerial techniques pioneered on the B&O. This partially explains how basic military ideas made their way to other roads, even lines that did not have an extensive military presence on their technical or managerial staffs. Other railroads borrowed from the B&O as the B&O borrowed from the United States Army.
CHAPTER THREE -- NOTES


2 Gideon Davis to Philip Thomas, December 20, 1827, in "Baltimore and Ohio Railroad Company Papers," Ms. 1192, Manuscripts Division, Maryland Historical Society, Baltimore, Maryland. [Hereafter cited as "B&O Papers," MHS Ms. 1192.]

3 L. Bylesby "To the Directors or Managers for forming the Baltimore and Ohio Rail Road," April 23, 1827, "B&O Papers," MHS Ms. 1192.

4 Baltimore & Ohio Railroad Company, Second Annual Report of the President and Directors to the Stockholders of the Baltimore and Ohio Rail Road Company, 1828, pp. 5-6. [Hereafter cited as B&O AR.]

5 Barbour to Little, May 2, 1827, in National Archives Record Group 77, Records of the Office of the Chief of

6 Thomas to Macomb, May 7, 1827, in National Archives Record Group 77, Records of the Office of the Chief of Engineers, Microcopy 505, "Registers of Letters Received by the Topographical Bureau of the War Department, 1824-1866," "T" Letter 312, Roll 1, frame 62. [Hereafter cited as "Registers of Letters Received, Topographical Bureau, 1824-1866," RG 77, M-505.] I have been forced to use these registers and the brief abstracts of each letter they contain because: "When the Topographical Bureau was removed from the jurisdiction of the Chief Engineer on June 21, 1831, letters relating to topographical matters for the period May 14, 1824 - June 16, 1831 were transferred to the Topographical Bureau. Most of these letters are missing." National Archives Record Group 77, Records of the Office of the Chief of Engineers, Microcopy 506, "Letters Received by the Topographical Bureau of the War Department, 1824-1865," Introduction to Roll 70, "T," July-December, 1852 (the first of the "T" rolls in this microcopy), p. iii. [Hereafter cited as "Letters Received, Topographical Bureau, 1824-1865," RG 77, M-506.]

7 Macomb to McNeill, May 9, 1827; Macomb to Long, May 10, 1827; Macomb to McNeill, May 26, 1827; and Macomb to Howard, May 30, 1827, all "Letters Sent, Internal Improvements, 1824-1830," RG 77, M-65, Roll 2, pp. 23, 32, 45-46; Thomas to Macomb, June 13, 1827, "Registers of Letters Received, Topographical Bureau, 1824-1866, "T" Letter 326, RG 77, M-505, Roll 1, frame 62.


16.The most useful source of information about the officers' experiences while in the service of the B&O is Stephen H. Long and William Gibbs McNeill, Narrative of the Proceedings of the Board of Engineers of the Baltimore and Ohio Rail Road Company, From Its Organization to Its Dissolution, Together With an Exposition of Facts, Illustrative of the Conduct of Sundry Individuals (Baltimore: Bailey & Francis, 1830). [Hereafter cited as Narrative.] As the title implies, the Narrative is the officers' attempt to "lay before [the public] a clear and candid exposition of the measures that have been adopted, the policy that has been pursued, and the peculiar kind of administration that has characterized the conduct and management of the affairs entrusted to the Board of Engineers." (p. iii). The Narrative is in two parts, the first, pp. 1-189, plus a 94-page appendix, written by Long, the second, pp. 193-352, plus a 53-page appendix, prepared by McNeill. Additional information on the procedures the B&O engineers used is available in Stephen H. Long, Rail Road Manual, or A Brief Exposition of the Principles and Deductions in
Tracing the Route of a Rail Road (Baltimore: William Woody, 1829), pp. 65-81. The quotes are from pp. 68-69. Long's pocket-sized book, in which he acknowledges "the kind assistance rendered by his coadjutators, the Engineers military and civil, employed in conducting the surveys made in behalf of the Baltimore and Ohio Rail Road Company," was intended to "place in the pocket of the Engineer, a brief and perspicuous compound of easy rules, that may serve as a Directory, to guide him in tracing the routes of a Rail Road." (p. iii) It consists of two parts, first a narrative, dealing with the technical problems of laying out a road and the method of making the survey. The second part is a collection of mathematical tables. Although this gets ahead of the narrative somewhat, it is worth noting here that the clash between Long and McNeiill and the Board of Directors touched the Rail Road Manual as well. The copy consulted at the Association of American Railroads Library was owned by one Henry Harding, who pencilled in a note under Long's name: "Stolen from J. Knight's private memorandum and published as original except in one or two instances where credit is attempted to be given." For Long's view of this issue, see Narrative, pp. 44-45, 61.


18 Narrative, pp. 18, 21; Appendix I, pp. 3, 4.

19 Weyer to Thomas, April 17, 1828, "B&O Papers," MHS Ms. 1192.


22 McNeill to Thomas, May 1, 1828, in Narrative, Appendix II, p. 31.

23 Ibid., p. 34.


25 Thomas to Macomb, May 17, 1824, "Registers of Letters Received, Topographical Bureau, 1824-1866," "T"
Letter 518, RG 77, M-505, Roll 1, frame 62. The original letter is missing.


27 Narrative, p. 29.

28 See "Regulations for the Engineer Department" in Narrative, Appendix I, pp. 11-16. The subtitle of McNeill's regulations gives some clue as to the managerial problems McNeill felt were most pressing: "Organization of the Engineer Department of the Baltimore and Ohio Rail-road company, providing a system of government of the same; and for securing a strict accountability in the fiscal operations of the Baltimore and Ohio Rail-road company, and economy in the disbursement of its funds."

29 See paragraphs 1, 2, and 4 of the "Regulations of the Engineer Department," in Narrative, Appendix I, pp. 11-13. Compare these three paragraphs, especially paragraph 2, with paragraphs 890, 904, 906, 907, and 916 in Article 67 of U. S. War Department, General Regulations for the Army; or Military Institutes, revised by Major General Winfield Scott (Washington: Davis & Force, 1825), pp. 169-176.

30 The superintendent's duties are outlined in "Regulations of the Engineer Department," paragraph 4. Compare this paragraph with Article 67 of General Regulations, paragraph 889, especially the first sentence. For the B&O system of accounts and reports, see "Regulations of the Engineer Department," paragraphs 5 and 7, then compare this to Article 67, paragraphs 891, 897, and 909. On the question of accountability, compare "Regulations of the Engineer Department," paragraphs 6 and 8

6th. All officers attached to the service of the Rail-road company, to whom instruments, books, stationary, and other property belonging to the company may be intrusted, shall render quarterly returns thereof, and shall be responsible for the same;

8th. When property is not accounted for, nor its loss satisfactorily explained, the person to whom the care of it has been confided, will be charged the value thereof;

with Article 67, paragraphs 915 and 892:

915. All officers of the corps of engineers and topographical engineers, who may be in possession of instruments, books, charts, maps, &c.
belonging to the engineer department, shall render to the topographical office, quarterly returns of the same, form 16, and, while they are in their possession, shall be responsible for them. . . .

892. When property is not accounted for, nor its loss satisfactorily explained, the officer to whom the care of it has been confided, will be charged the value thereof.

Other references are similarly explicit: on the Board of Engineers reports, compare "Regulations of the Engineer Department," paragraph 2, with Article 67, paragraph 906.

31Narrative, pp. 31-32.

32Hungerford, Story of the B&O, Vol. I, pp. 37-47. By this time Dr. Howard and his brigade had moved on to other projects, since the government refused to continue to subsidize the cost of his brigade. See Lt. A. Mordecai to Thomas, June 12, 1828; and Lewis Southard to Long, June 20, 1828, both in "Letters Sent, Internal Improvements, 1824-1830," RG 77, M-65, Roll 2, pp. 316, 327-328.

33Narrative, pp. 35-36.

34Ibid., pp. 52-53.


36Ibid., pp. 76, 81. Also see 2AR, B&O, 1828, p. 11, and "B&O Papers," MHS Ms. 1192 for a copy of one of their reports from England, dated December 9, 1828.

37These clashes are recounted in detail in Narrative, pp. 54-104. The quote is from p. 95.

38Narrative, pp. 104-123; the quotes are from pp. 104, 106-107, 110, and 123.

39Ibid., pp. 127-128.

40Ibid., pp. 128-129.

41Ibid., pp. 135-139. The quote is from p. 139.

42Ibid., pp. 144-145, 155, 197-199. Long was closer to a "victory" than he realized. At about the same time the Committee on Accounts was meeting, Thomas asked General Macomb for "copies of certain printed documents." (Thomas to Macomb, April 28, 1829, in "Registers of Letters Received, Topographical Bureau, 1824-1866," RG 77, M-505, Roll 1,
frame 62.) The documents were probably another copy of Engineer Department regulations and forms -- this was all the department had available for public distribution. This suggests that the legislative report incident had demonstrated to Thomas that the system that Long advocated was sound, but that the personality conflicts that had developed had made Long, at least, a liability. Thomas may have been using this "back-channel" to gather information needed for a corporate restructuring without giving Long any opportunity to gloat over his "victory."

43 Narrative, p. 156.
46 Ibid., pp. 201-203.
47 Ibid., pp. 216-221.
48 Ibid., pp. 222-227, 244-249.
49 Ibid., pp. 250-258.
50 Ibid., Appendix II, pp. 15-28; p. 282.
51 Ibid., note on pp. 262-264.
52 Ibid.
53 Ibid., pp. 277-278.
54 Ibid., Appendix II, pp. 22-27.
55 McNeill devotes 58 pages of his section of the Narrative to a denunciation of the committee, its activities, and its report. See Narrative, pp. 283-341. The report itself is in the Appendix to Part II of the Narrative, pp. 15-28. The quote is from p. 289.
56 Narrative, p. 341.
57 Ibid., p. 342.
59 Secretary of War J. H. Eaton to Thomas, January 13, 1830; Gratiot to McNeill, March 16, 1830; Gratiot to
Long, March 16 and March 18, 1830, all in "Letters Sent, Internal Improvements, 1824-1830," RG 77, M-65, Roll 3, pp. 192, 238-241, 243. Also see Narrative, pp. 346-348. While this was going on, Long and McNeill decided to write their Narrative. McNeill, in his monthly report to Gratiot, described the actions of the two committees and claimed that their reports were "calculated to impress the community with the idea that the Board of Engineers were censured by the Directors, and in consequence, Col. Long and myself . . . have at intervals been occupied in placing those measures in such a light that, 'ere long, their merits may be judged by the public." McNeill stated that Thomas knew of their intentions. See Narrative, p. 345.

60 McNeill to Thomas, March 21, 1830; Thomas to McNeill, n. d.; McNeill to Thomas, April 9, 1830; McNeill to Gratiot, c. April 9, 1830; and Lt. A. Mordecai to McNeill, June 10, 1830, all in Narrative, pp. 349-352. McNeill became the chief engineer of the Baltimore & Susquehanna soon after, and served until 1836. See Chapter Four, below.


62 For the final rounds of the struggle, see William Gibbs McNeill, "To The Stockholders of the Baltimore & Ohio Rail-Road Company," pamphlet, August 19, 1830.

63 AR, B&O, 1830, pp. 6-9.

64 Ibid., p. 11.


66 A comparison of Article 67 of General Regulations, 1825, McNeill's "Regulations for the Engineer Department," 1827, and Knight's By-Laws, and Rules and Regulations, 1830 demonstrates the links between the three. We see the same attention to detail, an almost identical organization, and many of the same procedures appearing in each. Compare, for example, Article 10 of Knight's Rules and Regulations with McNeill's paragraph 5, both dealing with a system of regular activity reports, and Knight's Article 12 with McNeill's paragraphs 5 and 8 on accountability. In the latter case, McNeill copied directly from Article 67, and Knight copied directly from McNeill.


70 Harwood, Impossible Challenge, p. 15.
CHAPTER FOUR

Army Engineers and the
Boston to Albany Railroad System,
1836 - 1842

When United States Army engineers entered the service of the Baltimore & Ohio Railroad in 1827, they found themselves in a situation where they had the opportunity to assist in the creation of a new type of corporate structure. By the time some of these same officers entered the service of Massachusetts railroads in the mid-1830's, the situation had changed. Military engineers would never again possess the influence and power they wielded during the early days on the B&O. Railroad organizers followed progress on the B&O closely, and they possessed much greater managerial expertise. Civilian engineers, no longer the amateurs the B&O refused to hire, competed with military men for prestigious railroad jobs. Railroad men now worried less about technical and fundamental organizational problems, more about operational questions. Congress and the army itself began to question the wisdom of allowing military engineers to serve civilian enterprises when a shortage of engineers delayed the completion of

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military projects. These forces combined to alter the relationship between the army and the railroads.

However, these changes did not mean that army engineers were no longer able to offer useful managerial advice to the railroads they served. The Western Railroad, one component of the Boston-to-Albany system, is the second of the early lines where, by most accounts, the industry made significant advances in the art of railroad management. The Western benefitted from the services of army engineers who were in the forefront of efforts to rationalize the railroad's administrative and operational procedures. Their contributions were indirect, based more on their training and experience than on any attempt to graft military procedures onto an organization wholesale, without any consideration of the needs of the organization or the desires of its management. There would be no packages of Engineer Department regulations arriving from Washington. Nonetheless, military engineers made a valuable contribution to the development of railroad management on the Western Railroad.

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Massachusetts was as impressed by the success of the Erie Canal as Maryland, but the decision to build a railroad across the state was not based solely on the
desire to compete with New York. The Massachusetts economy was changing in the 1820's. The commercial and agricultural slump that followed the War of 1812 helped promote an industrial boom. As the state developed a complex, diversified economy, agricultural, commercial, and industrial interests recognized that further growth in all sectors depended on the development of an efficient intrastate transportation system. The question of how the state would meet its transportation requirements remained unanswered for several years. After the state legislature debated and rejected a proposal for the state to build a canal from Boston to the Hudson River, attention shifted to the possibilities offered by the railroad.

In June, 1827, the Massachusetts legislature appropriated $10,000 for a survey of possible routes for a Boston-to-Albany railroad. The survey report, prepared by three civilian engineers, made a strong case for the railroad. In March, 1828 the legislature created a nine-member state board of internal improvements to oversee future railroad development, while New York agreed to cooperate with Massachusetts to conduct surveys of the twenty mile stretch of New York territory between the state line and the Hudson.

Despite its early support, the Massachusetts legislature refused to undertake the railroad as a state project and also rejected a proposal to offer state aid to
any private group that formed to build the road. Although the Baltimore & Ohio and railroads in England were demonstrating that the lines offered definite commercial possibilities, pro-railroad forces were unable to overcome sentiments, centered in areas not served by the proposed railroad, that state funds would be wasted on a project that offered nothing in return for local contributions. Frustrated in their efforts to obtain state assistance, proponents of the route concentrated their efforts on an attempt to build the line as a private venture.

The railroad forces found their plans thwarted by the sense of uncertainty that still prevailed in many quarters. Although enthusiasm for the railroad was high, Massachusetts capitalists remained reluctant to invest the millions of dollars to build a line from Boston to Albany. Boston mayor Harrison Gray Otis suggested in May, 1830 that a small group of investors build a short section of the line to demonstrate that a western railroad was a viable commercial venture. Another Bostonian, Nathan Hale, led an effort to get the state to authorize the construction of a line from Boston to Worcester. On June 23, 1831, the Massachusetts legislature chartered the Boston & Worcester Railroad. The success of the B&W and its sister lines, the Boston & Lowell and the Boston & Providence, both built by other groups of investors, would likely determine the fate of more ambitious plans to push a line
across the Berkshire Mountains to the Hudson and Albany.¹

The Boston & Worcester became a successful railroad and the first link of the road to Albany. In May, 1832 the Board of Directors authorized Hale, now president of the railroad, to lay out the line and begin construction. Hale secured the services of John M. Fessenden, one of the members of Colonel Long's "brigade" on the B&O, who had resigned his commission in November, 1831.² As on the B&O, the Board of Directors specified the general route their railroad would follow, leaving determination of the exact route to Fessenden and his assistants. Fessenden also designed the railroad's surface structures. Contractors bid for and built the line in small sections, following Fessenden's plans and estimates and subject to his supervision and inspection. Construction of the single-track road began in August, 1832; the line offered scheduled service to Newton (8 miles from Boston) in April, 1834, to Westborough (33 miles) in November, 1834, and to Worcester (44 miles) in July, 1835.³

Fessenden saw his role as engineer down-graded when construction ended, as superintendent James F. Curtis and agent William Jackson assumed control of the railroad's transportation operations. Curtis and Jackson faced many organizational and operational problems in the early days, but the railroad was small and the difficulties could be handled by using techniques borrowed from the B&O and
British railroads. Safety promised to be a problem on the single-track line, but Curtis handled it through a rigid scheduling system. Trains left both terminals at the same hour; normally they would meet somewhere near the mid-point of the route. Sidings situated about every six miles enabled the trains to pass. After two accidents showed that this system had its limitations, Curtis had a heavily-travelled seven-mile section near the mid-point of the route double-tracked so that trains could move more safely, a technical solution to an administrative problem. A simple division of labor between the train crews and the depot, yard, and shop crews established a basic system of accountability, which Curtis and Jackson could enforce through daily visits along the line if the need arose. Most managerial problems were met using common sense, trial-and-error, and experience. The system that evolved worked well enough for the short, heavily-travelled line, but problems would arise when the Western Railroad (the longer link of the route to Albany) tried to apply essentially the same system to a longer, larger, and more complicated line.  

