Dedicated to Scientific Management, Edwin Denby, 
Secretary of the Navy, 1921-1924

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I. Introduction

In 1952 the U.S. Navy released a draft describing the role of the Bureau of Ships during the Second World War. The draft made the following observation.

“Despite congressional budgetary limitations, the navy, for twenty years in its program of readiness, worked under scheduled of operation in competitive training and inspection unparalleled in any other Navy of the world. Fleet problem tactical exercises, amphibious operations with the Marines and Army, aviation, gunnery, engineering, communications were all integrated into a closely packed annual operations schedule. To the technical bureau, such as the Bureau of Ships, these maneuvers proved of inestimable value.”

In 1945, a U.S. Senate military subcommittee summarized the U.S. mobilization war effort as follows.

“Line production requires a rational layout and frequently, but not necessarily, involves the use of mechanical handling or conveyor systems moving materials to consecutive work stations. Moving conveyors serve as convenient work spaces and provide a means of pacing the line. The principles of work application develop the one best way for each step of production process and assist in the determination of standard cycle time for all operations. Because of the division of
labor line workers need not be highly skilled…. line production makes mass production possible on a scale difficult to achieve by other types of organizations.”

However perceptive, the government documents overlooked two individuals who made singular contributions to the navy’s fleet training and the nation’s mobilization effort during World War II, Frederick Winslow Taylor and Edwin Denby. This paper concentrates on the management policies of Edwin Denby, Secretary of the Navy, 1921-1924. We proceed as follows. First, we discuss Taylor’s early connection with the U.S. Navy at the turn of the 20th century. Second, we sketch in the background and management experience of Edwin Denby. Third, we review and summarize Denby’s administrative decisions as Navy Secretary. Finally, we identify elements of Taylor’s scientific management instituted by Edwin Denby.

II. The U.S. Navy and Frederick Winslow Taylor
Taylor’s insight into management is well known and requires little elaboration. Suffice it to say that Taylor recognized the complexity of management, the need for a functional staff, the concept of work time studies, the application of standardized procedures, and shop floor architecture to promote output flow. All were directed to permit an organization to reap the benefits labor division, specialization, efficiency and productivity. In Taylor’s mind, management and labor had a vested interest the production process. Production, he insisted, was not a zero sum game.
Taylor first experienced a struggle against time while a student at Philips Exeter Academy in New Hampshire. He came under the influence of George A. Wentworth, a mathematics instructor, who used a stop watch to measure the time students solved an assigned problem. After graduation Taylor elected to forego attending Harvard University and decided instead to develop his skill as a machinist. Taylor found employment at a steel firm near Philadelphia and over time was promoted to the position of foreman. It was during this period that Taylor began to formulate his concept of time measurement, worker incentives and shop productivity.

By the late 1890’s Taylor’s reputation as a management engineer was well known, fostered by his writings, his disciples and testimonials from industrial companies. In fact, by the turn of the century, Japan, Germany, France, and Russia had introduced facets of Taylor’s scientific management doctrine. It was perhaps inevitably that U.S. naval officers would became aware of Taylor’s precepts as well.

Oddly enough, the Spanish-American war provided an impetus for the Navy to adopt scientific practices. The war was short and the U.S. fleet easily disposed of Spanish warships in the Philippines and off Mexico. After the war U.S. naval officers began reviewing their gunnery accuracy. The results were disconcerting. Of 100 shots, some 3% hit their target. It was at this point that naval officers turned to management consultants for assistance. The consultants separated the squadron’s routine into individual steps, eliminated wasted movements, then reassembled the task into a new choreography. The results were encouraging. Target hits rose to 33%.3
Sometime later, President William Howard Taft invited Taylor to observe fleet gunnery exercises from the U.S.S. Minneapolis. Taylor observed that the exercises represented “the best application of scientific management that he had ever witnessed.”

Officers of the construction corps soon became intrigued with Taylor’s management concepts. One officer, in charge of a battleship’s printing shop, analyzed work movements and recalculated the steps into a new routine. Printing output not only increased but cut the number of press workers in half.

A next application was more controversial. Some constructors wanted ship forces to engage in ship repair work - work usually performed by machinists, boiler makers, electricians, molders, carpenters, all civilian employees. At the time, Navy yard employees were under the authority of a yard Commandant, a line officer awaiting an assignment at sea. Trained in fleet tactics, line officers were generally unfamiliar with maritime architecture or warship construction. Once a warship remains docked at the navy yard, the ship’s captain was reduced to the status of an interested observer while yard workers repaired a vessel.

