CHAPTER FOUR: WORLD WAR II

As Nazi Germany launched its heaviest air raid yet against London late in 1940, President Franklin D. Roosevelt addressed the nation on December 29th with his "Arsenal of Democracy" fireside chat. He presented his argument to the American people that, as a matter of national defense, the United States must rise to Britain's aid by manufacturing and delivering the munitions and supplies Britain needed to defend itself against Hitler's aggression. Most of Europe had already fallen to the Germans, Germany and Italy were conquering much of Africa, and Japan was conquering parts of Asia. If the U.S. did not help stem the tide of that aggression, the Axis powers would not only control several continents but the high seas as well, putting the Axis in position to launch an attack on the U.S. and the western hemisphere. In January 1941, Roosevelt would ask Congress for authority to lend or lease munitions and supplies to Great Britain and other allies, and soon Congress authorized a formal Lend-Lease Program that helped to sustain the militaries of the England, the Soviet Union, and China in the face of onslaughts mounted by German and Japanese forces. Thus began, after a slow start in the late 1930s, the rapid mobilization of America's industrial might. When the U.S. entered the war in December 1941, the expansion of the United States' capacity to produce munitions was therefore already well underway. According to historian Kent Roberts Greenfield, this use of America's industrial might was the cornerstone of Roosevelt's grand strategy to win the war through material superiority and thereby with the minimum loss of Americans' lives.[1] Historian Alan Gropman says that Roosevelt's grand strategy is what won the war:

> It's an old story, but bears repeating. The United States used a logistic strategy (as opposed to Hitler's *Blitzkrieg* strategy) to build armaments in depth rather than in width. Hitler, who expected to win his wars quickly, did not invest in infrastructure--that is, he did not use his raw materials to build new munitions factories; he used materials to build new munitions. When he discovered that the war was to be a long one, he had to begin building factories after the United States had completed its factory construction. Germany mobilized more men for its army that did the United States (with a much smaller population), spent a greater part of its gross national product on the war than the United States, and had a higher percentage of its women producing in industry than the United States, but it did not produce sufficient armaments and was drowned in a sea of allied munitions.[2]

---

[1]Doris Kearns Goodwin, *No Ordinary Time: Franklin & Eleanor Roosevelt: The Home Front in World War II* (New York: Simon & Schuster, 1994), 194-195; Alan Gropman, "Introduction," in *The Big L: American Logistics in World War II*, Alan Gropman, ed. (Washington, DC: National Defense University Press, 1997), xv-xviii; Kent Roberts Greenfield, *American Strategy in World War II: A Reconsideration* (Malabar, FL: Robert E. Krieger, 1982), 74, cited in Gropman, "Introduction," xvi.

[2]Gropman, "Introduction," xviii.

Ford's Richmond assembly plant was part of the gigantic American system of industrial production that helped to drown Hitler and the Axis powers in a sea of munitions. This chapter describes the activities that took place at the Richmond plant in support of the United States' war effort. The Richmond plant operated during the war under a contract the Ford Motor Company had with the U.S. Army's Ordnance Department to assemble jeeps and to process tanks for shipment overseas. Called the Richmond Tank Depot during the war, it was still owned and operated by the Ford Motor Company, but it was officially under the command of an Army officer in the Ordnance Department.

To help understand the activities at the Richmond Tank Depot during the war, this chapter also provides some historical context for several features of the environment within which the Richmond plant operated. First, there was the overall set of programs the Roosevelt Administration put in place to try to insure that the nation's industrial infrastructure could meet the challenge of war without running short of raw materials, without exploiting workers, without profiteering by individuals or corporations who might try to take advantage of the wartime market, and without wreaking havoc on the economy through dramatic price increases. Then there was the specific set of programs that the Ordnance Department put in place to procure the necessary weapons, ammunition, vehicles, and other supplies needed by the U.S. Army's fighting forces and by America's allies. There was also mobilization of the Ford Motor Company generally to participate in the nation's war production effort. Finally, the chapter provides some historical background on the development of the jeep, the one kind of vehicle that was actually assembled at the Richmond plant. These bits of historical context are interwoven with descriptions of what actually took place at Richmond.