The Boston & Worcester, the Boston & Lowell, and the Boston & Providence demonstrated to potential investors that the railroad could be made into a profitable transportation system. Their success provided the desired stimulus to efforts to raise the funds needed to
complete the line to Albany. On March 14, 1833 the Massachusetts legislature granted a charter to the Western Railroad Corporation. The Western was to build a railroad from Worcester to the New York state line, where it would connect with a short New York-chartered railroad. It is on the Western that army officers would play an active role in the formulation of new railroad management procedures.

* * * * *

The Western charter, held by the directors of the Boston & Worcester, lay dormant for more than two years while the B&W management concentrated on its road. Sale of Western Railroad stock began on August 3, 1835. The stockholders met for the first time on January 5, 1836 to elect a board of Directors, which in turn elected Thomas B. Wales president of the company on January 8. On the same day the board selected Wales to head a five-man committee authorized "to consider and report on the system for building the Road and the Officers to be employed thereon."

After accepting the committee's view that it was premature to discuss a system without consulting the railroad's engineers, the board then directed the committee "to negotiate with such Engineers as they may think proper and ascertain on what terms the services of suitable persons
can be obtained."^5

Although the railroad had in its files requests for employment from a number of skilled civilian engineers, including James Stevens, the state engineer of Massachusetts, the committee directed its attention toward army engineers.^6 George W. Whistler, formerly of McNeill's survey party on the B&O, was the committee's first choice for engineer. Wales, searching for an engineer who would "devote his whole time and services" to the work, wrote Whistler to inquire as to his availability on January 12, 1836. Whistler, who had resigned from the army in 1833, was employed as manager of the Lowell canal system's machine shop and as an engineer on the Providence & Stonington extension of the Boston & Providence Railroad. He told Wales that he could not accept employment on the Western. A disappointed Wales then asked Whistler if he could recommend anyone else to serve as either resident or consulting engineer. Whistler, on January 18, 1836, promised to discuss the matter with Wales the next day.^7

Perhaps acting on Whistler's recommendation, Wales next asked Whistler's former superior (and now his brother-in-law), Major William G. McNeill, if he could accept employment as the railroad's consulting engineer.^8 McNeill, perhaps the most experienced railroad engineer in the country at the time, responded favorably, although he was simultaneously involved in several other internal improvements
projects. The Board of Directors authorized the committee to begin salary negotiations with McNeill, who offered to bring a number of engineers who would work under his supervision. The committee was directed to settle the questions of what McNeill's terms were, what assistants he would bring, and "what amount of his personal attention he would be able to devote to this object." Wales seemed especially interested in McNeill's business and management methods.

McNeill offered to serve as consulting engineer, but only if he could obtain the services of a resident engineer he could fully rely on, since he admitted that he would be frequently unable to supervise the work personally. McNeill in fact refused to accept the job if he could not recruit this trusted assistant, even if the company was willing to meet his salary demands, which were rather high: he wanted $5,000 for the first year, when he would work for the railroad more or less full time, "subject of course to the supervision and control of the President of the Company, as the organ of the Board of Directors." He then asked for a four year contract for $10-12,000, for a period when he would spend less time on Western work. McNeill also wanted the right to appoint all his subordinate officers in the Engineer Department, subject to the approval of the Board of Directors. As for his methods, McNeill advised Wales to refer to the other
railroads he had worked for, specifying the Boston & Providence.¹²

While the committee considered these terms, Wales and McNeill discussed filling the resident engineer's position. McNeill recommended his former assistant (and Whistler's brother-in-law), Captain William H. Swift. Wales suggested two other candidates, Captain Joshua Barney, formerly of the B&O, and Lieutenant Roswell Park. McNeill was unwilling to rely on Park, "a young gentleman of merit," since the Western would be his first major project. Barney and Swift both agreed to accept the position of resident engineer, subordinate to McNeill, but McNeill still argued that "you can do no better than to allow me to employ Swift."¹³

The Board of Directors met on March 11, 1836 to consider the report of the committee that had been negotiating with McNeill. The report was read and immediately tabled because Francis Jackson, a member of the committee, submitted his report that was critical of the committee's recommendation to hire military engineers. Jackson's report accurately summed up ten years of criticism that had been levelled against West Point-educated engineers. Jackson wanted the railroad to hire "a practical man as superintendent . . . in preference to a professed Engineer, because under such direction it is believed that the Road will be constructed, at much less
cost, and with much greater despatch [sic.], with better judgement & much less perplexity to this Board." He believed that professional/military engineers (he used the terms synonymously) had an "express or tacit" agreement "to engross the management of public works and to enforce their own particular views & interests, to the exclusion of practical men." He claimed that military engineers ("scientific men") lacked "habits of economy, industry, foresight & judgement;" that "the habits, feeling & address of professed engineers are essentially military, uncongenial to the purposes of business transactions & repulsive to those of the mass of people, with whom they come in contact in this work;" that they preferred the beauty of a bridge or the imposing appearance of a viaduct "to the plain and homely attributes of utility and economy;" and that their chief ambition was "to obtain a scientific reputation - to excite the admiration of those whose tastes delight in elegance & grandeur without regard to cost." He concluded with the hoary argument that

the graduates of West Point, . . . , however skilful [sic.] they may be in their own department of Engineering are notoriously unfit for the practical purposes of the general direction and superintendence of such a work. It cannot be expected that any institution can take boys from the lap of wealth, luxury & idleness & fit them for all the duties of such an enterprise [sic.].

A wide segment of American public opinion subscribed to views similar to those Jackson expressed, but
these fallacious ideas had little basis in fact. The military's system of accountability stressed the habits of "economy, industry & foresight" that Jackson claimed the engineers lacked. They could hardly be accused of habitual extravagance when one recalls that on the B&O it was the military engineers who supported "utility and economy;" the civilians occasionally wanted more expensive construction. There were conflicts between military men and civilians, but such clashes seem to have been rare. Popular belief in such views was rooted in more out-dated anti-military rhetoric than in any objective evaluation of the conduct of the officers during their careers. Nonetheless, such views enjoyed a long life in the United States throughout the early nineteenth century.15

Jackson's criticisms carried little weight with either the committee or the Board of Directors. Wales advised the board to choose "the most scientific coadjutors." On March 16, 1836, the board heard and accepted a revised draft of the original committee report. On March 17, it appointed George Bliss, Edmund Dwight, and Wales to a committee to negotiate final terms with McNeill and Swift. On March 18, the committee made its formal offer to both. It offered McNeill a four year contract worth $10,000 ($5,000 for the first year, then $1,500, $1,500, and $2,000) if he would serve as consulting engineer. As resident engineer, Swift would
receive $4,000 for his first year "in consideration of this being the first great work, which is committed to his charge," but $5,000 for subsequent years of full time work. Both accepted these offers on March 23 and signed contracts with the Western on March 25, 1836. The Western Railroad would build its road with a mixed civilian/military management hierarchy, the military men in their familiar technical positions, the civilians handling business affairs.16

In July, 1836 the military presence on the Western was reinforced when McNeill informed the Board of Directors that George W. Whistler had agreed to work with McNeill as a consulting engineer. McNeill's actual role in company affairs is vague. He signed most of the survey reports, but seems to have spent virtually all his time in Boston. In any event, McNeill had other duties to attend to elsewhere, so he convinced Whistler to assume his duties and salary in his absence. McNeill asked the company to recognize Whistler as McNeill's equal in responsibility and control; since the company secured "his valuable services, without any additional charge to the corporation" the board approved of this unusual arrangement.17

Western Railroad survey operations began in April, 1836, with the engineers using familiar procedures. Swift, the resident engineer, initially had two survey teams in the field, although by June he had added a third. The
route naturally divided into two sections, one from Worcester to Springfield on the Connecticut River, the other from Springfield to the designated western terminus at West Stockbridge on the state line. The fifty-five mile stretch from Worcester to the river presented no significant engineering problems since it passed through flat to gently rolling terrain. The western section, however, required significantly more effort, since the engineers had to lay a route through the Berkshire Mountains, a not inconsiderable obstacle to the technology of the time. The engineers submitted preliminary reports throughout 1836; the first detailed report appeared on January 15, 1837, although the official survey report was not completed until January 2, 1838.18

Construction on the section east of the Connecticut River began almost immediately. The work went smoothly, and the Western ran its first Worcester-Springfield train on October 1, 1839. The western section, the hundred miles from Springfield to the state line, took more time to build. In the interests of speed, the Board of Directors decided to build from both ends simultaneously. Workers completed the bridge over the Connecticut River in July, 1841. The track gangs completed their work on the western section in October. The Western's New York subsidiary, the Albany & West Stockbridge, was completed on December 20, and on December 21, 1841 the Western inaugurated through
service from Boston to Albany.19

The Western was a single-track line, a fact that was to play a major role in its managerial history. The Board of Directors told the engineers to grade the road for a single track in October, 1836, primarily for economic reasons. However, they soon began to doubt the wisdom of this course of action. Wales asked the engineers for their opinions. In December Swift and his associates submitted a report which recommended grading the whole route for a double track, even if the railroad decided to lay only one track at the outset. The cost of this option was deemed prohibitive, however, so the board chose to adopt another suggestion the engineers offered, that of widening the cuttings and fillings for later additions. The directors knew that the single track would present operational difficulties, but they had no idea how serious these difficulties would become in time.20

From the outset the Western's management demonstrated a concern for the problems of fiscal responsibility and accountability that suggested the extent to which railroad management ideology had advanced in the course of a decade. The board had two reasons to be concerned with these matters, one practical and one legal. On the first count, money was tight, and Wales warned Swift to caution his assistants "against extravagance, and inculcate upon them economy and prudence." Swift,
seemingly unaware of the broader fiscal concerns of his employers, testily asked to be informed what he was doing wrong. He was hurt to think that Wales would find it necessary to cast aspersions on his abilities as a manager; all he sought was Wales' "unqualified approbation." Wales quickly assured Swift of his "perfect approbation of your management." He explained some of the railroad's fiscal problems and noted that "my only object was to impress upon your mind the importance of fixing upon your assistants the same rule of conduct in their expenditures which naturally governs you and me."\textsuperscript{21}

Wales and Swift also had a legal mandate to pay close attention to the fiscal affairs of their company. The Western's charter contained a provision that required the corporation "to make a report to the legislature [annually] . . . of their acts and doings, receipts and expenditures." The company's books were also open to legislative investigating committees. Failure to comply with these provisions would subject the Western to a fine of up to $10,000.\textsuperscript{22} The Board of Directors was always aware of this injunction and of the company's fiscal situation. From the outset it knew that the railroad required "a system of accountability, which alone can secure the efficient and economical administration of the business of the Corporation."\textsuperscript{23}
The exact role McNeill and Swift played in the creation of this system of accountability is unclear, but the forms and procedures eventually adopted demonstrate a physical and functional similarity to their B&O and army predecessors. Wales allowed Swift a fairly free hand to conduct the affairs of the Engineer Department. Wales was of course aware of Swift's business habits and methods, and with the board preoccupied with financial matters, Swift acted to establish a reporting and accounting system without specific board sanction. Swift was willing to make changes in the system he created -- "Should the manner in which the accounts are exhibited not correspond with the form in which you wish they should be rendered, I beg you will apprise me"\textsuperscript{24} -- but neither Wales nor the board initially found any reason to be dissatisfied with Swift's procedures. Wales routinely processed Swift's requisitions without comment. These requisitions were based on estimates prepared with the same attention to detail that marked Swift's earlier civilian and military work.\textsuperscript{25}

The work progressed to the apparent satisfaction of all concerned through 1836, with Swift continuing to superintend the day-to-day operations of the Engineer Department and to consult with McNeill and Whistler when the occasion warranted. An economic slowdown in 1837, however, brought the engineer's activities under greater scrutiny. In an effort to cut costs, the Board of Directors created
a committee to report on the salaries of company employees. The committee's report focused management's attention on Swift and McNeill's organizational handiwork, and the committee was not completely pleased with what it found.

The committee recommended that the railroad cut wages where and when possible. However, it noted that both the chief and resident engineers had contracts which guaranteed their salaries. The committee also reported that the general public believed that a "spirit of favoritism" pervaded the Engineer Department. While the committee found nothing to support this claim, it did recommend that the board exercise a "strict and judicious supervision" over the department, especially since the practice had developed in which the chief engineer hired all departmental employees "without the knowledge and approbation of the board." In the future, the company agent and the engineers were to report their appointments to the president and the board.26

Another committee examined the company's accounting procedures at about the same time. Again, the report it presented was generally favorable, but the committee found practices that it felt needed revision. First, the committee advised the board to reinforce and reassert its position as the ultimate source of authority in the company. Although Swift, McNeill, Whistler, and agent George Bliss "cheerfully" assented to the principle, the committee
thought it best to restate that Wales was the "Organ of the Board" and that all official communications between the board and the field officers were to go through his office. Perhaps more importantly, the committee further recommended

that the President require of the Resident Engineer a list of the names of all the assistant Engineers & under-assistants employed by him, with their salaries or wages; also the names of all the Contractors, copies of contracts & duplicates of receipts for moneys paid them on account; and from the agent the names of persons employed by him, & the wages paid . ..27

While none of the engineers seem to have been members of the committee, at least Swift was consulted and it is possible to see a link to Corps of Engineers procedures in these recommendations. Whether this report reflected Swift's suggestions on how the accounting system could be improved or a criticism of the procedures the engineers were following is not clear. Wherever the ideas came from, the committee's recommendations, which the board adopted on March 22, 1837, marked a further application of techniques that first appeared in the army to a corporate organization.

These two investigations, plus another one undertaken in the summer of 1838, marked the first serious attempt by the Board of Directors to examine in detail the operations of their company. On the whole, the committees were generally pleased with what their
investigations uncovered. They found that the company was being well served by its officers; indeed, the 1838 report expressed a degree of astonishment at exactly how complicated the company's affairs were and how diligently its officers prosecuted their duties.\textsuperscript{28} The recommendations that came out of the committee reports, when finally adopted, refined the basic system of accountability McNeill and Swift installed in the spring of 1836.

The reforms enacted in 1837 and 1838 were relatively minor adjustments made to an existing management system. The represented the Board of Director's effort to promote greater economy in the operations of the Engineer Department, not an expression of official dissatisfaction with the general course of operations. Swift, McNeill, and Whistler appreciated the problems the company faced: military engineers were well-acquainted with economy drives. They felt that the more complicated, tighter system of accountability the various investigating committees proposed would protect both the company and its officers from charges of extravagance and malfeasance. Since both sides appreciated the motives behind these reforms, they cooperated in their implementation. The results of these modifications were at least generally similar to the system McNeill and Long had tried to install on the B&O, but on the Western the impact was far more benign and beneficial to all concerned.
Until 1838, the officers were primarily concerned with the technical aspects of railroad construction, and with the creation of managerial systems that would promote the most efficient and economical prosecution of these engineering projects. However, events between 1838 and 1841 would first, alter the relationship between some of the officers and the railroads to which they were attached, and second, alter the nature of the managerial problems the railroads faced. The report of the 1838 investigation marked the conclusion of one phase of military/industrial cooperation on the railroads.

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West Point's success as a producer of trained engineers created difficulties for the army. For many years it was the only source of academically trained engineers and its graduates were in great demand, especially for internal improvements projects. The cadets were aware that they could easily parlay their education into a lucrative private career. They generally faced less promising prospects in the army, with its low pay and potentially dismal conditions of service. Many of them decided to resign their commissions soon after graduation to become civilian engineers.
At least as early as 1818, Major Charles Gratiot was complaining that army engineers were underpaid and that they could earn far more in civilian life. In 1825, a second lieutenant received a salary of $25 per month, a first lieutenant $30, a captain $40, a major $50, and a lieutenant colonel $60. Congress did not see fit to alter these salaries significantly for many years. In 1836 the Western paid Major McNeill $5,000; in 1837 Captain Swift received the same amount. The General Survey Act of 1824 may have enabled the army to keep officers like McNeill and Swift, since it allowed them to earn much higher salaries while retaining their military rank. However, Congress was beginning to criticize the situation.

A Congressional investigation in 1837 found that in 1836 the army had lost 97 Military Academy graduates between the rank of brevet second lieutenant and captain to resignation. The committee complained that as the Academy was then organized and conducted, "it becomes more of an object to gain admission into it and obtain an education and concurrent support in it at public expense than to enter public service afterwards, there to continue any length of time." Some members of Congress disliked paying for a young man's education only to lose him to a more lucrative profession on graduation. Rather than make the conditions of military service more attractive, Congress
tried to find ways to make it more difficult for a cadet to become involved with private enterprise.