Taking exception to the change in ship command, a few construction officers insisted that a ship’s captain retain authority over a vessel while undergoing repair work. A divided jurisdiction, constructors argued, violated the navy’s rule of command unity. Some constructors went even further and suggested that civilian yard employee be trained blue jackets in repair and maintenance work. If nothing else, trained sailors would reduce a vessel’s dependence upon a fixed naval base.
However ingenious, trade union workers viewed that proposition as impinging on their specialized turf.

During the years before World War I, construction officers began corresponding with Taylor, describing their plans to apply his shop management philosophy. While lauding the officers’ endeavors, Taylor was only too aware of the forces aligned against his management practices. He cautioned naval officers to proceed slowly and, in fact, suggested that they refrain from using the term “Taylor Rules.” Instead, he advised them to adopt the phrase “scientific management.”

Taylor was obviously on to something. Taylor practices were unconventional and controversial. In early correspondence, construction officers did not hesitate to send typed letters to Taylor. Over time, however, some officers began to send Taylor handwritten notes, fearful that typing clerks might reveal the content of views regarded as somewhat unorthodox.

Theoretically a civilian naval Secretary represented the President’s authority over the navy department. In reality that authority was limited by several factors. For one thing, a navy secretary’s budget was miniscule. Although the Navy’s General Board served in an advisory role, a secretary had no independent staff. Moreover, congress set the spending allowance to some half dozen navy bureaus. Once granted, a navy secretary was barred from reallocating funds from one bureau to another. Put differently, congress denied a navy secretary the very essence of management oversight.

A Navy Secretary’s status may have implied extraordinary authority, but it was often endowed with periods of frustration. Turnover was high. President Theodore
Roosevelt, for example, ran through six secretaries in five years. His last appointment, Truman Newberry, and a former industrialist from Detroit, ran to approximately twelve months. Newberry quickly recognized the validity of scientific management and promoted its application at U.S. naval yards and stations. The yards also introduced financial incentives that led to increases in yard productivity. Newberry’s appointment was a constructor’s dream come true.

Like all dreams the patient eventually awakens. The Taft administration, succeeding the Theodore Roosevelt administration, failed to renew Newberry’s appointment. Instead, Taft appointed George Meyer as navy secretary. Meyer soon declared that Taylor rules were a failure.

The new secretary also turned against naval construction officers. Commander Emmitt Evans, a constructor, had transformed California’s Mare Island yard into an acknowledged productive operation. Rather than applauding that achievement, Evans was transferred to the role of a yard inspector in Bath, Maine. When Evans sought a leave of absence to study management practices, the secretary turned down the request without explanation. After Evan’s superiors denigrated his annual “fitness report,” he got the message that his naval career was over and he resigned from the service. Years later, a retired navy admiral visited Evans and confessed that he was under orders to write a critical bogus fitness report.

If the Taft administration disappointed Taylor, he was somewhat more hopeful with the coming election of Woodrow Wilson, though the appointment of Josephus Daniels as navy Secretary gave him pause. Daniels, he thought, might be influenced by the growing presence of the U.S. trade union movement. In the early days of the
Wilson administration Taylor corresponded with the new Assistant Secretary of the Navy. Though affable and pleasant, Franklin Roosevelt appeared unresponsive to scientific management.9

Prior to the Wilson presidency, private shipbuilding yards had constructed 80% of the Navy’s warships. Wilson and Daniels vowed to reverse that policy. First, the administration expanded existing yard capacity. Next, the administration ruled that commercial yards holding navy contracts had to purchase guns and boilers from U.S. navy yards. In 1915, Wilson signed legislation directing government yards to build heavy warships assuming the yard experienced sufficient building capability. Such measures were only the beginning, however. A big blow came when Congress passed a bill in 1915 that made it illegal for naval officers to adopt stop watch practices or to impose piece work bonus programs. Navy yard efficiency measures had now become illegal. Civilian trade unions had scored a momentus victory.10

Following the sinking of the British liner, Lusitania, in the spring of 1915, Wilson embarked on a massive construction program directed to give the U.S. naval supremacy. By this time, navy yard workers had acquired civil service status, and work seniority supplemented by a proliferation of union work rules. Indeed, the International Association of Machinists were so grateful to Secretary Josephus Daniels that in his final days in office they awarded him a plaque of appreciation. Daniels had led the battle against scientific management.11
III. The Background - Edwin Denby

Born in Indiana, Denby’s father served as Minister to China. Denby worked for the Chinese Imperial Maritime agency for almost 10 years. Upon his return to the U.S. Denby completed his undergraduate and law degree at the University of Michigan and set up a law practice in Detroit. He also joined the Detroit naval militia - an early form of naval reserve. With the outbreak of the Spanish-American war Denby served as a gunner’s mate aboard the USS Yosemite. The warship assisted the Marine Corps in establishing a U.S. base at Guantanamo, Cuba.

After the war, Denby returned to Detroit and became involved in state politics. He served one term in the Michigan state legislature sponsoring legislation that encouraged U.S. firms to locate in Michigan. He also promoted the development of a state accounting board. Denby was elected to three terms in the U.S. Congress, representing Michigan’s first district. Denby’s fourth reelection bid in 1910 failed, defeated by Frank Doremus, a Detroit city official. During the election Denby announced that he supported an open shop.

While in congress, Denby was a member of the House Naval Affairs Committee. He drafted legislation that reformed the consular’s office of the State Department, renown as a refuge for political patronage. Denby introduced competitive examinations targeted to promote a federal meritocracy.12

In his last year in office, President Taft asked Denby to negotiate property losses resulting from the construction of the Panama Canal. The canal’s waters overran adjacent farm land and occupants wanted compensation. Denby spent three months
in Panama checking titles, property ownership, estimating losses, and negotiating financial settlements.\textsuperscript{13}

After his congressional defeat, Denby returned to the Detroit scene and became involved in the city’s industrial growth and development. He co-founded the Denby Trucking Company, served as treasurer of the Hup Motor Car Company, acquired and sold the Empire electric car company. He started the Detroit Bus Company and formed the Detroit Bank of Commerce and the Detroit Trust Company.

Denby also became active in the Detroit Board of Commerce. Created at the turn-of-the century the Board devoted itself to the growth and industrialization of a booming city. As a Board director, Denby chaired a committee assigned to monitor national issues that might impact Detroit’s future. In 1916, the Board, now made up of 4000 members, elected Denby as their president. Denby thereafter declared that the Board would concentrate on education.\textsuperscript{14}

In the second decade of the 1900s Detroit’s manufacturing boom had resulted in a labor shortage. The city welcomed immigrant workers, but many arrivals could neither speak English nor handle basic quantitative skills. Frank Cody, Assistant Superintendent of the Detroit School system and Commerce Board member, proceeded to open night schools for interested students. Detroit’s industrial plants provided space for evening school classes as well. The Board of Education also laid the groundwork for Cass Technical High School. Here, selected students could take courses mechanical drawing and the mechanical arts.\textsuperscript{15}

Denby’s vision of education took an unexpected turn while he was Board president. Some members expressed an interest in learning about scientific
management prompting the Board to explore two options; invite university professors to deliver lectures on the subject, or hire industrialist consultants familiar with Taylor methods. Instead, Board members expressed a preference to visit factories on site and observe time studies in action.

Accordingly, the Board approached the Packard Motor Car Company, the Timken Roller Bearing Company, the Northern Motor and Manufacturing Company, all practitioners of scientific management. The Board asked if its members could visit company operations and assembly lines. Put differently, the Board asked firms who had adopted scientific management if they would be willing to educate their potential market rivals? Surprisingly, the host companies agreed to do so.¹⁶

The Board of Commerce inaugurated what they called “plant conventions.” Invited guests visited a host plant and observed final assembly operations. Afterward the guests were taken to a conference room where a time staff member not only responded to questions, but assigned exercises tying time studies to unit cost calculations. Finally, the Board assembled and published instruction booklets, available to all interested parties. The Board celebrated the fact that their system of knowledge transfer set them apart from Chicago, Buffalo, St. Louis, New York or Cleveland.

As Board president, Denby was aware of pending legislation before congress, in particular, a bill that banned government plants from adopting time studies or piece work incentives. Under the direction of Boyd Fisher, the Board sent a group of 30 executives to Washington, D.C. to meet with President Wilson. The members explained that if the U.S. banned government yards from adopting scientific
management, federal agencies might be tempted to steer subcontracts away from firms that had embraced Taylor’s practices. The President said he would speak to the relevant congressional committees. President Wilson subsequently signed a government ban on scientific management. U.S. trade unions later indicated that they would direct government contracts away from firms that supported an open shop.\(^\text{17}\)

In 1917, the third year of the Great War, Germany launched a submarine offensive in the Atlantic. By April, President Wilson asked for a declaration of war against Europe’s central powers. Congress overwhelmingly supported the President. Denby submitted his resignation to the Board of Commerce and enlisted in the U.S. Marine Corps as a private. He survived boot camp, was later detached to France, and mustered out with the rank of major.

Warren Harding not only won the election of 1920 but his party succeeded in capturing both houses of congress. The President-elect asked John Weeks, a former senator from Massachusetts, to serve as Secretary of the Navy. An Annapolis graduate, Weeks turned down the offer on grounds of a conflict of interest. He knew too many naval officers. Weeks, however, accepted the war cabinet portfolio. When Harding asked for possible candidates for navy, and Weeks suggested Denby. Denby accepted.