The 1837 Congressional committee had not discovered a new phenomenon. In 1817, Benjamin H. Latrobe discussed his decision to allow his son, John H. B., to attend West Point. In a letter to Isaac Hazelhurst, he cited five reasons: the education, "of the very best kind" was free; his son would be paid while he was in school; the discipline he would undergo was "necessary to his indolence and the development of his constitution;" his education would prepare him for a lucrative civilian career; and finally, if he chose not to stay in the army, he could take his father's place as an architect and civil engineer. Latrobe could think of only one objection: "a determined taste acquired at West Point for military life" yielded neither profit nor honor in the United States.32

The same arguments swayed a generation of cadets. One wrote that he knew "that engineering ... is one of the most lucrative & honorable professions [sic.]" that he could pursue, but it "took a man of superior talents [sic.]" to get into the Corps of Engineers. Cadet Jacob Bailey wrote his mother that he would pay careful attention to the course in civil engineering because "the number of Railroads constructing in all parts of our country will furnish employment for many engineers, and if I do not get stationed at West Point, I think I should try to get
employed on some one of them for a while." Even George Washington Cullum, who later became superintendent at the Academy, reached the point in 1836 where he had almost decided to leave the service because "from the offers that have been made to me I know that I could advance my pecuniary affairs much."\textsuperscript{33}

Chief Engineer Colonel Charles Gratiot noted that the resignations from the army were beginning to attract unfavorable public and Congressional attention, and he recommended that Congress change the law to require Academy graduates to serve a longer term after graduation. Pressure to make statutory changes in the conditions of service came from other sources as well. The Corps of Engineers wanted its officers back so that they could be assigned to other operations. An undercurrent of jealousy began to appear in the officer corps. The growing body of civilian engineers resented the intrusion of officers into what they saw as their professional domain. In response to these complaints, on July 5, 1838 Congress passed an act that drastically altered the relationship between the army and private internal improvements projects. Although the act did specify longer terms of service for Academy graduates, its most important provision prohibited officers from working for private firms. All officers were recalled to their normal duty stations. The days of direct army support of internal improvements were over.\textsuperscript{34}
The Directors of the Western were appalled at the thought of losing their resident engineer in the midst of the project. The act of July 5, 1838 gave the officers one year to terminate their private obligations and rejoin their units. On December 27, 1828 the Board of Directors drew up a memorial for presentation to Congress, asking either that Captain Swift be exempted from the provisions of the act or that he be allowed to remain in the railroad's service until construction was completed. Their request was turned down. On May 31, 1839 Swift informed Wales that he was resigning from the service of the Western. He submitted his resignation on June 12, 1839, to be effective on July 5. The board accepted his resignation with regret and transferred his duties to Whistler and McNeill, neither of whom were affected by the act of July 5. Although this was an acceptable temporary expedient, the board wanted a permanent chief engineer who could reside at Springfield and work for the road full time. In October, 1839 the board formed a committee to make suitable arrangements with either McNeill or Whistler. Whistler eventually became the Western's chief engineer. 35

One of Swift's last acts in the service of the Western was to work as a member of a committee formed to plan the organization of the Transportation Department in April,
1839. In this case the board, aware that the eastern section of the road was nearing completion, demonstrated a degree of foresight that was absent on many other roads. The committee focused on operational problems, not technical matters. It would determine how the road would be organized when operations began and how it would conduct its business. From this report emerged the organizational procedures the railroad used, with modifications, for several years.36

George Bliss, the Western's agent and a member of the committee, reported that the plan the committee suggested was largely the work of Captain Swift.37 The report recommended the creation of a "Transportation Department" under the control of the chief engineer, who was ex officio general superintendent. He was assisted by two masters of transportation, one at Springfield, one at Worcester, who in turn supervised road masters and their track gangs, conductors, train crews, the master mechanic and his assistants, baggage masters, ticket agents, way agents, and other employees. Many of these employees filed some form of monthly report; those who collected money submitted their returns daily. Some company officials also had to prepare periodic estimates. When the plan was formalized as Transportation Department regulations in 1840, all employees were enjoined to observe "a strict regard to economy in the use of fuel, oil, &c., and a cheerful
compliance with all regulations" to "evince that interest in the performance of their duties which is absolutely necessary to their usefulness." The Western commenced operations under this system in October, 1839.

It is easy to trace the philosophical antecedents of these regulations. There is nothing to suggest that the Massachusetts industrialists who served on the Western's Board of Directors had experimented with anything as complicated as this management system in their factories. They had no need to. The railroad made a careful study of management practices on other lines, but in 1839 there was only one other railroad, the B&O, that was large enough to have faced anything like the operational and administrative problems the Western anticipated, and at that date the B&O was still concentrating on construction problems. Swift faced the same type of managerial problems army leaders had met and mastered twenty-five years before. Given his familiarity with the procedures his superiors had adopted, it is hardly surprising that Swift chose to model his own contribution to the Western's management on their efforts.

Of course events shaped these reforms as well. Information on B&O procedures was available, and McNeill, Whistler, and Swift were all intimately acquainted with what the B&O was doing. Recall that in 1838 the B&O was still using a revision of Knight's 1830 regulations, and
that they owed much to McNeill's efforts. At this point, the evolutionary links between the B&O and the Western would still be directly influenced by military practice. The officers, at least, had been through this procedure before.

Swift departed in July, 1839. McNeill and Whistler served the railroad in his place, but as operations expanded the Board of Directors began to feel that its interests were not being adequately served by two part-time officers. In May, 1840 the Western acted to redefine its relationship with McNeill and Whistler. McNeill continued as consulting engineer, with his duties expanded to include general oversight of the Albany & West Stockbridge. Whistler became the full-time chief engineer of the Western/A&WS system, at a salary of $6,000 per year. The railroad again turned to an Academy-educated engineer when it promoted John Childe to the position of resident engineer on the A&WS. The board ratified these changes on May 14, 1840.39 It is worth noting again that as Chief Engineer Whistler's duties included those of general superintendent. He assumed control of both the Engineer and Transportation departments.

As the Western's operations expanded flaws began to appear in the operating system created in 1839, flaws that became threateningly obvious when a series of accidents focused public attention on the operational difficulties
the railroad was experiencing. On October 5, 1841, just one day after the railroad opened its line from Boston to West Stockbridge, two passenger trains collided head-on in Westfield township, killing two and injuring seventeen. The public was shocked, and various groups called for an immediate investigation and changes in the railroad's operating procedures. Although the railroad's own investigation of the crash showed that it was caused by a conductor who failed to follow his operating regulations, the board recognized that it would have to act to try to prevent a recurrence of the catastrophe. On October 16, 1841 the Board of Directors appointed a four-man committee, which included George Whistler, to examine the regulations and practices of other railroads and to draw up new regulations "as shall in their opinion best promote the safety of the traveller and the security of the trains."\(^{40}\)

Bliss credits Whistler with most of the reforms the committee suggested in its report. According to Bliss, the board relied on Whistler"for the rules and regulations for trains, and for systematizing the operations of employees of every grade." In 1841, Whistler "perfected and systematized" the procedures established by Swift two years earlier.\(^{41}\)

The committee issued its report on November 30, 1841. It found that Swift's system was fundamentally sound and repeatedly noted that the changes it was suggesting were
little more than amendments to the rules and regulations then in force.\textsuperscript{42} The revised regulations divided the road into three essentially self-contained divisions, each under the control of a road master whose primary responsibility was maintenance of way and property. Each division was further divided into sections under a superintendent, who actually directed most operations. The divisional road masters were required to keep a journal of their operations "in order that the experience thus acquired may be rendered servicable in subsequent operations." They were also required to file detailed monthly reports of their operations.\textsuperscript{43}

The new regulations also tried to eliminate any possible ambiguities. They laid out definite lines of authority and communication and established in detail the exact responsibilities of each of the railroad's employees. The regulations for the train crews were especially explicit. The flow of information along the chain of command increased as more employees filed more frequent and more detailed reports. This information became increasingly useful in the formulation of fiscal and operational policies. Again and again, however, the report stressed that these were not significant changes in existing operating procedures. Indeed, the committee cautioned the board that if it was to adopt the "Twelve Articles" as reported "it might convey the impression that they were new
subjects of arrangement . . . and excite the wonder of the public that measures for their safety had been so long delayed."\textsuperscript{44}

When the state of Massachusetts investigated the operations of the Western in 1842, it found that the railroad was working diligently to correct its problems. Bliss and Whistler received a sympathetic hearing before a Senate investigating committee, where they described the length to which the railroad had gone to gather and compare the operating rules of British and American railroads, and where they admitted that

after an accident had occurred from some case not provided against in existing regulations, the happening of the accident itself suggested some new rule which would forever prevent the recurrence of another from a similar cause; and they were themselves surprised that they had not earlier seen the necessity of such new rule.\textsuperscript{45}

This comment again demonstrates that in this case Whistler and Bliss were responding to specific contingencies as they modified the Western's operating procedures. Events certainly influenced the nature of these reforms at least as much as any particular management ideology Whistler in particular might have followed. Neither the military's organizational theory nor its administrative procedures offered any exact information on how the railroad should respond to this particular combination of events. However, when Whistler faced these events his own response was shaped by his education and experience
and by the contemporary state-of-the-art in railroad management science. His military career exposed him to military procedures, which also played a disproportionately significant role in shaping railroad management to this point.

Just as the original operating regulations marked Swift's last major contribution to the Western, the 1841 revision was Whistler's last significant effort to shape managerial developments on the railroad. On May 17, 1842, George Whistler resigned his position on the Western to accept a job in Russia, where he had been invited to build the Moscow to St. Petersburg railroad for the Tsar. He apologized that he had not given the board much notice (he hoped to leave on June 1), but noted that "Captain Swift, who is fully acquainted with all circumstances connected with this department," had offered to oversee the settlement of Whistler's accounts. The Board of Directors reluctantly accepted his resignation and tendered him their thanks in a testimonial letter on June 10, 1842. On May 25, the board ordered Wales to assume the duties of engineer and general superintendent until further notice. On September 29, 1842 the Board of Directors elected James Barnes (U.S.M.A., 1829) Chief Engineer of the Western Railroad. He outpolled his colleague John Childe (U.S.M.A., 1827) by one vote. Swift, McNeill, and Whistler had stocked the Western's
Engineering Department with a number of former Corps of Engineers officers, so the military influence would continue.

* * * * *

Managerial procedures stabilized on the Western after Whistler's departure, one mark of the success of the 1842 reforms. Whistler went to Russia, where he died in 1849. Swift returned to the Western as company president in 1851, serving for two years. His primary concerns as president were fiscal and competitive, as the Western battled the Boston & Worcester over rate questions. In 1868 the Western and the B&W merged to form the Boston & Albany Railroad.49

The contributions the military engineers made to management development on the Western were perhaps fundamentally more important than those made on the B&O. The focus of organizational developments on the B&O was on engineering; the most basic question in the eyes of Long and McNeill was how to build a functional, durable road at the least possible cost. The same question applied on the Western, but the answer the Western obtained was shaped by the presence of McNeill, who made his own administrative goals and methods clear before he accepted the job. McNeill and Swift, then Whistler, had little trouble getting
their subordinates to follow their instructions during the construction phase, in part because the subordinates were now more familiar with the outlines of the system and prepared to follow it. Management also accepted the procedures, which made their application to another road immeasurably less divisive.

The real key to the officers' contributions on the Western was their ability to fashion functional operational procedures using elements of the same administrative philosophy that had shaped technical administration. The relative ease with which the Western's organizational and administrative committees were able to fashion detailed operating systems suggests the presence of experienced administrators in the planning process. The operating plan Swift formulated in 1839 was detailed and surprisingly complete and shows few signs of a system that was hurriedly patched together using random ideas suggested by inexperienced personnel. If Stephen Salsbury's assertion that "the early executives did not realize that railroads required new managerial techniques unknown to either Boston's merchant princes or the rising textile entrepreneurs" is correct, one can only conclude that administrative reform owed much to the ideas of people other than Wales and the members of the Board of Directors.50 The similarity between the managerial system erected on the Western and the administrative procedures used by the United States
Army strongly suggests that the individuals who created the Western's structure were familiar with military methods and with the course of reform on other railroads.

Their contemporaries credit Swift and Whistler with being the source of many of the new operational ideas applied on the Western. The scale and scope of the Western's activities made it impossible for the railroad's management to control the road using the traditional bonds of "kinship and friendship" that had sufficed in earlier business ventures. Only a bureaucratic form of management could ensure the degree of control needed to make the Western both safe and profitable, and the United States Army was one of the nation's few functioning bureaucracies of any size at the time.

Whistler and Bliss have been criticized for not having made any attempt to reform an inadequate administrative system until the railroad suffered serious operational breakdowns.\(^{51}\) This is valid to a point, but unfair. Few managerial hierarchies enact drastic organizational reforms unless and until operational or fiscal difficulties clearly demonstrate that the survival of the company is threatened unless such reforms are made. This is largely true today, and was certainly true in the 1840's, when a change of the magnitude of the one made on the Western was more revolutionary than evolutionary (taking the 1839 and 1841 reforms as a block). Once the management of the
Western recognized that changes were needed, it acted immediately to formulate a managerial system better able to cope with the operational problems the railroad faced. When a traditional system broke down, Swift and Whistler turned to a managerial system they were familiar with and used it as a model for the system they shaped for the Western.
CHAPTER FOUR -- NOTES


3 Salsbury, Boston & Albany, pp. 93-111.

4 For details on running the B&W, see Salsbury, Boston & Albany, pp. 112-132. The question of the transfer of technical and especially managerial information through the technical press would benefit from more detailed research. Two of the best known and most widely read railroad journals of the time were Railroad Age and American Railroad Journal. Both reprinted the early reports of the B&O as they became available, and letters to the editor show that both Long and McNeill, as well as many other well-known railroad personalities, subscribed to the ARJ. For more on the Journal, see Alfred D. Chandler, Jr., Henry Varnum Poor: Business Editor, Analyst, and Reformer (Cambridge, Mass.: Harvard University Press, 1956). Poor was editor of the ARJ for years.

1836 - 1864, Boston & Albany Manuscript Collection, Archives and Manuscripts Department, Baker Library, Harvard University, Cambridge, Massachusetts.

6 See, for example, John Childe to Abbot Lawrence, October 14, 1835, and Abbot Lawrence to George Bond, December 22, 1835, both in Western Railroad Corporation, "Clerk's Files, 1836-1864." These files contain reports numbered serially, although these letters are filed between reports no. 7 and 8. Also see James Stevens to Wales, January 22, 1836, in Western Railroad Corporation, "Letterbook, 1836-1838," p. 3.


8 Wales to McNeill, January 18, 1836, in WRR, Letterbook, 1836-1838, pp. 2-3.

9 In 1836 McNeill was nearing the end of an extraordinary military career. Although he remained an active officer in the U. S. Army Corps of Topographical Engineers, he spent little time on military affairs for more than a decade. The following is a summary of the last ten years of his military career:

<table>
<thead>
<tr>
<th>Project</th>
<th>Dates</th>
</tr>
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<tbody>
<tr>
<td>B&amp;O</td>
<td>1827-1830</td>
</tr>
<tr>
<td>Baltimore &amp; Susquehanna survey</td>
<td>1830</td>
</tr>
<tr>
<td>Chief Engineer, B&amp;S RR</td>
<td>1830-1836</td>
</tr>
<tr>
<td>Patterson &amp; Hudson survey</td>
<td>1831</td>
</tr>
<tr>
<td>Chief Engineer, P&amp;H</td>
<td>1831-1834</td>
</tr>
<tr>
<td>Boston &amp; Providence survey</td>
<td>1832-1833</td>
</tr>
<tr>
<td>Chief Engineer, B&amp;P RR</td>
<td>1832-1835</td>
</tr>
<tr>
<td>Providence &amp; Stonington survey</td>
<td>1832-1833</td>
</tr>
<tr>
<td>Chief Engineer, P&amp;S RR</td>
<td>1832-1837</td>
</tr>
<tr>
<td>Florida and Alabama railroad surveys</td>
<td>1834</td>
</tr>
<tr>
<td>Taunton &amp; New Bedford survey</td>
<td>1835</td>
</tr>
<tr>
<td>Chief Engineer, T&amp;NB RR</td>
<td>1835</td>
</tr>
<tr>
<td>Long Island Railroad survey</td>
<td>1835-1836</td>
</tr>
<tr>
<td>Chief Engineer, LI RR</td>
<td>1835-1836</td>
</tr>
<tr>
<td>Western Railroad survey</td>
<td>1836-1837</td>
</tr>
<tr>
<td>Consulting engineer, WRR</td>
<td>1836-1840</td>
</tr>
</tbody>
</table>

McNeill resigned his commission in 1837. He then served as
a consulting engineer for numerous railroad projects until his sudden death in 1853, age 51. His major projects, 1837-1853 include:

<table>
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<tr>
<th>Project</th>
<th>Dates</th>
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<tbody>
<tr>
<td>Chief Engineer, State of Georgia</td>
<td>1837</td>
</tr>
<tr>
<td>Chief Engineer, proposed Charleston,</td>
<td>1837-1840</td>
</tr>
<tr>
<td>Louisville &amp; Cincinnati RR</td>
<td></td>
</tr>
<tr>
<td>President, Chesapeake &amp; Ohio Canal</td>
<td>1842-1845</td>
</tr>
<tr>
<td>Chief Engineer, Brooklyn Navy Yard</td>
<td>1844-1845</td>
</tr>
</tbody>
</table>

Given McNeill's performance on the B&O and the Western, it is likely that he tried to apply military management and accounting techniques to at least some of these projects as well. He played a major role in transferring the techniques of modern management to a variety of enterprises. To the best of my knowledge, no one has yet undertaken a serious study of his life and career. See "McNeill, William Gibbs," Dictionary of American Biography, Vol. XII, pp. 152-153. Also see Cullum, Biographical Register, Vol. I, pp. 161-166. Cullum's assessment of McNeill is worth quoting at length:

General McNeill . . . was devoted to his work; had a quick topographical eye for reconnaissance; and, almost at a glance, could survey the adaptability of ground to practicable purposes. But, having no constructive capacity whatever, he relied entirely upon his intelligent assistants for all the details, accessories, and machinery for railroad building. . . . His tact and skill in managing men; his faculty of appropriating other's talents and labors, making them appear his own; his invisible and subtle influence in magnetizing and managing boards of directors, were most wonderful. This he considered the masterly engineer of the boldest projects, -to play lord paramount while stockholders subscribed shares, and his professional assistants, of far superior engineering attainments, carried out his magnificent schemes in obedience to his imperious edicts, the results of which were presented to the world in a manly, powerful style, with a masterly grasp of the whole subject involved. Altogether, McNeill was a remarkable man, and the country owes him a debt of gratitude for his agency in the initiation of our grand system of internal improvements.