IV. Administrational Issues

Upon assuming office, Edwin Denby confronted a host of policy issues. Stated as a questions they were as follows:

First, could the secretary rely upon the judgement of the navy’s General Board?
Second, could the secretary’s oil reserve desk compete with Interior’s Bureau of Mines, Bureau of Land management and the U.S. Geological Survey?

Third, how could a navy secretary guarantee yard efficiency at the Navy’s shore establishment?

Fourth, how could the Office of Naval Operations coordinate the U.S. fleet and the navy’s bureau system?

Fifth, how could the secretary insure fleet readiness in the event of a national emergency?

Sixth, what was mission of the U.S. Marine Corps?

Seventh, how could a secretary enhance the fleet’s operating range and mobility at sea?

Eighth, how could the navy and war department coordinate the nation’s industrial mobilization?

Denby’s tenure as Secretary attempted to address each of these administrative and policy issues. Consider first the secretary’s own office.

Secretary’s Office

Within three weeks after the Armistice, President Wilson announced that he would revive the 1916 navy bill and build a fleet second to none. The announcement ignited a construction race among former allies, Japan and Britain.

The Harding administration inherited Wilson’s warship build up. In early summer of 1921, President Harding and Charles Evans Hughes, Secretary of State, announced a naval conference to be held in Washington, D.C. in the fall of that year. Secretary Hughes asked Denby to estimate the naval tonnage sufficient to guarantee the
safety of the U.S. Denby turned to the navy’s General Board. The Board responded, one million tons. Hughes asked for a second estimate. The Board responded, 800,000 tons. At this point, Denby by-passed the General Board and appointed three advisors to the State Department: Admiral Robert Coontz, CNO, Captain William Pratt, Operations, and Theodore Roosevelt, Jr., Assistant Secretary.\textsuperscript{18}

Next, Denby addressed the composition of the Naval Research Laboratory created under the Wilson administration. For some reason, Secretary Daniels had left the structure of the laboratory in limbo. Denby proceeded to pull together several government agencies, a radio group from the Commerce Department, a wireless research office in Annapolis, an aviation laboratory in Anacostia, D.C. He later added a heat and light contingent to round out the laboratory’s structure.

One issue remained unresolved; who would manage the laboratory? Thomas Edison, a consultant to Josephus Daniels, was emphatic that appointing military director would throttle the laboratory’s creative potential. Although Edison had suggested the appointment of a civilian director, Daniels had not moved on the matter. Denby placed the laboratory under his own office, then assigned over all authority to Theodore Roosevelt, Jr. Assistant Secretary of the Navy.\textsuperscript{19}

Operation’s War Plans

In 1915, congress created the Office of the Chief of Naval Operations under the direction of the navy’s ranking officer (CNO). Congress, however, banned the CNO from issuing direct orders to the fleet or to the department’s bureau system. Rather, all CNO orders had to flow from the office of Secretary.
Daniels originally apposed Operations from engaging in war planning activities. Following the Armistice of 1918 Daniels had a change of heart. He permitted Operations to set up a war planning section.

In the meantime, Denby discovered that two agencies, the General Board and Operations, were engaged in war planning activities. Theodore Roosevelt, Jr., warned Denby that the General Board and Operations were beginning to quarrel over bureaucratic turf. Denby resolved the issue by upgrading Operations war planning to division status. He then assigned the General Board to investigate such technical matters as cruiser capability, floating dry-docks, marine aviation, oil reserve policy, etc. Operations now stood as the department’s premier war planning agency.

Navy Yard Division.

The Navy Department, since 1842, was organized into specialized, functional agencies known as bureaus, each bureau headed by an officer holding the rank of rear admiral. Among activities, the bureaus dealt with equipment, construction, engineering, ordnance, yards and docks. Originally, the yards were assigned to repair U.S. warships. Over time, the bureaus began to move into construction work – each bureau responsible for a particular ship component. The yards were obviously busy, each bureau employed their own staff, several operating their own power plant. No one bureau was designated to coordinate the navy’s ship building work.

In 1921, Denby issued a General Order creating a Navy Yard Division within the secretary’s office. The order instructed the yards to adopt work methods designed to
promote efficiency and reduce cost. The order also instructed the yards to develop a common cost accounting system.\textsuperscript{21}

Denby then created the position of an industrial manager - someone was experienced in ship construction and standardized construction practices. The secretary assigned yard oversight to the Office of the Assistant Secretary of the Navy.