10WRR, BD MB, 1836-1841, pp. 15-16.

11Wales To McNeill, February 3, 1836, in WRR, Letterbook, 1836-1858, p. 5.
12 McNeill to Wales, February 5, 1836, in WRR Clerk's Files, File 26.

13 McNeill to Wales, February 29, 1836, in WRR Clerk's Files, File 26.

14 All the quotes are from Jackson's report, printed in WRR, BD MB, 1836-1841, pp. 18-19. This report is also WRR Clerk's Files, File 24.


16 WRR, BD MB, 1836-1841, pp. 22-31. Much of the correspondence and the final contracts are in WRR, Clerk's Files, File 29.

17 WRR, BD MB, 1836-1841, p. 50; Western Railroad Corporation, Second Annual Report of the Directors of the Western Railroad Corporation (Boston: Dutton & Wentworth, 1837), p. 3. The retention of Whistler placed control of the Western's Engineer Department in the hands of a military clique that may have been America's first railroad family. McNeill, Swift, and Whistler were all Military Academy graduates, McNeill Class of 1817, Whistler and Swift Class of 1819. They were also brothers-in-law through Whistler's marriages to Mary Swift and Anna McNeill. The Whistler-McNeill union produced several offspring, including William Gibbs McNeill Whistler and the noted American artist James Abbot McNeill Whistler, who immortalized his mother in "Arrange in Grey and Black, No. 1: The Artist's Mother."

18 Bliss, Historical Memoir, pp. 34-36; Wales to Bliss, May 3, 1836 and Wales to Swift, May 16, 1836, both in WRR, Letterbook, 1836-1838, p. 32; WRR BD MB, 1836-1841, p. 104.


20 Bliss, Historical Memoir, p. 38.

21 Wales to Swift, July 8, 1836; Swift to Wales, July 11, 1836; Wales to Swift, July 12, 1836, all in WRR Letterbook, 1836-1841, pp. 43-44, 46-47.

22 WRR, 1 AR, 1836, p. 23.

23 Ibid., p. 11.
24 Swift to Wales, May 30, 1836, in WRR Letterbook, 1836-1838, p. 34.

25 See, for example, Swift to Wales, May 30, 1836; Wales to Josiah Quincy [Corporate Treasurer], June 21, 1836, in WRR Letterbook, 1836-1838, pp. 35-36.

26 WRR BD MB, 1836-1841, pp. 77-79.

27 Ibid., pp. 80-81.

28 Ibid., pp. 117-118; WRR, 4 AR, 1839, pp. 24-32.


30 U. S. War Department, General Regulations for the Army; or, Military Institutes, Revised by Major General Winfield Scott (Washington: Davis & Force, 1825), Article 71, Pay Department, p. 286.


graduates became presidents of railroads and other corporations; 48 became chief engineers; 41 became superintendents, 7 became treasurers, and 155 became civil engineers. It would be difficult to trace the managerial career of each of these 286 graduates, but if the careers of the handful of officers examined so far is any indication, the potential impact could be extremely significant.


36 WRR BD MB, 1836-1841, p. 151; WRR 4 AR, 1839, p. 6. In the Annual Report the board noted that much remained to be done "before the road can be efficiently opened for public use." Compare this attitude to that expressed in the New York & Erie's Annual Report for 1853, which said in effect "now that we've built it it's time to think about running it."

37 Bliss, Historical Memoir, p. 90.

38 WRR, BD MB, 1836-1841, pp. 154-156, referring to "Report of a Committee on Running the Road," No. 21, June 12, 1839. Also see WRR, Transportation Department Regulations, 1840; the quote is from p. 12, referring specifically to engine men.


41 Bliss, Historical Memoir, p. 90.


43 Ibid., pp. 2-3.

44 Ibid., p. 1.


46 WRR, Clerk's Files, Nos. 74 and 79, 1842.


48 Ibid., pp. 144-146.


CHAPTER FIVE

Herman Haupt and the Pennsylvania Railroad, 1847 - 1852

The Pennsylvania Railroad was the last of the early major railroads to benefit from the technical or managerial assistance of the United States Army before the Civil War. In this case Herman Haupt, a West Point graduate who managed to avoid further military service entirely, played an active role in the operational management of the Pennsylvania Railroad. As a trusted ally of J. Edgar Thomson and as Superintendent of Transportation and later General Superintendent, Haupt assisted in the formulation of what was for a time the nation's most complex and highly developed management system. He was also involved in a bitter battle to defend the perogatives of experienced, professional railroad managers against the machinations of a group of Pennsylvania Railroad directors who tried to assume operational control of the railroad. Haupt and Thomson routed the directors in what was the last stand of the 'old order' in railroad management. In the process they helped to complete a revolution in American
management philosophy and practice.

* * * * *

The early history of the Pennsylvania Railroad follows a familiar pattern. The city of Philadelphia lost its position of commercial predominance after the completion of the Erie Canal, and Baltimore's decision to build its railroad threatened to further damage the city's trade. The state of Pennsylvania responded in the late 1820's by constructing an ambitious canal/railroad system from Philadelphia to Pittsburgh across more rugged terrain than either of its rivals faced. The state's "Main Line of Public Works" linked Pennsylvania's two main commercial terminals, with feeder lines serving other manufacturing and marketing centers. Construction began in 1828, and the system was essentially completed in 1834. The Main Line was divided into four segments. From the west, a 104-mile canal followed the Allegheny and Connemaugh rivers to Johnstown, the western terminus of the Allegheny Portage Railroad, a thirty-six mile system of inclined planes that traversed the summit of the Allegheny Mountains. At Hollidaysburg, the eastern end of the portage, the railroad met a 172-mile canal that flowed to Harrisburg and ultimately to Columbia on the Susquehanna River. The Philadelphia, Lancaster, and Columbia Railroad
carried passengers and produce the last eighty-two miles to Philadelphia. A complete transit of the 394-mile route took about four days.

Although the state spent several million dollars on its "Main Line," few of its users were completely satisfied with it. The system represented a major technical and engineering accomplishment, but it had serious faults. The canals were obviously a weak point. Constructed while a canal mania was sweeping the country, they were no more reliable than their counterparts elsewhere. They froze in the winter, flooded in the spring, and ran dry in the summer. The need to transfer goods from canal boat to rail car twice between Pittsburgh and Philadelphia proved time-consuming and expensive. The Main Line served well enough when it did not have to face more efficient competition, but few believed it to be the final solution to the state's commercial and transportation difficulties.

The threat of railroads to the north and south in the 1840's forced Pennsylvanians to deal with the inherent limitations of the State Works. In New York, local groups were in the process of building the lines parallel to the Erie Canal that Cornelius Vanderbilt would consolidate into the New York Central system in 1853. Other investors were in the process of organizing the New York & Erie Railroad to serve the southern tier counties of New York state as well as parts of northern Pennsylvania. These lines
posed no immediate threat to Philadelphia's commercial prosperity, but a far more pressing danger loomed from the south. In 1834 the B&O reached Harpers Ferry, Virginia. By 1842 its line ran to Cumberland, Maryland and it was preparing to build a line north to Pittsburgh. Some years before the state of Pennsylvania had granted the B&O a right-of-way for this line, but these rights would expire in February, 1847. In 1846 the B&O asked for an extension of the time it had to build its line.

The merchants of Philadelphia now decided they had to act. If the B&O tapped the Ohio River trade at Pittsburgh it could destroy Philadelphia's commerce with western Pennsylvania and the Ohio Valley. Philadelphia interests therefore proposed to build a railroad from Harrisburg to Pittsburgh. In the spring of 1846 partisans of both the B&O and the Philadelphia proposals swarmed into the state capital at Harrisburg to lobby for their project. The legislature was fairly evenly divided on the issue and in fact it eventually granted both sides what they wanted. On April 13, 1846 the legislature incorporated the Pennsylvania Railroad Company. It granted the B&O its extension on April 21. However, a small majority in the legislature favored the Pennsylvania, and it managed to add a rider to the B&O bill that gave the Pennsylvania until June 30, 1847 to raise one million dollars and to place thirty miles of its line under contract. If the
Pennsylvania met these conditions, the amendment provided that the governor would revoke the B&O's rights.

The organizers of the Pennsylvania Railroad acted quickly to secure their charter. Stock sales began on June 22, 1846 in Philadelphia and other Pennsylvania cities. By July 3 the railroad had raised about $850,000. When sales subsequently lagged, Philadelphians brought pressure on the city government to buy a large block of railroad stock. After a municipal election secured a pro-railroad majority on the city council, the city agreed to purchase 30,000 shares at $50 par when the railroad sold the same number of shares to other subscribers. After a massive door-to-door subscription drive in Philadelphia brought public sales to 30,750 shares, the city purchased its block. The city made a down-payment of $500,000 for its shares, subscribers contributed a similar amount, and on February 25, 1847 the governor of Pennsylvania issued a charter to the Pennsylvania Railroad Company. The stockholders met for the first time on March 30 and elected a board of directors, which in turn elected Samuel V. Merrick president of the company when it met the next day.¹

The board had much to do in the next three months if it was to successfully block the B&O's progress into Pennsylvania. Between April 1 and April 7 the board discussed the organization of its "Engineer Corps." On April 9, 1847 it elected J. Edgar Thomson "Chief Engineer of the
Pennsylvania Railroad Company." At the same meeting the board approved an organizational plan for its engineer department. The plan called for the election of two associate engineers, so the board elected Edward Miller and Thomas B. Foster to those positions. Thomson agreed to accept the appointment on April 21, but only after the board amended the engineer regulations to reflect his demand that Miller and Foster be made responsible to him, not the board. Thomson arrived to begin work soon after, although Miller and Foster had been on the job for some time.2

Using surveys made earlier for other projects, Thomson and his assistants laid out a line from Harrisburg to Lewistown through the Juniata Valley and signed contracts for the work. They also located a route from Pittsburgh eastward for some fifteen miles and let contracts for grading this section. With these contracts the Pennsylvania met the conditions set down in the amendment to the B&O act of July 21, 1846, and on August 2, 1847 the governor declared null and void the law that gave the B&O its right-of-way in Pennsylvania.3

In John Edgar Thomson the directors of the Pennsylvania Railroad secured the services of one of America's pre-eminent civilian railroad engineers, easily the equal of McNeill from a technical standpoint and probably his superior as an administrator, although one must remember
that Thomson was beginning his managerial career as McNeill's was ending. Thomson benefitted greatly from McNeill's experiences and used administrative procedures developed by McNeill and others as a basis for his own contributions to management developments. He was a native Pennsylvanian who had little formal education but who learned engineering from his father. After working on the Philadelphia & Columbia surveys and on a similar project in New Jersey, he travelled to England to study railroading and continental civil and mechanical engineering practice. He returned to the United States in 1832 and accepted an appointment as chief engineer of the Georgia Railroad.\(^4\)

Thomson worked for the Georgia Railroad for fifteen years, leaving in 1847 to accept the position on the Pennsylvania. He initially supervised the construction of the Georgia's line from Augusta to Atlanta, but when the railroad's first choice as superintendent proved unsatisfactory, the Board of Directors ordered Thomson "to organize the Departments requisite for conducting the business of the Road in use, and to appoint all officers, and fix their rate of compensation."\(^5\) Thomson, who followed progress on the B&O and other railroads closely, erected a management structure that resembled those evolving on the B&O and the Western.\(^6\)

Thomson refined his administrative procedures according to the dictates of operational experience until, by
1844, he was able to report that defects in the general system of railroad management were "gradually undergoing a cure, and we are now able to present it in its true character, a good and improving [emphasis in original] investment of capital." He also installed a complicated system of reports, following standard and widely-accepted railroad practice, and found that as a result he could "with tolerable accuracy . . . determine the cost of railroad operations," a subject previously "veiled in obscurity."\(^7\)

Thomson's associate engineers on the Pennsylvania were also experienced engineers and one, Edward Miller, had extensive railroad experience. Miller suggested to the board that they devise a formal system of financial accountability. He advocated a system where the associates would pass their requisitions to the chief engineer, who would periodically draw funds from the company president. The chief engineer would then render quarterly "a clear and detailed account" of his expenditures. Miller volunteered to have "the printed blanks prepared in accordance with your views."\(^8\)

The board's exact reply to Miller's suggestion is not known, but Thomson did eventually adopt a system of accountability similar to the one Miller proposed. The board needed the information these accounts provided because the railroad's charter directed that the president and the directors provide the stockholders a detailed report of the railroad's operations and financial position. The company
also needed to maintain accurate records so that it could pay the tolls the state collected for allowing the Pennsylvania to use the State Works, although this was not of immediate concern. As the stockholders and the state became more demanding in their requests for information, the railroad kept ever more accurate records of its transactions. In the early days, however, the board was content to receive monthly reports and estimates from the engineers and to examine the contracts they made.\textsuperscript{10}

Although the organizational process continued smoothly, Thomson soon ran into an unexpected problem. The associate engineer in charge of the eastern division, William B. Foster, "a man of intelligence, amiability and good judgment," was a canal engineer who lacked experience in railroad location and construction. He hired many of his former canal assistants, who also knew little about railroad work. When Thomson inspected the route they laid out, he decided that sixty miles would have to be re-surveyed before construction could begin. Thomson chose not to replace Foster, but he did decide to hire a more experienced railroad engineer for the extra surveys. On January 12, 1848 the board approved Thomson's nomination of Herman Haupt as his "Principal Assistant," a position not formally authorized in the engineer department organization.\textsuperscript{11}

Haupt graduated from the United States Military Academy in 1835 and was commissioned a brevet second lieutenant
in the 3rd Infantry. At the time, West Point graduates were expected to serve five years, including their four years at the Academy. Due to a clerical error Haupt's appointment was signed and dated one year before he entered West Point, so upon graduation he had officially served his five years. Haupt took immediate advantage of the error: he resigned from the army three months after graduation. Haupt became a railroad engineer and worked on several railroad surveys in Pennsylvania and Maryland. He became interested in the theory of bridge construction and wrote a number of well-received books and pamphlets on the subject. From 1844 to 1847 Haupt taught engineering at Pennsylvania College at Gettysburg. While at Pennsylvania College, he became acquainted with Thomson and several other engineers attached to the Pennsylvania. They advised him to seek employment on the railroad.12

In 1846 Haupt visited company president Merrick, who told him that "engineers were as plenty [sic.] as blueberries" and that he had dozens of applications for each position. Merrick refused to offer Haupt a job, so a disappointed Haupt returned to Gettysburg.13 Thomson then discovered the errors that Foster and his assistants made in locating their portion of the line. One of the assistants, Samuel Mifflin, suggested that Thomson hire Haupt. Mifflin and Foster both wrote to Haupt advising him to contact Thomson about the job. Haupt travelled to Harrisburg to see Thomson,
whom he found "taciturn and non-committal in everything." They could not reach an agreement at the meeting, so Haupt returned home. Mifflin then pressed Haupt to take the job: "Don't be a fool. Take the job and ask no questions. I know Thomson intimately. He is a queer fish, but he is in a tight place with that location. You can help him and . . . he will not be ungrateful."14

Haupt accepted the job as Thomson's assistant. Thomson immediately assigned him to Foster's division. Haupt began his surveys in mid-December, some weeks before the board officially approved his employment, and completed his work in about three weeks. Thomson was pleased with Haupt's work and began planning a new assignment for his assistant.15

As work on the first division of the Pennsylvania continued, Thomson decided that it was time to study the general progress of railroad management. Since it would soon be time to organize the operational branches of the Pennsylvania Railroad, Thomson wanted to gather as much information as he could on railroad management practices on other lines. In February, 1849 Thomson sent Haupt on a tour of New York and New England railroads with instructions to "examine their Stations, Depots, Shops, Roads, in fact everything connected with their business operations." Haupt visited the New York & Erie, the Western, and several other railroads. He then prepared a plan of organization and
management for the Pennsylvania Railroad, complete "with forms and blanks for every branch of the business."