In his first year in office, President Harding was successful in convincing Congress to create a Bureau of the Budget under the direction of Charles Dawes, a Chicago Banker. Dawes first assembled executive managers in an auditorium and informed them that their allegiance belonged the president, not to their individual constituencies. Dawes asked each agency to appoint a budget officer. Denby assigned that role to Admiral Robert Coontz, Chief of Naval Operations. The paymaster of the navy, the Chief of the Bureau of Supplies and Accounts, vigorously opposed the appointment.\textsuperscript{22}

U.S. Fleet

Though line officers may have understood why Secretary Daniels had transferred half of the fleet to the west coast after the Armistice, they remained concerned that a divided fleet constituted weakened fleet. In 1921, Denby consolidated the fleet on the west coast. He then placed the fleet under a single commander, known as the Commander in Chief, U.S. Fleet or CINCUS.

The secretary then divided the fleet into four groups, the Battle Fleet, the Scouting Fleet, the Control Force, the Base Force. The Battle Fleet stood as the navy’s premier offensive unit, supported by combatant auxiliaries. The Scouting Fleet, made up of cruisers, served as in eyes of the battle fleet. The Control Force, was detailed to support
the amphibious operations, and included fleet submarines. The Base Force was composed of repair ships and fleet tenders, all supporting the fleet at sea.

Although, the fleet scheduled annual exercises under the direction of CINCUS, CINCUS still had to submit his exercise plan to the CNO for approval. During fleet exercises Operations staff officers acted as umpires, ruling on ship, casualties, damage, or loss.

Naval vessels, cruisers, destroyers, battleships were usually aligned into type squadrons. The captain of each warship reported to a type commander responsible for ship repair, maintenance, and personnel training. The Navy also adopted a task force format, a force assigned to a specific fleet mission. Relieved of type duties, the task force commander could now concentrate on tactical training. Once a mission was completed members of the task force reported back to their type commander. Accordingly, a ship captain reported to two superiors. The navy began to adopt to what later would be called a matrix command structure.  

Fleet exercises prompted a task force commander to request a flag ship, independent of the fleet squadron. Oddly enough, a Bureau of the Budget officer supported that request on grounds that a flagship was essential for fleet coordination.

Finally, the Harding administration transferred naval aviation from Operations to a new, separate bureau – the Bureau of Aeronautics – an organization opposed by Brigadier General William Mitchell, Army Air Service. The bureau concentrated on pilot training and developed carrier landing and launching protocol. To Daniel’s credit, the Secretary over-ruled the Admiral William Benson’s opposition to converting an
auxiliary collier into an experimental carrier - the USS Langley. In subsequent exercises, the carriers, now members of the battle fleet, engaged in reconnaissance and target spotting. Denby’s General Order had integrated naval aviation into the Battle Fleet.

U.S. Marines

Following the Armistice, the U.S. Marine Corps struggled to sort out their future mission. The Washington naval limitation provided an opportunity. In early 1922, Major General Commandant John Lejeune observed that although the U.S. had agreed to forego an armed base west of Hawaii, the Washington agreement did not preclude the U.S. from establishing a mobile base force. Developed by Lieutenant Colonel Earle Ellis, the Marines planned to seize enemy held islands in the western Pacific. The Marine Corps now adopted amphibious warfare as their new mission.

As part of their mission the Marines began experimenting with linking ground radio units to marine pilots. (The Marines also experimented communication truck loaded with wireless equipment.) More important, the Marines sought an airfield. Denby and Lejeune convinced congress to fund the purchase land adjacent to Quantico, Virginia. Marines also indicated the need for a coordinating ship separate and apart from other combatant vessels. The request would become the precursor of an amphibious command ship, the AGC ships of World War II.25

Bureau/Yards

Precisely when Denby concluded that the navy was structurally bottom heavy and overly decentralized is unclear. As noted, the secretary did comprehend that coordination
stood as an institutional imperative. He assigned that role to Operations. The secretary also decided to insert a war plans section into the Bureau of Construction and Repair. The unit catalogued a list of commercial ships that posed as candidates for conversion into fleet auxiliaries. In the event of a national emergency, ship conversion saved time compared to constructing new vessels from the keel up.26

In June, 1923, Denby issued General Order No. 433. The order assigned new ship construction to the CNO – a direct move into bureau control and cognizance. The Bureau Chiefs were obviously upset. The CNO impinged on their turf. In a weekly secretary’s council meeting the bureau chiefs insisted that they worked well together and that the proposed order was simply unnecessary. Denby agreed but he said he was concerned whether cooperation would continue under subsequent navy secretaries. General Order 433 thus remained on the books during the interwar period.27

The relationship between the fleet and navy yards remained relatively undisturbed throughout the early 1920’s - a vertical arrangement that awarded the navy yards a captive customer. The result tended to alter ship construction in house. If a private firm proposed a new torpedo or landing craft, the bureaus took on the role of a buying agent on behalf of the U.S. Fleet or the U.S. Marines. The bureaus were thus placed in the position of evaluating the merits of a competitor’s product. That status did not trouble civilian yard employees who insisted that such outsourcing ought to be banned outright.

In October 1922, Edwin Denby and John Weeks, War Secretary, cosigned a letter creating an Army-Navy Munitions Board (ANMB). The letter traced its origen to the U.S. experience during the First World War. Both the War and Navy Department competed for war material – a buying rivalry that spilled into higher prices. The ANMB
was an attempt to prevent such panic buying practices in the future. Under the direction of a department civilian, the ANMB served to remind both armed services of an often neglected consideration. In the event of a national crisis U.S. armed services would perforce turn to the private sector for war material supplies, and equipment. Once again, Denby assigned Theodore Roosevelt, Jr. as the navy’s Board representative.

The navy’s bureau chiefs questioned both the need and the legal standing of the ANMB. For one thing, a co-signed letter did not rise to the level of congressional law. For another, the Materials section of Operations could easily handle any outsourcing imperative. And in any event, the navy’s bureau system stood ready to supply the necessary material requirements for the fleet.

The Navy Secretary asked for volunteers to serve on the Board. The Bureau chiefs replied that few officers could be spared. Admiral Coontz intervened and provided a staff member to the Board. Because of its vertical structure, the result left the ANMB largely dominated by the War Department. Indeed, the Army’s Industrial College invited naval officers to become acquainted with production lead times, depreciation schedules, assembly line operations, and corporate accounting statements, to little avail. The War Department in the 1920’s did the heavy lifting.28

Logistics

During his tenure as Secretary, Denby discovered that his office operated an oil reserve desk. The desk administered three oil set asides – two under President Taft and one under President Wilson. In the spring of 1920 Secretary Josephus Daniels asked two committee chairman to attach a rider to a pending naval appropriation bill. The rider transferred naval oil reserves from the Interior Department to the Office of the Navy
Secretary and authorized the secretary to buy, sell, store, exchange oil “… in his discretion.” Daniels assigned an officer from the Bureau of Engineering to advise the secretary on oil reserve matters.29

Denby questioned the basic premise of the secretary’s oil desk, responsible for 55,000 acres of public land. The secretary’s office was bereft of a meaningful budget, staff or petroleum expertise. Interior’s Bureau of Land Management, Bureau of Mines and U.S. Geological Survey, by contrast, managed 17 million acres of public land and fielded some 150 technicians familiar with oil reserve, royalty calculation and oil leases.30

Reminding President Harding of the agency duplication, Denby recommended that Interior serve as an oil agent on behalf of the Navy Department. The President agreed and issued an executive order in May 1921. Denby then transferred the secretary’s oil desk to the Bureau of Engineering and asked the Bureau Chief to serve as the Navy’s liaison officer to the Interior Department.

The Harding administration inherited a two ocean defense plan from the Wilson administration in 1921 a plan that contemplated the location fuel oil tanks on both U.S. coasts, Hawaii and the Panama Canal Zone. Within a month, Denby signed off on the plan. Rear Admiral Clarence Williams, head of operations war planning, added two additional changes. First, he proposed that the oil storage tanks be placed above rather than below ground to save construction time. Second, the original Pearl Harbor tank farm fell short of meeting the requirements of the fleet. Williams proposed that an additional eight tanks be constructed on another area assigned to the U.S. Marine corps.
Denby, over the objection of Major General John Lejeune, accepted Williams’ proposal.31

During the early 20’s, the fleet began experimenting with refueling ships at sea. Two procedures were open. An astern method, dropping a hose from an oiler to a destroyer, was regarded as safe but ponderously slow. A broadside technique transferred fuel faster but carried the risk of ship damage or collision. In the 1923 fleet exercises the Navy recorded that an oiler refueled two destroyers simultaneously.

A floating base and refueling at sea were rudimentary concepts in the 1920’s. The concept, nevertheless, embodied the hallmark of a logistic revolution. Instead of a customer (the fleet) returning to a fixed base, the supplier (an oiler) served the customer at sea. Put differently, a merchant vessel had the potential of redefining the very essence of a naval base.

During the First World War, the U.S. embarked on a mass production of auxiliary ships – some wooden, others steel. Unable to achieve a speed in excess of 10 knots the merchant vessels could not keep pace with the fleet. The Harding administration, proposed a speed stipend to shipping firms if they purchased modern merchant vessels. The legislation also provided financial incentives to private ship building yards.