When Haupt submitted his "Report on General Systems and Policy for the Pennsylvania Railroad" to Thomson, Thomson reportedly waved it away, saying to Haupt "You don't expect me to go over all those papers do you? I think we have discussed them sufficiently; send them to the board." On March 7, 1849, Thomson officially submitted Haupt's plan for the organization of the railroad to the Board of Directors, which in turn referred the report to a special committee for consideration.

Haupt's organizational plan divided responsibility for the operation of the road among four departments -- transportation, maintenance of way, motive power, and maintenance of cars -- under the immediate supervision of the superintendent of transportation. It also laid out a system of "Accounts of the General Office" modelled after the system in use on the Georgia Railroad (Thomson's old line). The accounting system demanded daily, weekly, and monthly reports from the conductors and station agents. The General Transportation Office [in Harrisburg] examined these accounts, but handled no money; "its business consists in regulating all the other offices on the line, and in securing accuracy and uniformity in their accounts. The General Office also kept records of receipts, disbursements, purchases, consumption of stores, performance of engines, "and all other
operations connected with the business of the road." 19

Haupt and Thomson combined to create a managerial structure that was virtually unique in the American business community, a system that went a step beyond procedures then in use on other railroads. They recognized that the Pennsylvania's business would be so voluminous and so complex that it would be beyond the effective control of managers using more traditional administrative procedures. Their response was to divide responsibility: officers on the line would direct the day-to-day operations of the railroad, while another group of corporate officials would concentrate "on the broader problems of cost determination, competitive rate making, and strategic expansion, rather than on more routine operating activities." 20 Haupt's General Transportation Office would house the Pennsylvania's staff officers, a group with few antecedents in American business practice. There was, of course, at least one organization that had long since found that the division of management functions between line and staff officers yielded improved efficiency and greater economy in its operations. Haupt's 1849 plan introduced to the railroad a notion that John C. Calhoun had applied to the army about thirty years previously.

It would take some time before Haupt and Thomson could put their management ideas into full operation. After more than two months of deliberation, the committee empanelled to consider Haupt's plan returned a favorable report on
May 30, 1849. On June 8, 1849, the Board of Directors accepted the committee's report and amendments and adopted the Haupt plan. At the same meeting, the board acted to fill some of the new positions the plan created. To that end, the board voted "That for the present the duties of the General Superintendent shall be committed to the Chief Engineer" [Thomson], and they directed him to prepare additional rules and regulations for his new office not specified in the general plan of organization they had already adopted. 21

The Harrisburg-Lewistown division of the Pennsylvania Railroad opened on September 1, 1849. On the same day, William C. Patterson succeeded Samuel V. Merrick as president of the Pennsylvania Railroad. On September 5, the directors approved Thomson's nomination of Herman Haupt to fill the newly-created position of Superintendent of Transportation at a salary of $2,000 per year. 22

In 1849, the Board of Directors approved a plan of organization that, it seems, few of them fully understood. They vested operational control of their railroad in the hands of General Superintendent/Chief Engineer Thomson and Superintendent of Transportation Haupt. In so doing, they had delegated one of the traditional functions of the owner/manager to subordinates. The Board of Directors still had very important strategic functions to fulfill, but in 1849 it could do little more than sit back and watch others run the
railroad because it had already made many of the key decisions allowed them under the new system. The directors could only wait until the line and lower-level staff officers began forwarding their reports, information that, in any event, passed through at least Haupt's hands first. Perhaps without fully realizing it, the board placed the operational control of their railroad in the hands of professional managers who, as they gained expertise, became more and more reluctant to accept advice from the "amateurs" on the Board of Directors. As Thomson and Haupt perceived the situation, they had their jobs to do, and the board had its job. Unfortunately, a number of directors refused to accept this situation and opted to try to reassert the right of the Board of Directors and especially the company president to direct the operation of their company.

The battle for control of the Pennsylvania began toward the end of 1850. The board watched the company's business develop throughout 1850 and made little move to challenge either Haupt or Thomson. However, by late October the directors felt they had occasion to question the activities of their subordinates. From an operational standpoint, the Pennsylvania experienced many minor problems during its first year of operation. Although it avoided the disastrous accidents that plagued the Western when the Massachusetts railroad opened, the Pennsylvania's trains frequently ran late and baggage and freight got lost or left behind. The
board soon noted that the travelling public and shippers manifested a great dissatisfaction with the management of the railroad. It requested that Thomson (based in Harrisburg) report to Philadelphia (the corporate headquarters) for consultations. Thomson chose to respond to the board's complaints in a letter. He wrote that he was aware of the public dissatisfaction and blamed it on "the false start given the transportation department." He noted that the workers were largely inexperienced but that they were learning their jobs, although he singled out an unfortunate Mr. Henderson, whom he characterized as a man who was "far too excitable for his post and [who] makes a lot of blunders." for special censure. The general superintendent promised that time would solve the problems.²³

Thomson attended the board meeting on October 30 when the secretary read his reply. Despite his optimism, the Board of Directors remained unconvinced that time would solve the problems. Under pressure from Patterson and Merrick, the directors became convinced that the real source of the trouble lay in the management system they adopted a year earlier. At the October 30 meeting, the board directed that a four-man committee (composed of the president, the chief engineer, and two directors) visit the B&O, the New York & Erie, and "such lines of Rail Road in the New England States as they may select" to examine "the system adopted in regard to the management and running of their passenger and
freight trains of cars and any other matter connected with railroad management."²⁴

It is inconceivable that the board did not know about Haupt's 1849 trip to the same area for the same purpose. Perhaps the board distrusted Haupt's preference for the methods of Thomson's Georgia Railroad and wanted to examine other railroad's operating procedures themselves. Whatever reasons lay behind its decision, the board openly expressed its dissatisfaction with the Thomson/Haupt management system and regime, although it carefully refrained from criticizing either individual directly. The board did question Thomson about Haupt's qualifications. Thomson defended his subordinate, stating that he considered Haupt "extremely competent in every way to fill the situation of Superintendent of Transportation," but Thomson also admitted that Haupt had learned all he knew about the railroad business in the service of the Pennsylvania, since he had no previous railroad management experience.²⁵

Thomson could see trouble brewing and decided to remove himself from the impending struggle. On December 18, 1850, Thomson informed Patterson that he was resigning from the general superintendency at the end of the year, but he retained his position as chief engineer. The board accepted his resignation on January 8, 1851. Even though Thomson was no longer directly involved in the growing debate over management procedures and methods, he spared no effort to ensure
that an advocate of his management methods assumed a position of responsibility in the management hierarchy. His "second" was his trusted assistant, Herman Haupt. After the board accepted Thomson's resignation, it elected Haupt general superintendent.26

Haupt's accession to the position of general superintendent marked the beginning of a year-long struggle for operational control of the Pennsylvania Railroad. The battle raged not between contending financial interests, but between the railroad's operational supervisors and the Board of Directors, the issue being largely one of which of two contending managerial philosophies would shape the railroad's organizational and operational procedures. Haupt and Thomson stood for professional management. Their plan placed operational control of the railroad firmly in the hands of a few key staff officers who based their operational decisions on information provided by line and subordinate staff officers. The Board of Directors made financial and general policy decisions but had little to do with the actual operation of the road. The board could ratify these decisions, or reject them if it saw fit, but neither the president nor the board was expected to try to make detailed operational decisions or try to tell the line and staff officers how to do their jobs. Haupt and Thomson believed that the railroad business was too complex to trust its direction to part-time managers on the board.
Merrick, Patterson, and a shifting minority of two or three other directors felt differently. The members of the board tended to be merchants, manufacturers, or bankers who were used to playing an active role in the detailed operational management of their companies. The minority was unwilling to accept the notion that the Pennsylvania was significantly different than their businesses. They wanted to have a direct say in the railroad's operation, or at least in the decisions that determined these operations. They recognized that the railroad needed full-time executives, but they saw no reason why they should allow these officers to exercise the power Thomson and Haupt claimed.

This difference of opinion broke into open conflict because Haupt could count on putting together a coalition of directors who were prepared to support him against Patterson and Merrick. Haupt knew that the board was divided when he accepted the superintendency, and this knowledge undoubtedly encouraged him to resist his organizational enemies when they tried to assume some of what he believed to be his professional perogatives.

Haupt was also very much Thomson's man and perhaps his mouthpiece before the Board of Directors. There is no evidence to suggest that Thomson originally hired Haupt for use as a pawn in some plan to advance his own claim to a higher position. When the opportunity presented itself, however, the two found themselves working closely together
in pursuit of a goal that they both believed in. Thomson and Haupt were kindred spirits when it came to questions of managerial philosophy. Both he and Haupt shared a belief in bureaucratic procedures -- centralized control, delegated authority, carefully defined lines of communication, rational, standardized operating methods applied to all branches of the organization, definite responsibility and accountability -- and in the ability of these procedures to solve the specific problems of railroad management.

Thomson learned this through experience and by carefully studying what other railroad managers learned elsewhere. He followed Knight's pioneering efforts in the 1830's and watched Knight apply some of the administrative techniques the B&O solicited from the United States Army. Standardized reports allowed Knight to establish primitive systems of cost control and accounting. A chain of command facilitated control of construction and transportation activities. Thomson also watched as the Western applied some of these same procedures to the more detailed problems of railroad operations. The managerial system he created for the Georgia Railroad owed much to the military procedures first applied on other lines. This information was readily available. Thomson followed managerial progress on other railroads closely.27

West Point trained Haupt to accept bureaucratic values. The professional values that the Military Academy
tried to teach its graduates reinforced the lessons Haupt applied from his engineering training. Since an engineer was trained to approach technical or managerial problems in a rational, analytical way, the military's bureaucratic, hierarchical system would appeal to an officer who served as an engineer or manager outside the military environment. Haupt's education and his way of looking at professional problems were part of the army's contribution to railroad management development on the Pennsylvania. In this respect, Haupt was typical of dozens of former officers who served other less noteworthy railroads. They applied the same values when they responded to management crises. This potentially makes the pattern of military influence even more significant and pervasive.

But the army did more than just supply Haupt with a hierarchical, authoritarian mind-set and a willingness to accept bureaucratic values. What made Haupt so particularly valuable to Thomson on the Pennsylvania during this transitional period was another product of Haupt's military education and experience. Haupt was psychologically predisposed to react aggressively when someone who did not share his beliefs attacked what he felt were well-founded values. The same feelings that drove Long and McNeill to challenge their superiors on the B&O compelled Haupt to react in the same way some twenty years later.
The Merrick-Patterson faction moved to reassert the board's operational control soon after Haupt replaced Thomson as General Superintendent. On February 13, 1851, Patterson ordered Haupt to cease his official communications with the Pennsylvania Board of Canal Commissioners. The Canal Commissioners controlled the State works, which the Pennsylvania used to connect its system with Philadelphia and other points. During Thomson's tenure as superintendent, he negotiated rates with the commissioners. Patterson now told Haupt that the company president would conduct these negotiations. On February 15, Haupt informed Patterson that his own view of his professional duties prevented him from complying with Patterson's directive "unless it is the wish of the Board that I should do so." Haupt was in Harrisburg, near the offices of the Canal Commissioners, and he doubted that Patterson, in Philadelphia, could negotiate effectively. The order also violated Haupt's "views of propriety in regard to the relative positions and duties of the officers of the Company."29

The last point was the key to this first clash between Haupt and the Board of Directors. Thomson previously told Haupt to continue the negotiations with the commissioners, and Haupt had no reason to believe that his duties and responsibilities would be any different than his predecessor's. Haupt also based his resistance on the supposition that since the president, the general superintendent, and
chief engineer were all elected by the board they were not accountable to each other but to the board, "the source from which their powers emanated."\textsuperscript{30} Haupt claimed that the duties of the President were executive and financial; those of the Superintendent and Chief Engineer professional: that the former [i.e., the president] communicated the instructions of the Board, but was not authorized to direct on his own responsibility the heads of other executive departments in reference to their professional duties. I considered my department separate from that of the President, and myself responsible to the Board for my official acts;\textsuperscript{31}

Although Haupt could cite strong legal support for his position from the corporate by-laws,\textsuperscript{32} the Board of Directors refused to accept his argument and on February 19, 1851, on a motion by Merrick, unanimously voted to inform Haupt that it expected "from him a compliance with the instructions of the President."\textsuperscript{33}

Patterson forwarded a copy of the resolution to Haupt on February 22 with a letter that was sure (if not, in light of the circumstances, calculated) to anger Haupt:

> Whilst I cannot permit a subordinate to question the authority under which I act, I deem it sufficient for the present to refer you to the resolution on this subject, adopted by the Board at their last meeting, in the hope that a better understanding on your part of the duties and responsibilities of your office will preclude the necessity of further action on theirs.\textsuperscript{34}

Haupt told Patterson that he found his language "deeply wounding," although he accepted the decision to, in his view, reduce the grade of superintendent to that of a
subordinate to the president. Haupt cited precedents set on the Pennsylvania and on other railroads to justify his stand. He accepted Patterson's right to "request" him to do something, but he refused to acknowledge the president's right to command him to act. He offered to resign, but the board ignored his offer.  

The promulgation of a new set of railroad regulations precipitated another clash between Thomson and the Patterson-Merrick faction. The board worked sporadically on these regulations since its meeting of October 30, 1850, though there is no record that the Maryland, New York, and New England railroad tour occurred. The directors apparently prepared the plan without consulting either Haupt or Thomson, hardly an auspicious decision. When Haupt saw a draft of the plan, he felt that it was "inapplicable to the business of the road" and the work of "one who had no idea of its practical operation." Haupt noted his objections and the board modified the plan, in Haupt's view "correcting the mistakes of the first, but introducing others not much less objectionable." Haupt later met with the committee preparing the regulations and offered further suggestions, which the secretary pencilled in on the draft. On May 2, 1851 the board met in special (and, it appears, secret) session to consider the new plan. After making some minor alterations, it approved the regulations. Haupt's revisions did not appear in the final draft.
After the February clash, Haupt and Thomson suspected that the board would act to assert the right of the company president to supervise, if not directly control, the engineer and transportation departments. This is essentially what the new regulations did. They organized the road into two departments. The "First Department," under the general superintendent, controlled all construction, transportation, and maintenance activities. The "Second Department," under the company treasurer, had charge of all financial matters. As this organization suggests, the general superintendent exercised tremendous authority over the operations of the company. Haupt did not object to this. The board even saw fit to retain at least the basic elements of the staff system Haupt and Thomson created in 1849. There were, however, two provisions of the regulations that Haupt and Thomson found especially onerous. 37

The first concerned the estimates and accounts the superintendent was expected to furnish monthly. The board wanted its transportation accounts settled monthly, and the superintendent had to report on the results before the end of the calendar month. The board also demanded detailed estimates of all expenditures one month in advance. Furthermore, the superintendent was not authorized to exceed the amount the board appropriated without a specific, case-by-case authorization from the president. Haupt doubted that he could prepare such detailed estimates and accounts without
neglecting his other duties, but he did attempt to follow these provisions. 38 What especially galled Haupt and Thomson was a provision that dealt with the powers of the president: "All Regulations, Instructions, and other actions of the Board shall emanate from the President as its Organ and in the absence of such action the acts of the President shall be regarded as duly authorized." 39

Haupt immediately tried to convince the board that its new regulations were impractical. He repeatedly stated his belief that "the instrument had been prepared by one who was ignorant of the practical operation of a Railroad;" that "some of its provisions resulted from an imperfect knowledge of the business of our own road and the usages upon others, and could not practically be carried into effect;" and that "it was an instrument the perusal of which by any railway superintendent would convince him that its author could not have foreseen its practical operations." 40 To more fully substantiate his complaints, he sent copies of the new regulations to other railroad superintendents for their comments. This correspondence included a lengthy exchange with Daniel Parker, General Superintendent of the B&O, whom Patterson reportedly consulted as the board worked on its regulations. 41

Parker told Haupt that although the estimates were standard procedure, the B&O did not require such detail. Parker, responding to a series of questions from Haupt, then proceeded to criticize virtually every provision of the board's
newly-installed accounting system. The estimates could serve no purpose "unless it be to keep the heads of the officers who make them up clear." Parker himself could "certainly not" prepare any monthly report before the end of the month and those monthly reports that he did submit were "only approximate, and hardly that." Indeed, Parker maintained that "a detailed and accurate statement of all the receipts and expenses . . . cannot be done for any road monthly."\(^{42}\)

Haupt felt that he had made his point regarding the impracticality of the new accounting system. However, the question of the president's powers remained. Haupt learned from his allies among the directors that the offending section was added in the face of strong opposition and after bitter debate. Patterson and Merrick convinced their colleagues that if the president abused his powers, he would still have to answer to the Board of Directors. Haupt called this view "a nullity." He saw no reason to credit the president with infallibility in railroad matters, especially since the more experienced professional officers of the company could rarely act without board or presidential sanction.\(^{43}\)