Denby testified in favor of the ship subsidy before the relevant congressional committees. He also assigned Operation’s war planning chief to a committee working on behalf of the subsidy program. When questioned by one lawmaker why the Navy was interested the merchant marine industry, Denby replied that without auxiliaries the fleet would be restricted to its home base.32
Denby injected another element to his merchant ship policy. He recommended the creation of Merchant Marine Reserve Force. In the event of war, merchant reservists could serve and command the fleet’s supply chain. Yard civilian unions hardly welcomed policies that favored an alternative to any navy yard. The Seaman’s union were especially upset, defining the merchant marine service as a potential strike breaking weapon. The legislation passed the House but died in the Senate.

In 1922, Denby observed that mobility constituted the soul of naval strategy. Presumably, the notion of a mobile force enabled the fleet to reduce its dependence upon a continental navy base. Self-repair, fleet tenders, refueling at sea, mobile drydocks, thus contributed to the goal of fleet self-sufficiency and mobility.33

Denby issued General Order #67 that directed ship forces to adopt programs of self-repair as opposed to relying upon naval yard workers. The order also encouraged naval vessels to solicit fleet tenders, essentially a floating machine ship, for help and assistance. Failing that, a ship captain had to obtain formal permission to qualify for navy yard work.34

The proliferation barnacles and vegetative growth not only compromised a vessel’s speed but increased fuel consumption, necessitating a return to a navy yard for cleaning. A ship withdrawn from the fleet was not cost free, however. A departed ship and compromised the battle effectiveness of the fleet as a whole. In addressing the fouling issue, Denby issued two research contracts, one to the Army’s War Chemical Division, the other to the fisheries division, Department of Commerce. Any solution to the infernal barnacle might possibly transform the fleet into a force multiplier.35
V. Conclusion

In sum, Edwin Denby adopted fleet readiness as his overriding mission. He understood that a decentralized navy structure compromised that goal. Hence Denby elevated the authority of the Office of Operations as a counter-weight to the navy’s shore establishment. In the process, Denby invoked and applied elements of Frederick Winslow Taylor’s doctrine of scientific management.

The enclosed Taylor-Denby matrix depicts that application. The vertical axis represents the Denby’s decision points; the horizontal axis, the elements of Taylor’s rules; the red cells the application of scientific management at each level of the navy’s decision points.

Though simplistic, the Taylor-Denby matrix suggests two patterns. The cluster of red dots reflects Denby’s endeavor to upgrade Operations as the department’s coordinating focal point, applied to the Fleet and Marine Corps. The absence of red dots, on the other hand, reflects Denby’s inability to impose reforms on the shore establishment and the Navy’s bureau system. In the latter case, Congress’s ban on yard adoption of scientific management was an obvious deterrent.

The Taylor-matrix is not all inclusive, however. The matrix, for example, not only fails to specify Denby’s administrative changes, but masks the application of a learning-feedback dynamic associated with the Navy’s Division of Fleet Training. During World War II, the learning process would take the form of “action reports,” located in a centralized microfilm center in Washington, D.C. for officer training and
edification, somewhat reminiscent of a Detroit Plant convention. The bureau of ships study, cited above testifies to the critical role of fleet exercises.\textsuperscript{36}

Finally, the matrix obscures the long term contribution of the ANMB, cited in the earlier Senate report. For thirteen years the ANMB resided as an agency backwater in the executive branch of government. Following Germany’s invasion of Poland in the fall of 1939, President Roosevelt reached into the federal establishment and brought the ANMB within the authority of the executive office of the President. For the first time, the agency had a budget. By 1941 the U.S. commenced its move toward industrial mobilization. After Pearl Harbor, the ANMB, under the leadership of Ferdinand Eberstadt, increased the supply of machine tool and die equipment, set up a material precedence list and resolved production bottlenecks to such an extent that one observer concluded that Eberstadt had shortened the war by 12 months.\textsuperscript{37}

Equally significant, the ANMB permitted the navy to bypass congresses 1915 Taylor ban at navy yards and arsenals. In fact, the ANMB outsourced much of the Navy’s supply requirements to the U.S. industrial sector - the sector that had been receptive to Taylor’s doctrine of modern management practices. U.S. war production effort obviously made its mark. For every Japanese combatant, the home islands supplied two pounds; for every American combatant, the U.S. supplied four tons.\textsuperscript{38}

In sum, the U.S. experience in the Second World War united, in absentia, Edwin Denby and Frederick Winslow Taylor. Seldom recognized, rarely acknowledged, the accomplishments of Taylor and Denby continue to reside quietly in the dusty archives of a bygone era.
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<th>Executive Line</th>
<th>Staff Planning</th>
<th>Specialization</th>
<th>Standardization</th>
<th>Time Compression</th>
<th>Routing/Scheduling</th>
<th>Outsourcing (Specialization)</th>
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<td>Sec. Navy, Asst. SecNav</td>
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<td>Operations</td>
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<td>Logistics</td>
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<td>Marines</td>
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<td>Yard/Bureaus</td>
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<td>Agency Coordination</td>
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Crash Production

Potus

Sec Nav
CNO
Cominch

GB

Yards
Bureaus

Fleet:
Marines
Infantry

Industrial
groups A
B
C
D
F

Anti-Taylor
Pro-Taylor

Sinha Kounlaska
2015
NOTES


2 U.S. Congress, Senate, Subcommittee on War Mobilization, Committee on Military Affairs, 1945, p. 348.


4 Frederick Winslow Taylor papers, Stevens Institute of Technology, Library archives, April 10, 1916 Taylor to R.M. Watt (Cited as Taylor papers.)

5 Taylor papers, correspondence with W.B. Tardy, November 16, 1910.

6 Taylor papers, correspondence with W.B. Tardy, February 7, 1911.

7 Taylor papers, correspondence with W.B. Tardy, February 12, 1911.


9 Taylor papers, also, Franklin D. Roosevelt to Sanford E. Thompson, May 24, 1913, said Roosevelt:

   “I am not impressed, however with the application of the so-called “Taylor” system to navy yard work.”


   “The banning of Taylor methods in the arsenals, in the navy yards – on instruction of the new assistant navy secretary, Franklin D. Roosevelt – and in all government funded operations by 1916.”


12 Papers of William J. Carr, manuscript Division, Library of Congress, Box 1, Feb. 1906, Diaries of Carr; also Katharine Crane, Mr. Carr of State: Forty-Seven Years in the Department of State, (New York: St. Martin’s Press, 1960), pp. 84-85.
In 1908, Denby served as commissioner of “Land Titles for the Panama Canal Zone.”


“Factory executives will go to school.” Detroit Board of Commerce, the Detroiter, 7, 24 (March 13, 1916), 1.
Detroit Board of Commerce 6, 49 (July 6, 1915): 2-3; “Executive club members study method of scheduling and dispatching production.”

A “Detroit Convention” at the Northway Motor and MFG Co. 1. The Northway systems aims to relieve department foremen of all planning and clerical work in connection with getting work through the shop. This frees their time for duties of supervision over workmen and inspection of equipment and progress of work.”

Boyd Fisher became an expert on labor turnover.

Warren G. Harding papers, letter from Warren Harding to Walter Brown, June 11, 1921, roll #141; Dartmouth Library; also Edwin Denby papers, Burton Historical Collection, Detroit Public Library, Box 5, memorandum for the Secretary of the Navy, from R.S. Griffen, 27 (May 1921, pp. 87-88.

CIS Index, General Order N. 84, Regulations governing the operation of the experimental laboratory, 25 March, 1922.


Congressional Information Service, CIS Index to Executive Documents 1920-1932, General Order No. 103, establishment of an Office of Fleet Training, 6 June 1923.

Admiral Harry Hill, Oral History, Columbia University, Daniels dealt with the Bureau Chiefs individually, poor on coordination between the Bureaus and the Fleet, 72.


“Taylor rejected the traditional linear hierarchy of ‘military’ line of command. In its place Taylor substituted functional management; also Gerald E. Wheeler, Admiral

24 Warren Harding papers, Roll 141, a budget officer comments on U.S. Fleet needs, April 1922. Dartmouth College Library.

25 NARA, RG 127, U.S. Marine Corps., Division of Plans and Policies, War Plan Section, 1915-1946, Box 2, Breckinridge Library, Quantico, VA.


27 NARA, RG 80, Minutes of Secretary’s Council, July 14, 1923; also Jules Augustus Furer, Administration of the Navy Department in World War II, (Washington: U.S. Navy, 1959), 111.


29 Edwin Denby papers, Burton Historical Archives, Detroit Public Library, H.A. Stuart, “Naval Petroleum Reserves Nos. 1, 2, and 3 and Naval Oil Shale Reserves, 14 February 1921, Box 5.


32 U.S. Congress, Senate, to amend merchant marine act of 1920, 66th Cong, Sec. 2, testimony of Edwin Denby, May 16, 1922, 2189.

33 Edwin Denby papers, Bentley Historical Library, University of Michigan, Box 1, 1922.

34 Warren G. Harding papers, Dartmouth College Library, Reel 141, General Order No 76, 25, August 1921, 307.

35 Frederick B. Laidlaw, “The history of the prevention of fouling,” U.S. Naval Institute Proceeding, 78, 7 (July 1952): 77. “In 1922, at the request of the Navy Department experiments in hot plastic anti-fouling paint were begun again by the chemical warfare service in September, 1922, under the Bureau of Construction and Repair.”