After registering his complaints, Haupt set out to comply with the new regulations, apparently convinced that he could best demonstrate their faults by following their provisions to the letter. Haupt submitted the required
reports, but the time he spent preparing them prevented him from giving proper attention to his other duties. Haupt's monthly reports were long, tedious, and detailed. The board heard his April reports on June 4, 1851, but board secretary Thomas Firth reported that the letters were "too long to report" in the minutes of the meeting. After receiving another set of Haupt's monthly reports, Patterson characterized Haupt as "a man whose communications to the board were a perfect diarrhea of words, with a constipation of ideas." The two sides jockeyed for advantage throughout the summer. In September 1851, the Patterson-Merrick faction decided to force the issue by attacking Haupt directly. The Board of Directors formed a committee (composed of Samuel V. Merrick, John Yarrow, and Alexander Derbyshire) to investigate charges of neglect of duty, disobedience of orders, and insubordination levelled against Haupt by Patterson. The committee recommended that Haupt be replaced, but decided to allow Haupt to defend himself before the Board of Directors. When he presented his defense in late October, Haupt demonstrated that the evidence Patterson presented to support his charges was fraudulent, based on altered transcriptions of his official correspondence. The Board of Directors vindicated Haupt, but nonetheless, they asked him to resign for the good of the company. Haupt agreed to stay on until the board could select his successor even though
Patterson and Merrick wanted him out immediately. A group of stockholders also requested that the board not fill the position until after the stockholders meeting scheduled for February, 1852. 46

News of the power struggle soon came to the attention of the stockholders and the public. On January 20, 1852, Haupt published a "reply ... to a letter from a large number of stockholders ... requesting information in reference to the management of the road," the first public account of the events of the last several months made by one of the participants. 47 Haupt took the opportunity to impress upon the stockholders his idea that "the interests of the road require that its management should be entrusted to the hands of gentlemen of professional skill and practical ability." Individuals, he noted, did not "intuitively" acquire a knowledge of the "science of railway management ... by the act of election to office." When they claimed they did "it is time for the stockholders to inquire if all is right." 48

As Haupt saw it,

The drudgery is to a great extent now over; the task of organization has been performed; the numerous parts which constitute the complicated mechanism of a railway system have been brought into harmonious action; a complete code of regulations, applicable to almost every possible contingency, has been established; subordinates, who entered the service of the Company without experience, are now competent and efficient officers; every wheel in the machine is now in place and in order. The work of the pioneer is now over. My successor will find the highway prepared for him; ... 49
In the meantime, "conspirators" put in motion a plan to force the issue at the stockholders meeting scheduled for February 2, 1852. Renegade board members met in Philadelphia to discuss the situation. They decided to present a reform ticket headed by J. Edgar Thomson. Christian Spangler and Haupt went to Harrisburg to secure Thomson's approval. Thomson was on a tour of the western division when the two arrived, so they arranged to meet in Lewistown. Thomson was at first reluctant to accept their proposition; he feared that if the effort failed, he would lose his job as chief engineer. Haupt and Spangler reassured Thomson that the Patterson-Merrick faction represented only the "silk-stocking aristocracy" and that the workers and the "solid businessmen" would support them. Thomson "yielded a reluctant assent to the use of his name" after an evening's pleading, "and a contest ensued which agitated the city of Philadelphia as much as a Presidential election."50

The reform group presented its slate of candidates, headed by J. Edgar Thomson, on January 27, 1852.51 The Patterson-Merrick faction responded with its own campaign circular on January 30, which claimed that the reform element wanted to destroy "the system of management which has not failed to succeed."52

On February 2, 1852, the stockholders voted their shares. The result was a complete victory for the reform
ticket. All seven of its candidates were elected handily. On February 3, 1852 the new board unanimously elected Thomson president of the Pennsylvania Railroad Company. On February 11, Haupt informed the directors that he would remain on the job as general superintendent until other arrangements could be made.53

Although the Haupt-Merrick battle had engrossed much of the board's time for the better part of a year, the 1851 Annual Report described the contest as being between Thomson and Patterson over the question of debt. Thomson thought the road should issue bonds to raise funds, while Patterson believed that the railroad should levy additional assessments against its stockholders or sell more stock to accomplish the same end. The report of a special committee created to investigate the issue, published after the election, attempted to soothe ruffled feelings and to downplay the devisive elements of the clashes. The debt question was moot since Thomson's election as president, and the committee refused to comment on the Haupt-Merrick affair. The committee chose instead to remind the stockholders that "the primary object of this work" was the "GREAT PUBLIC BENEFIT" [emphasis in original] which the road, "under practical management, must confer upon the State and the City."54

On September 8, 1852, the Board of Directors received a letter from Herman Haupt in which he announced his
to resign as general superintendent, effective November 1. Haupt's decision led to the formation of a special committee which, on October 27, issued an enthusiastic resolution praising Haupt and "expressing [the board's] entire approval of the faithful and enthusiastic manner in which he has performed the arduous and intricate duties of Superintendent." Haupt moved to Mississippi, where he became chief engineer of the Southern Railroad. Thomson replaced Haupt with Herman Lombaert and appointed Edward Miller to his old position as chief engineer. Thomson also acted to place his own stamp on the Pennsylvania's operational policies. On November 23, 1852, the Board of Directors adopted a report from the Road Committee that recommended some changes in the road's administrative, operational, and organizational procedures. The 1852 regulations, based largely on principles enunciated in Haupt's 1849 report, divided administrative duties among four departments -- construction, transportation, auditor, and treasurer -- all "under the general direction of the President, as the organ of the Board." Despite all the controversy of the preceding two or three years, the new regulations made the president the chief executive officer of the railroad. The chief engineer and the superintendent of transportation rendered their reports, estimates, and monthly accounts to him, and the president reserved the right to approve all contracts personally, although even he had to obtain full board sanction for major
purchases or construction projects. Subordinate agents assumed greater responsibility for their accounts, thereby saving the superintendent some work, but the superintendent was still ultimately responsible for the accuracy of the accounts and for the performance of his subordinates. The auditor's department examined all corporate accounts and assumed the duties of a legal department, while the treasurer actually received and disbursed corporate funds.57

It is perhaps rather surprising that the 1852 regulations bore such a striking resemblance to the board's regulations of May 2, 1852. It seems that the Board of Directors was working toward a viable solution to the railroad's managerial problems, but it neglected to consider the personal and professional sensibilities of skilled subordinates who were jealous of the board's assault on what they saw as their special professional perogatives. The key difference in 1852 was that with Thomson as president, potentially recalcitrant subordinates could be sure that their views would be heard by a professional engineer and railroader who was intimately well-acquainted with their problems. Thomson earned a measure of professional respect that Patterson and Merrick could never hope to enjoy. The "old order" was potentially competent to create useful new managerial forms in 1851, but on the Pennsylvania at least it proved unable to satisfactorily staff the organizational hierarchy it tried to create with officers who shared its view of their
duties and responsibilities. The subordinates it sought to control rebelled, and the "old order" lost its struggle to control the road to a rising group of professional engineer/managers which felt that it had both the technical and managerial skills needed to operate successfully an organization as complex as the Pennsylvania Railroad.

Haupt did not stay long in Mississippi. In the spring of 1853, Edward Miller resigned as chief engineer of the Pennsylvania Railroad. On April 20, 1853, Christian Spangler nominated Haupt to be Miller's successor. Haupt was the only candidate the board considered, and it elected him unanimously. He served in that capacity until 1856, when the Pennsylvania tied its eastern and western divisions together with the opening of a tunnel through the Allegheny Mountains, circumventing the Allegheny Portage. The city council of Philadelphia elected Haupt to the Board of Directors of the Pennsylvania Railroad, and he served as a director from March through December, 1856. Haupt then became involved with the Hoosac Tunnel in Massachusetts, where he ran afoul of Boston & Albany interests. From April 27, 1862 until September 14, 1863, he was chief of construction and transportation for the United States Military Railroads. After a long and distinguished career on many other projects, he died at the age of eighty-eight in 1905.58
Thomson served as president of the Pennsylvania Railroad from 1852 until his death in 1874, in which position he became far more personally powerful than Patterson or Merrick could ever have imagined. The board acquiesced as Thomson assumed almost dictatorial control of virtually all executive functions. He seems to have made most of the important decisions himself, using information supplied by officers of the transportation, accounting, treasury, and, after 1857, legal departments. He became so powerful that in 1874 the stockholders decided to investigate the management of their road. While offering no suggestion that Thomson was guilty of any personal improprieties, a special investigating committee decided that the Board of Directors had to reassert its right to control corporate operations.

The committee believed that the operations of the company had advanced to the point where it was impossible for one individual to handle the job. It suggested that Thomson, who died while the investigation was in progress, was not the problem, calling him a "mastermind -- a man of honest intentions and remarkable ability." The committee did, however, fear for the future. If present policies continued, the company, which in 1874 controlled approximately 8,000 miles of railroads and had a capital of $400,000,000, could fall into the hands of an "incompetent, dishonest, or speculative President -- which is by no means impossible." When Thomson died, the committee suggested
sweeping changes in the railroad's high-level administrative organization. Never again would a president of the Pennsylvania Railroad exercise the power Thomson held for more than twenty-two years.60

Herman Haupt played a significant role in Thomson's climb to power on the Pennsylvania. Thomson saw in Haupt the qualities -- intelligence, honesty, and loyalty -- that made him Thomson's most trusted ally when the two entered the struggle to impose their management methods on the line. But Haupt was no mere pawn in some grand power-play planned by Thomson. Haupt believed in the ideas Thomson espoused, and this belief served him well as the battle with the board became more bitter. Haupt fought long, hard, and ultimately successfully for concepts he believed in, even when he had little to gain and much to lose by siding with his mentor.

It is no accident that Thomson's protege was a Military Academy graduate. Even as late as the 1840's, there was no group as familiar with procedures and possibilities of modern bureaucratic management as the officer corps of the United States Army. Civilian managers recognized this fact and continued to turn to former officers for assistance. Haupt contributed little new to management techniques on the Pennsylvania, although the organization adopted in 1849 and again in a somewhat modified form in 1852, was largely his handiwork. He worked closely with civilian colleagues who shared his views, more like Swift and Whistler than Long and
McNeill. As Haupt himself said, the work of the pioneer was over. Some traditionally oriented businessmen remained to be convinced that the new management system was the most appropriate answer to the problems their firms faced. Haupt helped Thomson convince them.

Haupt's career on the Pennsylvania Railroad suggests a third pattern of military contributions to managerial development on the railroads. Haupt never specifically tried to explain his actions or his motives during this period by recalling his brief military career. However, his education and experience influenced his activities. As a trained engineer and military officer, Haupt viewed the managerial problems he faced through a particular intellectual prism. His response to these problems was based on the procedural and behavioral model he learned at West Point.

Long, McNeill, Swift, and Whistler acted according to roughly the same model. In their case, the answers they formulated by using this model are easier to describe because they were more unique at the time and had a more decisive and therefore more demonstrable impact on managerial developments. But the pattern suggested by Haupt's career might be the most significant of all in the long term. Most military officers who went on to later civilian careers as business executives never had the opportunity to make the dramatic contributions Long, McNeill, Whistler, Swift, and even Haupt made. They worked in relative obscurity, but if
they used the military model to solve administrative problems the same way the five officers did an extremely significant network of soldier/managers helped to shape the development of the business community into the twentieth century.⁶¹

* * * * *

The army officers on each of the three railroads examined so far, made contributions that reflected the state of corporate administrative thinking and the managerial needs of the railroads during three different phases of railroad development. They helped shape the evolution of railroad management before and during the supposedly revolutionary period of 1849-1856. Long and McNeill helped fill an administrative vacuum. Whistler and Swift modified military procedures to make them more applicable to specific railroad situations. Haupt helped refine, promote, and defend the new management system that evolved by the mid-1850's. Although these contributions seem significant enough in their own right, the experience of the New York & Erie Railroad, a line that never had a significant military presence, suggests that their particular contributions were indeed critical to the immediate, short term success of the railroads they served.

2 Pennsylvania Railroad Company, Board of Directors Minute Book No. 1, March 30, 1847 to September 4, 1851, pp. 4, 6-7, 9, 15, 17.

3 Burgess, Centennial History, pp. 46-47.


5 Georgia Railroad and Banking Company, Report of the Engineer in Chief of the Georgia Rail Road and Banking Company to the Convention of Stockholders, 1842, p. 4.

6 Ibid., pp. 4-5.


8 Miller to Merrick, April 13, 1847, in PRR, BD MB 1, pp. 11-12.


10 Resolutions adopted September 5, 1847 in PRR BD MB, 1, p. 44.

11 Herman Haupt, "Reminiscences of the Early History


14Ward, That Man Haupt, p. 25.

15Ibid.


18PRR, BD MB 1, p. 155.


21PRR, BD MB 1, pp. 172, 174.

22Ibid., pp. 176, 179, 189, 192, 199, 203-204.

23Ibid., pp. 337-338.

24Ibid., pp. 341-342.

25Ibid., p. 341.

26Ibid., pp. 364, 373-374.

27Haupt based his PRR management system on the approach Thomson used on the GRR. This is noteworthy for
several reasons. First, it suggests that the "revolutionary" developments made between 1849 and 1855 are far more evolutionary than is normally allowed. Second, the GRR was the explicit model for the PRR, lending weight to the claim that the organization builders of the period did need and follow existing models. Third, evidence in the Annual Reports and a cursory examination of the trade press support the notion that Thomson closely followed managerial developments elsewhere.


30 Haupt, Reply, p. 10.

31 Ibid.


33 PRR, BD MB 1, p. 399.

34 Haupt, Reply, pp. 11-12.

35 Ibid.


37 The May 2, 1851 regulations are in PRR, BD MB 1, pp. 435-440.
38 PRR, BD MB, 1, pp. 435-436.

39 Ibid., p. 440.

40 Haupt, Reply, p. 17; PRR, BD MB 2, p. 27.

41 Haupt, Reply, pp. 16-17; PRR, BD MB 2, p. 27.

42 Haupt, Reply, pp. 16-17.

43 PRR, BD MB 2, p. 26; Haupt, Reply, p. 17.

44 PRR, BD MB 1, p. 454; BD MB 2, p. 27.


46 For information on this clash, which occupied an inordinate amount of the board's time for several months, see the corporate records cited above, especially PRR, BD MB 2, and Haupt, Reply. Ward, That Man Haupt has a concise summary of the battle.

47 This is Haupt's Reply of the General Superintendent, cited above. It seems that the Reply is noteworthy less because of its contents that its tone. Haupt adopts exactly the same self-righteous, supercilious tone that Long and McNeill used in their Narrative; indeed, Haupt maintained this tone in most of his dealings with the board during the last quarter of 1851. The argument the officers used are similar: they refused to be held accountable for acts dictated by others, in both cases "others" who were "neither by profession nor by practice an engineer or railway superintendent." Haupt, Reply, p. 4.

48 Haupt, Reply, p. 8.

49 Ibid., p. 35. Haupt touches on an important point in this passage. Even as he and the board struggled for control of the railroad, the employees learned to carry out their functions in peace. The staff level that Haupt represented served to insulate the line and lower level staff officers from the turmoil in Philadelphia. As in any good bureaucracy, the work continued even as the crisis developed.

50 Haupt, "How JET Became President of the PRR," p. 8.

51 "Stockholders Reform Ticket For Directors of the Pennsylvania Railroad Company, January 27, 1852."
"To the Stockholders of the Pennsylvania Railroad Company," January 27, 1852."

PRR, BD MB, 2, pp. 119-123.

AR, PRR, 1851, pp. 5, 11-18, 23. The quote is from pp. 17-18.

PRR, BD MB 2, pp. 232, 262. The quote is from p. 262.

Pennsylvania Railroad Company, Organization for Conducting the Business of the Road, Adopted by the Board of Directors, November 23, 1852 (Philadelphia: Crissy & Markley, 1852).

Ibid.


Ibid., pp. 167-180.

Numerous works look at the non-military careers of Military Academy graduates, but no one has addressed the question of what effect their military career had on their responses to problems they faced in other fields of endeavor. See, for example, William H. Baumer, Jr., Not All Warriors: Portraits of 19th Century West Pointers Who Gained Fame in Other than Military Fields (New York: Smith & Durrell, 1941). R. Ernest Dupuy, Where They Have Trod: The West Point Tradition in American Life (New York: Frederick A. Stokes Co., 1940) and Morris Janowitz, The Professional Soldier (New York: Free Press, 1971) both discuss this military ethos, but do not apply it to any particular industry. Thomas C. Cochran, Railroad Leaders, 1845-1890: The Business Mind in Action (Cambridge, Mass.: Harvard University Press, 1953) is an interesting survey of how businessmen addressed various kinds of management problems, but military men do not figure prominently in either the period or the sample.
CHAPTER SIX

The New York & Erie Railroad, 1832 - 1859

The period when United States Army officers assisted in the creation of new operational and administrative systems on three of the nation's most important early railroads ended when Herman Haupt left the service of the Pennsylvania Railroad in 1856. Although there were still many military men serving dozens of other lines throughout the nation, by the mid-1850's civilians occupied virtually all the most important managerial positions in the largest companies.\(^1\) The industry drew on other internal and external sources of competent manpower to fill technical and administrative positions. West Point no longer provided the nation's only supply of academically-trained engineers, and the railroads themselves served as the most useful training ground for their next generation of managers. Since military men never amounted to more than a small fraction of all railroad executives, talented civilians moving up through the railroads' own administrative hierarchy soon supplanted the officers in positions of authority.

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For nearly three decades, however, the United States Army provided the railroads with a cadre of skilled engineers and administrators who played a disproportionately significant role in the formulation of administrative and operational procedures on three precedent-setting lines. The Baltimore & Ohio, the Western, and the Pennsylvania all employed military men in positions of administrative authority at some point during the early stages of their corporate development, and all three lines benefitted greatly from the presence and experience of the officers. Virtually all the nation's early railroads faced crises of one form or another during their formative years. The experience of these three suggests that lines that had a military presence in their management hierarchy were better able to overcome these crises through promptly-executed, well-directed administrative reform.

The New York & Erie was an exact contemporary of the three pioneers, and in time it too became one of the nation's most important carriers. However, the railroad never placed military men in positions of administrative authority. For roughly the first twenty years of its existence, the NY&E served as a good example of how not to run a railroad. The organizers and early managers of the NY&E faced problems like those their colleagues met and mastered on other lines. Feeling that they lacked an appropriate model to use as a guide, and unwilling or unable to profit
from experience gained on other lines, the leaders of the NY& E frequently mishandled these crises as they occurred. Financial difficulties reflected and exacerbated the results of technical, organizational, and administrative incompetence. The NY& E eventually adopted procedures similar to those employed on other lines and became, in time, a well-publicized example of a management innovator. However, even this did not end the railroad's troubles.

* * * * *

The New York & Erie was another railroad conceived in response to the Erie Canal. Residents of New York's "Southern Tier" counties resented that the canal that enriched their northern neighbors had not improved their situation. Some factions favored the construction of more canals, but the success of railroads elsewhere focused public attention on that transportation technology. In the spring of 1832, the New York legislature granted a charter to the New York & Erie Railroad Company.

The railroad immediately solicited engineering assistance from the federal government. In June, 1832 the War Department assigned Colonel DeWitt Clinton, Jr. to supervise survey operations. On July 4, 1832, however, President Andrew Jackson, responding to pressure from state Democratic politicians who feared the railroad's
impact on the canal, ordered Clinton to stop the work unless the company assumed all the costs of the surveys. This the company was in no position to do, so the War Department reassigned Clinton to other projects. He did complete a preliminary survey of the proposed route from Piermont to Dunkirk and recommended that the company continue the project. Clinton's departure brought work on the railroad to a standstill. The stockholders completed the organization of the company on August 9, 1832, almost eighteen months after the legislature incorporated the company. The president of the company, Eleazer Lord, turned to the state government for engineering assistance.²

On May 6, 1834 the state appropriated $15,000 for a NY&E survey. Governor William Marcy appointed Benjamin Wright, James Seymour, and Charles Ellet to supervise the work. The early engineering staff of the NY&E was civilian. Unfortunately, the engineers lacked railroad experience. They were honest and talented men, but the NY&E would pay for their inexperience. The engineers completed their surveys of the 483-mile route in December, 1834 and filed their reports with the New York secretary of state early the following month. The legislature was not satisfied with the reports, so later in 1835 Captain Andrew Talcott (USMA, 1818) and Edwin F. Johnson resurveyed the route.³
The early managers of the NY&E faced an enormously difficult task. Wright and his associates grossly underestimated the cost of the work, and the railroad had difficulty raising funds to finance construction. The Board of Directors authorized frequent changes in the route and design of the road, further adding to costs. From an operational standpoint, the NY&E did not adopt a system of rules and regulations to govern its employees until 1841. Since the formulation of such a system was traditionally the province of the railroad's technical specialists, the NY&E's failure to procure experienced railroad engineers tended to retard the development of a well-organized managerial hierarchy to superintend construction operations.

The NY&E's lack of a management system attracted the attention of a legislative investigating committee, which noted that, previous to the adoption of a set of corporate by-laws in September, 1841, the "powers and duties of the several officers and agents of the company were not specifically defined, but were left to such limits as were, by common consent, or by analogy to the organization of other like chartered institutions, concurred in." The committee "regretted that a more permanent and harmonious system [emphasis in original] of government had not been adopted by the company and defined by established rules." The legislative investigators also noted that the company suffered from a very poor public image. People mistrusted
a company that could not provide the kind of detailed information prospective investors had come to expect from the railroads.\textsuperscript{4} This inability to provide information was rooted in the informal, poorly defined methods the company used to supervise its work. The information flow so important to the success of other railroads did not yet exist on the NY&E.

The corporate by-laws approved on September 10, 1841 marked a significant improvement over the ad hoc procedures that previously governed operations. Unfortunately, they were not equal to the operational standards already in place on contemporary railroads. The organization these by-laws outlines appears complex and complete, but the by-laws themselves are vague as to the exact duties and responsibilities of the officers they specify. For example, the by-laws stated that the president "shall individually possess the same supervisory power over all the departments that is commonly exercised by the presiding officer of incorporated companies." Perhaps the most useful aspect of the new system was the detailed accounting system it established, based on periodic reports submitted by many railroad employees. The system came to late to save the railroad, however. By 1842 it was in the hands of receivers.\textsuperscript{5}

The receivers made better use of the information available to them than the old management did.
Superintendent H. C. Seymour reported in 1842 that, on instructions of the receivers, he made "weekly and monthly reports of the business of the road, containing statements of the sums received and expended with vouchers therefor." There were also some positions occupied by men of extraordinary managerial competence, noteworthy because they were so rare. In 1838, Thomson S. Brown became chief engineer of the Western Division of the NY&E. Brown's organizational talents came to the attention of the state legislature when it investigated his division in 1841. It noted that "the organization [was] a little more complete" than that of any of the railroad's other units. Brown's skills as an organizer and manager brought him to the attention of the receivers and later the Board of Directors when the railroad passed back into their hands. In 1842, Brown became chief engineer of the NY&E, a post he held until 1849, when he resigned and left the country to replace his former colleague George W. Whistler in the service of the Tsar on the Moscow & St. Petersburg Railroad. Brown graduated from West Point in 1825 and resigned from the army a decade later.

Although Brown's background and organizational activities on his division supports the thesis that military officers could resolve administrative problems that stymied their civilian colleagues, the NY&E made little use of his managerial talents. The railroad apparently never
recognized that the procedures he applied to its engineer department were applicable to the line's other activities as well. Brown himself did not attempt to advance a more comprehensive system, perhaps because the Board of Directors demonstrated so little foresight in anticipating future managerial problems.

The railroad continued to struggle throughout the 1840's. It never found its Long, McNeill, Whistler, or Swift to create a comprehensive management system, or its Haupt to compile one from other sources. The railroad's management did try to apply the lessons it learned as the road grew, but such efforts were sporadic and not the results of any seriously-considered, well-planned organizational reform effort. Although the directors claimed that they were too preoccupied with technical problems to worry about operational or administrative matters, they allowed the technical work itself to progress in a rather haphazard manner without an effective method to control costs or to keep themselves informed of problems or inefficiencies. However, as the railroad entered the 1850's its directors gave more serious consideration to the operational problems their railroad found looming in its immediate future. 8

In 1852, after twenty years of recurring crises, the NY&E Board of Directors finally promulgated a set of operational and organizational regulations that reflected
the application of lessons learned on the NY&E and on other railroads. The Organization and General Regulations established three executive departments under a superintendent in charge of transportation, an engineer in charge of construction and maintenance, and an auditor, responsible for all operational accounts. The new regulations described the duties of employees in detail and further developed the system of accounts first laid out a decade earlier. The new corporate by-laws that appeared at about the same time provided for a far more advanced division of executive labor and better definition of function than their predecessor. As the regulations dealt largely with the activities of the line officers and the employees under their direction, the by-laws pertained mainly to the administrative staff. Although the 1852 by-laws repeated the omnibus "Duties of the President" clause of the 1841 edition, other provisions spelled out much more carefully what he and his associates were expected to do.9

The 1852 by-laws and regulations seem to be less the work of a single administrative genius than the results of a major attempt by several corporate line and staff officers to apply elements of a system devised initially on other lines to the particular needs of the NY&E. By the early 1850's American railroads had gathered a significant amount of managerial experience, and
the results of this experience were widely disseminated, studied, and discussed. The railroads were still on the frontiers of managerial developments in the United States, but as an industry they could look with pride and satisfaction on about twenty-five years of significant developments. Men like J. Edgar Thomson did bring a much greater refinement to railroad management practice in the mid-1850's, but they were not pioneers in the strictest sense of the word. They did not really create; they borrowed, modified, and adapted.

One result of the 1852 reforms on the NY&E was that the board gained a much clearer picture of what was happening throughout its company, and it used this knowledge to address more detailed operational questions. In 1853, the board announced that it was undertaking a major effort to increase the railroad's receipts and reduce its expenses. The board believed that the latter goal "could be effected by the establishment of a system, by which the managers could ascertain the value received for all expenditures made; by exacting a rigid accountability therefor, and by imposing a check on improvidence, in the requirement of estimates in advance for all proposed expenditures." The New York & Erie was not the first railroad, nor indeed the first large organization, to try this method to promote economy, efficiency, and accountability. The question is rather why it took the NY&E so long to realize
that this approach offered one possible way to accomplish its corporate goals.

If any one man can be credited with fathering a more or less complete system of railroad management on the NY&E, that man must be Daniel C. McCallum, who brought together many ideas developed elsewhere and combined them into a coherent code of railroad management practice. He is, however, perhaps given more credit for original contributions to the science of railroad management than he deserves. Exactly how McCallum came to be associated with the NY&E is obscure, but in 1854 he was superintendent of the railroad's Susquehanna Division. The railroad instituted a new system of operational rules on March 6, 1854, but McCallum believed that the new rules were too lax to be effective. Soon after the rules went into effect, McCallum convinced the Board of Directors that he had devised an improved code of conduct for railroad employees. The board accepted his claim and directed the railroad's superintendent, Charles Minot, to apply McCallum's rules to the whole NY&E system. Minot felt the code was far too draconian to be useful or acceptable to the railroad's employees, and he refused to do as the board directed. When the board insisted, Minot, one of the individuals most responsible for the 1852 reforms, resigned. On May 1, 1854, Daniel C. McCallum became general superintendent of the NY&E.\(^{11}\)
McCallum immediately promulgated his "Supplementary Instructions." The railroad's engineers (i.e., the locomotive operators) found the new rules especially onerous. On May 19, two weeks after the regulations went into effect, a committee of engineers called on McCallum to request clarification of certain provisions of the operating regulations. After receiving a haughty and unsatisfactory reply, the trainmen walked off their jobs on June 17. McCallum quickly broke their strike, apparently by firing forty engineers and forty firemen, but the issue generated ill-will between the management and the workers and between McCallum and the Board of Directors. 12

McCallum's fame as a management pioneer rests on the "Superintendent's Report" he issued on March 26, 1856 for inclusion in the NY&E's 1855 Annual Report. McCallum delineated six "general principles" of administration. They included "a proper division of authority," delegation of authority to enable the officers of the company to carry out their responsibilities, lines of communication so that superiors could judge whether the delegated responsibilities were "faithfully executed," efficient means of communication so that reported derelictions could be corrected, frequent reports so that all operations could be carefully watched, and a strict system of accountability applied to all employees. The key to the whole system was internal information flow, and to provide this flow McCallum
laid out carefully defined lines of communication and prescribed daily, weekly, and monthly reports that were to move along these lines. The information these reports provided enabled "top and middle management to coordinate complex widespread activities and to monitor and evaluate the performance of a large number of managers handling them."[13]

McCallum believed that his system was the key to the financial success of the NY&E. He claimed that the railroad's managers "cannot avail ourselves to any great extent of the plan of organization of shorter lines in framing [a management system] for this, nor have we any precedent or experience upon which we can rely in doing so."[14]

Although the New York & Erie was longer than any of the other lines then in operation, McCallum either fell victim to an attack of corporate chauvinism or he simply refused to acknowledge the debt his railroad owed to its predecessors and contemporaries, large and small, when he wrote this. His new management system was more complex and technologically advanced, thanks to the extensive use the railroad made of the telegraph, and perhaps better thought out than similar procedures in use on other lines, but it was not absolutely unique, even in the limited context of the American railroad industry. Other lines were moving in the direction McCallum took, although most of the major lines quickly chose to copy the procedures of the
McCallum system soon after it appeared. While McCallum
cannot exactly be accused of "reinventing the wheel," his
system represented an evolutionary, not a revolutionar
y step in the development of the railroad management prac
tice. As to his claim that he and the NY&E had no prece
dent or experience to draw on, it seems that McCallum and
his contemporaries had lost sight of where the roots of
these managerial ideas lay.

Other railroads soon applied McCallum's ideas on
their lines, but McCallum himself had little time to super
vise the installation of his procedures on the NY&E. The
residual ill-will remaining from the strike poisoned
McCallum's relations with the Board of Directors. He had
his defenders, none more vocal than Henry Varnum Poor,
the influential editor of the American Railroad Journal.
Poor called McCallum "a Superintendent [emphasis in origi
nal] who unites training, with a mind full of expedients;
an iron will, with affability of manner; the closest ad
herence to methods with expansive and liberal views; and
to crown the whole, a man of unsullied character, always
insistent upon a conscientious discharge of duties."
Poor also gave McCallum credit for pulling the NY&E into
the ranks of the profitable, well-managed railroads. Un
fortunately, not all interested parties shared Poor's
enthusiasm.15
Although they enthusiastically supported McCallum's administrative plans, the Board of Directors was less pleased with the details of his operational regulations. As official criticism of his personnel policies mounted, McCallum decided that he had no recourse but to resign. On February 25, 1857, he tendered his resignation to company president Homer Ramsdell. To explain his policy, McCallum cited his belief that "a work of such magnitude, requiring the sacrifice of such a vast number of persons of such grades, and involving in its operations such a mass of details, must necessarily require the enforcement of a rigid discipline, and perfect and systematic order through all its ramifications."16

Ramsdell accepted the resignation regretfully. He thanked McCallum for his efforts and remarked that although the substance of McCallum's rules were unobjectionable -- in a general sense they were "in use on all well-regulated railroads" -- his "rigorous manner of enforcing them" made them obnoxious and objectionable to some employees. Ramsdell claimed that McCallum may have been victimized by over-zealous subordinates and that the board itself bore some responsibility for the labor troubles, since it endorsed the rules in the first place. However, like a good subordinate, McCallum obeyed and enforced the orders, exacting "from others only what you accorded as a right to your superiors -- you demanded rigid obedience of orders;
this is the extent of your offending . . ."\textsuperscript{17}

The board treated McCallum less charitably when it reported his resignation in its annual report. The company's new president, Charles Moran, announced that the strikes "could have been avoided, had the proper means been resorted to, and that without detriment to discipline." He believed that had McCallum "properly treated" the engineer's complaints, "they would have submitted to any rule necessary to protect life or property and insure the proper performance of duty." Moran concluded by noting that

In this country, where all classes have equal rights, and where all are accustomed to assert and maintain their independence, edicts will not suffice to govern men. Their reason must be appealed to and they must be made to feel that the sacrifice required of them, if any, is necessary and proper. A dictatorial manner of enforcing even popular rules, will rarely succeed, and never secures that hearty assent and cooperation on the part of subordinates, so necessary to the good administration and the well-being of a corporation like this.\textsuperscript{18}

Moran issued a new set of operating instructions in 1857 that were based on McCallum's ideas but which employed a slightly softer tone. In some aspects, the new regulations were more complex than earlier sets, especially in the amount of financial and operational information employees were expected to report. However, even what was arguably the most complete and advanced managerial system in the nation could not save the NY&LE from another collapse. On August 16, 1859, the railroad was once again
placed in the hands of receivers. It was reorganized as the Erie Railway in the early 1860's.¹⁹

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The New York & Erie suffered, perhaps unnecessarily, through more than twenty years of inept management before it finally found administrative personnel who could create an efficient, effective organizational system to control its operations. This inability to solve fundamental managerial problems was rooted in the inexperience of the line's first managers. Feeling that they lacked a relevant model to copy, they had to struggle to create essentially the same organizational structures their colleagues had already erected on other lines. The system emerged only after the NY&E's managers struggled through a morass of incompetence and ineptitude that has no parallel on any of the other major early railroads. Competent managers eventually rose to positions of authority, but the time it took to find these individuals was nearly fatal to the railroad.

The NY&E was never in a position to benefit from the skill and experience of military men. Those former officers who served the railroad in a technical capacity did apply their organizational and administrative talents to the limited range of activities they controlled, but they never made the move from technical to administrative
positions of authority. If the experience of some of the NY&EE's contemporaries is any guide, the railroad's crises were to some extent avoidable. Unfortunately, the NY&EE never used the source of managerial talent it possessed in limited numbers in its ranks, and the officers themselves never saw fit to advance a claim to positions of greater authority. It is perhaps too much to claim that a lone army officer, properly placed, could have made the NY&EE a successful railroad in the 1830's and 1840's. However, it is safe to assume that a more capable manager could certainly have done no worse than the individuals who assumed control of the railroad before about 1850.
CHAPTER SIX -- NOTES

1. To avoid unnecessary confusion, throughout this chapter "civilian" will refer to individuals who never had any connection with the army, at least before the Civil War. "Military men" are individuals who were at one time army officers. Most of them were graduates of the United States Military Academy. After July, 1839 no serving officer worked for a private venture.


3. IAR, NY&E RR, 1835, pp. 4-5; Mott, Story of the Erie, pp. 30, 37.


1854, p. 548; ARJ, Vol. XVIII, No. 958, August 26, 1854, p. 536.


17 Ibid., p. 203. The board felt that it had to act after the engineers struck again in early October, 1856.


19 New York & Erie Railroad, Instructions for the Running of Trains, etc., on the New York & Erie Railroad To Go Into Effect on Saturday, August 1, 1857 (New York: NY&ER RR Press, 1857); Hungerford, Men of Erie, pp. 143-144.
CONCLUSION

For approximately thirty years, United States Army Engineer officers served a number of the nation's most important early railroads. During those years, the railroads adopted organizational and administrative procedures new to the business community. It was no accident that during the years of the most dramatic and significant managerial developments on the railroads coincided with the period of active military involvement. When the organizers of the early railroads recognized that contemporary management theory offered little to guide them when they attempted to meet the unique administrative requirements of their firms, they opted to use elements of a potentially more useful management model advanced by some of the military engineers attached to the railroads. Although the officers joined the lines to provide technical assistance, their familiarity with some of the nation's most advanced administrative concepts enabled them to exert a decisive influence on managerial developments at a time when the new industry struggled to cope with the organizational problems caused by its own success.
The organizational crisis the railroad industry faced between about 1827 and 1857 was not unlike a similar crisis met and mastered by the War Department between about 1818 and 1821. The War Department's response to its crisis led to the creation of the nation's first corporate management hierarchy that exhibited characteristics similar to those seen in later "modern" business organization. The railroads themselves did not recognize that the War Department's experience offered clues to the approach that would ultimately begin to solve their problems. Although similar problems might be expected to elicit similar responses from similar organizations, it took the active intervention of army officers in railroad service to direct the attention of railroad organizers to the potential of the military management model. Once they recognized the utility of this model, however, railroad managers quickly adopted some of its basic procedures and adapted them to the needs of their firms.

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The army faced its administrative crisis during the War of 1812. Although the War Department had evolved a relatively advanced administrative system by about 1800, a decade of governmental indifference, if not outright hostility, to things military, allowed the system to deteriorate
badly by 1812. Since a succession of administrations chose to forget lessons learned during the Revolutionary War and the Indian campaigns of the 1790's, the Madison administration was forced to relearn them when war broke out. Contemporary commentators explained the problems faced by American arms throughout the war as the inevitable result of administrative short-sightedness and incompetence. The corrective for these deficiencies lay not in new tactics or new weapons, but in a concerted attempt to restructure, reorder, and revitalize the art of military administration in the United States. This was the primary goal of John C. Calhoun when he became Secretary of War in 1817. Since political and economic considerations dictated a small, scattered army, Calhoun and his military associates committed themselves to a program designed to increase military effectiveness through well-directed administrative reforms. Their efforts would, they hoped, improve the army from the top down.

Calhoun set out to accomplish two specific goals. First, he hoped to centralize administrative power and authority into the hands of the secretary of war. Second, he wanted to instill a sense of responsibility and accountability throughout the army. Since the army was a dispersed, multi-functional, multi-divisional organization, Calhoun and his subordinates, most notably generals
Winfield Scott and Thomas S. Jesup, moved to establish uniform administrative and operational procedures applicable to all members of the army by revising the scope and expanding the content of army regulations. General and departmental regulations defined lines of authority and communication and prescribed the type of information that was to flow along these lines. An enlarged corps of staff bureaus assumed responsibility for carefully defined support functions, the heads of the staff bureaus responsible directly to the secretary of war.

When the basic elements of the Calhoun reforms fell into place around 1821, the United States Army became the most efficient, carefully organized bureaucratic organization in the nation. Calhoun, Scott, and Jesup gave no thought to the prospect that the system they instituted would one day prove useful to the business community. They were concerned only with the military, political, and economic factors that influenced their professional activities. A potentially "expansible" army needed a staff to prepare the logistical groundwork for expansion, and the staff could also deal with the financial matters that periodically attracted the attention of a parsimonious Congress. In one way or another, the staff officers found themselves dealing with the allied issues of efficiency and economy that fostered the growth of a "cult of accountability" in the War Department.
Although the system eventually bogged down in the morass of bureaucratic inertia, the military reformers could be justifiably proud of what they had created.

No part of the army escaped Calhoun's reform efforts. Even as he supervised changes in the staff bureaus and applied his administrative ideas to the line, he watched while Sylvanus Thayer molded the Military Academy at West Point into an institution that reflected the broader organizational reforms then sweeping the army. Thayer accomplished his goals, and the Academy became one of the nation's pre-eminent institutions of higher learning, especially in the field of engineering education. There is, however, one aspect of these reforms that makes the Academy noteworthy as a potential source of managers as well as engineers. An Academy education exposed the cadets to the military management system in all its complexity and tried to teach them the procedures and values the system represented, ideas the graduate would be expected to apply without question throughout his military career. As a result, the Military Academy graduated officers, engineers, and trained bureaucrats, thoroughly familiar with the nation's most advanced and complicated management system. This would become important when a generation of Academy graduates went to work for the railroads.
By the time the officers, graduates of Thayer's Academy, began to join the railroads as technical specialists in the late 1820's, the military management system was a highly developed, well-tested set of administrative procedures. The staff bureaus, including the Corps of Engineers, carried on operations of unprecedented scope and complexity. A string of inland and coastal fortifications and the advancing National Road testified to the skill with which the engineers, to cite one branch of the service, applied both their technical and administrative talents to the tasks at hand. When Congress decided to loan military engineers to civilian projects in 1824, they carried with them elements of a managerial system that seemed immediately applicable to the needs of the railroads. Indeed, in the eyes of the officers at least, the railroads proved so lacking in fundamental organizational ideas and talent that the officers felt compelled to apply the system and values they were familiar with to some of the firms they served.

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The railroads were the arena where the technical and administrative skills available in the army were applied to the needs of the American economy. Although there is no evidence to suggest that the early railroads
solicited the assistance of military engineers for anything other than purely technical reasons, the railroads subsequently demonstrated little reluctance to experiment with the officers as managers. For their part, the engineers, especially those serving the Baltimore & Ohio, demonstrated even less reluctance to offer their administrative talents in situations where they felt their skills surpassed those available to their parent company in its civilian management hierarchy. Unfortunately, the civilian management usually took a more optimistic view of its abilities, and it came to resent the intrusion of officers who seemed to represent interests inimical to the entrepreneurs.

There were three distinct phases during the military's managerial involvement with the railroads. The first phase occurred between 1827 and 1830, when the officers served the B&O. The men who organized and financed the railroad gave little thought to the management of their activities before Long and McNeill arrived to begin work. Impressed by their talents, the civilian organizers willingly placed the officers in positions of authority on the railroad's Board of Engineers, then gave them a free hand to create whatever kind of management system the engineers felt would best serve the railroad's needs. Given the opportunity, McNeill borrowed liberally from Engineer Department regulations. The first management
manual prepared for use by an American railroad contained provisions that McNeill copied verbatim from army regulations. Thus, the military's managerial influence on the early B&O was direct. However, the B&O engineer regulations McNeill prepared pertained only to the technical operations of that department. They were concerned only with the organization and administration of the company's construction activities. Although direct, the military's contribution was also limited because the railroad as yet needed no more broadly based assistance.

The officers never had the chance to expand their managerial horizons on the B&O because of the clash that occurred between them and their civilian colleagues in 1829. This battle was as unfortunate as it was inevitable. Both sides recognized that the system McNeill devised to control the railroad's engineering operations had the potential to become an extremely useful management tool. Long and McNeill knew of no other system; their commitment was based on extensive experience within a limited range of activities. Thomas and his associates admired the system too, but their attraction represented a rather more rational choice. Since they were businessmen themselves, they could have opted to use any number of more traditional decentralized, less bureaucratic management approaches. Instead, the civilian managers willingly allowed McNeill to prepare his regulations, and they
adopted them without demur.

However, when it came to applying the system, the two sides found themselves locked in a bitter philosophical struggle. The officers, used to working in an environment that stressed obedience and conformity, saw the regulations as a prescriptive code meant to be followed literally and absolutely. Furthermore, the military environment stifled creativity to the extent that the officers had little freedom to express individuality in design or construction. Another body determined where they would build a fort, for example, and prepared the preliminary trace which the engineers were expected to follow. Cost control was their over-riding operational concern. They pursued utility, economy, and accountability with a fanatical zeal. On the B&O at least, the officers never seemed to grasp why the Board of Directors would approve an expensive tunnel over a cheaper cut, or a finely finished stone bridge over a more utilitarian, less expensive wooden trestle. This attitude was alien to their way of life. The military men initially demonstrated an inability to fully comprehend the complex social, political, and psychological variables that influenced the board's actions. The board wanted an occasional monument, for whatever reason, and it was willing to pay for it. The board saw the regulations as a means by which it could oversee the course of operations, but it was unprepared to concede that the
regulations limited it to any particular course of action or management policy.

From the perspective of the board, "Long and McNeill represented outside interference using claims of professional privilege in order to impose a governmental formalism."¹ The board sided with Wever because he represented a more traditional kind of businessman/craftsman, better able to understand the board's motives, and not inclined to cite chapter, verse, and line of regulations to excuse or justify his actions. The board was impressed by the potential of McNeill's system, comfortable with Wever's methods, and enraged by the haughty, self-righteous, supercilious arrogance the officers displayed. It decided they would have to go, even while deciding that elements of the system they proposed remained. The board recognized that the system was the solution to the problems they faced. They preferred to hire managers more familiar with their methods and motives, however.

The personality conflict notwithstanding, the experience the B&O gained in using elements of the military management system between 1827 and 1830 quickly became the foundation upon which the B&O and its contemporaries built the next generation of railroad management procedures. Knight used McNeill's regulations as the basis for his 1830 B&O operating manual. Other railroads watched the B&O closely, and borrowed liberally from its technical and
and operational manuals. As the nation's first significant, successful railroad, the B&O established administrative precedents that other railroads found particularly useful.

It took time for the officers and civilians to gain an appreciation of each other's outlook, motives, and talents. Since the two sides blundered blindly into intimate contact on the B&O, there was no time to rationally analyze what each could expect from the other. By 1836, when the officers again entered the service of the second precedent-setting line, the context of their professional contact had changed. In the intervening six years, both sides gained a much clearer insight into the way the other worked, and they learned to work together much more harmoniously. Without compromising their principles, the officers became far less "military" in their dealings with their civilian colleagues and superiors. The officers seemed less condescending, more cooperative, and perhaps less inclined to debate vague questions of honor and professional perogatives.

From the civilian perspective, railroad organizers by 1836 had gained a better sense of what they could expect from the officers. This made them at least more circumspect in their dealings with the engineers. Perhaps more importantly, civilian railroad organizers now recognized more clearly how the management system the officers were so
committed to could help them. The system of accountability, for example, that had seemed so cumbersome and unnecessary on the B&O now began to prove its worth. Experience demonstrated that railroads were extremely expensive to build. Financiers proved more eager to employ a tool that would enable them to track cash flow and limit expenses. Since the Commonwealth of Massachusetts and many towns along the line had opened their treasuries to help finance the Western, both they and the investing public in general demanded more detailed periodic reports from the Western than Maryland demanded from the B&O. The reports that made up the system of accountability enabled the railroad's directors to respond to these frequent requests for information with dispatch, since the information was readily available in standardized format.

The army engineers, particularly Swift and Whistler, added a new dimension to the military's contribution to railroad management development on the Western. McNeill concentrated exclusively on the problems of organizing and controlling the B&O's technical activities. When he joined the Western, he again applied military procedures to the railroad's engineering operations. Swift and Whistler, on the other hand, drew heavily on the organizational and administrative lessons they learned as army officers when the time came to frame operating procedures to control the daily workings of the road. There was
nothing in army regulations that applied directly to the problem of how to run a railroad. However, the organizational theory that shaped the regulations was applicable to the problem. Procedures like centralized planning and control of decentralized operations, strict cost accounting, regular reports, and standardized organizational regulations that helped streamline military administration in the 1820's were applicable to the railroads. Military establishments in the United States and in Europe experimented with the concept of independent, self-contained operating units years before the Western organized its divisions. Furthermore, the administrative procedures that served to control engineering activities could be readily used to perform the same function in other branches of the railroad service. It took no great managerial insight to recognize that the same form that enabled an engineer to record his activities could, with only slight modification, be used by a mechanic or a ticket agent for the same purpose.

Military-civilian cooperation was more productive and less acrimonious on the Western than on the B&O since both sides shared a greater belief that the procedures they developed would serve the desired ends. The Pennsylvania Railroad story is again one of conflict, although the clash was more complicated than the B&O struggle. By 1846, railroad management had developed a number of basic
concepts tested in almost twenty years of railroad service. Civilian managers now far outnumbered officers (strictly speaking, former officers) in top management positions on the major railroads, the Pennsylvania included. Despite the changing situation, the Pennsylvania became the third management pioneer that drew on the education and experience of an army officer.

J. Edgar Thomson used Herman Haupt as point-man in Thomson's effort to install a more rational management system on the Pennsylvania Railroad. Since both Thomson and Haupt shared a belief in the utility of systematic management procedures, devised and executed by professional managers, Thomson could rely on Haupt to champion this position before a Board of Directors that resented this usurpation of one of its traditional activities. Since the professional risks involved in this effort were great, Thomson could have his position prepared, presented, and defended by a subordinate inclined, like Long and McNeill, to challenge institutional incompetence and inefficiency. Had Haupt failed, Thomson was still in position to make later efforts. Haupt's willingness, indeed eagerness, to participate in this battle served Thomson's interests, gave Haupt managerial experience he used to advantage during his later career, and, it seems, ultimately led to the emergence of the Pennsylvania as the most important managerial model for other railroads and other industries.
It was no accident that the railroads that used military officers in positions of authority became the acknowledged leaders in the process of management development. The officers in the service of the B&O, the Western, and the Pennsylvania helped to create, refine, and defend a new kind of corporate management system, based on elements of the military management model, when the railroads they served faced organizational and administrative difficulties during the course of their corporate development. Long, McNeill, Whistler, Swift, and Haupt provided services that profoundly influenced the course of later managerial evolution. Without their efforts the railroad system as a whole might have experienced the same kind of recurring managerial problems that came perilously close to wrecking the New York & Erie. Although they were certainly not the only individuals considering the difficulties of operating a railroad at the time, their presence in the administrative hierarchies of some of the most significant pioneer railroads made their contributions particularly important.

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Since the United States Army was the nation's first organization that exhibited attributes later used to define large-scale business enterprises, it seems reasonable to
conclude that army officers had the potential, at least, to become managers of some of these organizations when they eventually appeared. The railroads provided the technical and organizational arena that enabled army officers to exercise their talents as engineers and administrators.

This is not to imply that a mere handful of officers, working sporadically for about thirty years, single-handedly created modern management in the United States. Civilian railroad organizers also played a vital role in this process, especially as some of the more important ideas coalesced and blossomed into extremely complex management systems in the 1850's. It seems, however, imprudent to attempt to assign too much credit to any one individual, since managerial progress, like technological advance, "occurs predominantly in the form of small increments contributed by a great many talented individuals rather than through the few spectacular inventions or breakthroughs [made] by those we recognize as geniuses."² Real progress came only through the cooperative efforts of dozens of men on many railroads, including lines that are not normally discussed as railroad pioneers.³ As railroad management evolved, the people involved selected practices from many organizations and knit them together into the fabric of managerial procedures that emerged in the 1850's. None of these procedures were really new.
What was unique was the particular combination of procedures that finally seemed to answer some of the railroad's more pressing needs.

The army system was not adopted as a complete, fully developed managerial model, applicable to every circumstance or problem encountered in railroad management. Managers, civilian and military, adapted some of its elements as needed. The officers did, however, start the process. They knew something of the problems the railroads would face, and they thought they knew how to solve them. The officers laid the organizational and administrative foundation. The army management system provided a conceptual and procedural framework that the officers advanced when there were no other equally suitable ideas forthcoming from the business community. Later work would modify the detailed procedures, but no one ever suggested a model that proved any more useful. United States Army officers were the catalysts of managerial reform in America.
CONCLUSION -- NOTES


3Consider, for example, Thomson's work on the Georgia Railroad. One must also remember that military officers also served many other railroads. McNeill's career has already been discussed, above. His old companion Stephen H. Long eventually went to work for the Western & Atlantic Railroad in Georgia, where he again insisted that "operations generally were to follow the rules and regulations of the United States engineer department." Even if only a small percentage of the officers serving railroads behaved in this fashion, this still represents a number of railroads experimenting with a similar system at roughly the same time. Since the railroad press broadcast the results of these experiments, the knowledge of what others were trying to do elsewhere was available to anyone who opted to look into the problem. The above quote is from Calhoun, The American Civil Engineer, p. 134.
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