Another theme that is important to consider while examining the history of the Richmond plant is the growth of large-scale technological systems in the United States. Such systems came into public consciousness during the post-World War II period with the advent America's Atlas and Polaris missile programs, the celebrated effort by National Aeronautics and Space Administration (NASA) to put a man on the moon, the emergence of think-tanks like RAND that contracted to perform complex systems analyses, the use of computers in support of those projects and programs, and the widespread efforts by businesses and all levels of government to apply the systems approach to solve social problems.[3] Since that time, several historians have explored the history of the development of systematic approaches to the design and management

---

[3]On the application of the systems approach (systems engineering, systems management, systems analysis, etc.) to military and aerospace projects, see Thomas P. Hughes, *Rescuing Prometheus* (New York: Pantheon, 1998); Agatha C. Hughes and Thomas P. Hughes, eds., *Systems, Experts, and Computers: The Systems Approach in Management and Engineering, World War II and After* (Cambridge, MA: The MIT Press, 2000). On the application of the systems approach to social problems, see Marvin Berkowitz, *The Conversion of Military-Oriented Research and Development to Civilian Uses* (New York: Praeger Publishers, 1970); Robert H. Haveman, *Poverty Policy and Poverty Research: The Great Society and the Social Sciences* (Madison: University of Wisconsin Press, 1987).

of large-scale technological systems within firms in the nineteenth and early twentieth centuries.[4] What set the giant post-World War II projects apart from the earlier examples of the systems approach is that the war-time projects went beyond the individual firm.

The post-World War II projects like Atlas and Polaris were giant government-sponsored projects that required the skills and manpower of several private firms working simultaneously on interdependent facets of the project. The scientists, engineers, and management specialists who devised the techniques for designing and managing such large and complex projects like Atlas and Polaris got their initial experience during World War II. The Manhattan Project was famous for developing and building the atom bomb in an amazingly short time, but seeds of the systems approach really sprouted in the wartime necessity to coordinate the procurement, production, shipment, and distribution of an unprecedented volume of ordnance and other military supplies and to build the facilities to do so. Participants in the development and management of America's successful ordnance production programs in turn credited the successes of their efforts to experiences gained on the large federal dam construction projects of the 1930s, which were also government sponsored and involved the work of several firms all working simultaneously toward the completion of the larger project.[5]

The Richmond assembly plant has an interesting tangential connection to these developments by dint of its being part of the Ford Motor Company's technological system. As described in the previous chapters, Ford had already developed its own complex system within the firm. During the war, Ford participated with many other firms in the much larger government-sponsored projects aimed at supplying the Allied armies, navies, and air forces with the supplies needed to emerge victorious. One young systems manager came out of that experience to take a job at Ford and develop a reputation sufficient to entice newly-elected President John F. Kennedy to name him Secretary of Defense in 1961. Kennedy chose Robert McNamara to be Secretary of Defense in order to apply systems analysis and systems management to the entire Department of Defense. From there, the methods spread to other

---

[4]James R. Beniger, *The Control Revolution: Technological and Economic Origins of the Information Society* (Cambridge, MA: Harvard University Press, 1986); Alfred D. Chandler, Jr., *The Visible Hand: The Management Revolution in American Business* (Cambridge, MA: Belknap Press, Harvard University Press, 1977); David A. Hounshell, *From the American System to Mass Production, 1800-1932: The Development of Manufacturing Technology in the United States* (Baltimore: The Johns Hopkins University Press, 1984); Thomas P. Hughes, *Networks of Power: Electrification in Western Society, 1880-1930* (Baltimore: The Johns Hopkins University Press, 1984).

[5]Allen Schick, "The Road to PPB: The States of Budget Reform," *Public Administration* 26 (December 1966): 243-258; Dean S. Warren, "Human vs. Hardware--A Critical Look at Aerospace as an Urban Problem Solver," *Aviation Week & Space Technology* 94 (7 June 1971): 62; John E. Bokel and Rolf Clark, "Acquisition in World War II," in *The Big L: American Logistics in World War II*, Alan Gropman, ed. (Washington, DC: National Defense University Press, 1997), 102.

federal bureaucracies, to state and local governments, and fostered the short-lived belief that, if

America could put a man on the moon, the nation could use the same methods to solve its pressing social problems.[6]

McNamara graduated in the late 1930s from the University of California at Berkeley with a degree in economics and minors in mathematics and philosophy. He then went to the Harvard Business School, finishing a graduate degree in 1939. McNamara was serving as a junior faculty member at Harvard when Japan attacked Pearl Harbor. Shortly thereafter, President Roosevelt challenged the nation to build 50,000 airplanes per year to fight the war. To manage such a drastic increase in its forces, the Army Air Corps needed to train statistical control officers, and it asked Harvard to help. McNamara worked with Charles B. Thornton, a lieutenant and statistical whiz in charge of the Air Corps' statistical control program that was intended to allow central command to know and respond to information about the status of airplanes, the conditions of the men, and the state of operations. An example of the influence Thornton and his young team of statisticians had on military decision-making came as the end of the European war approached, and the American military was planning to move many of its B-17 bombers from Europe to the Pacific. Thornton's team examined the costs involved and made a convincing argument to their superiors that it would be more cost-effective to build new B-29s in the U.S. and fly them to the Pacific than it would be to try to fly the B-17s to the Pacific. And late in the war, McNamara used his statistical expertise to help Curtis LeMay's XXI Bomber Command plan the logistics of fuel supply necessary to fly B-29s from India to bases in China and then on to targets in Japan. McNamara's statistical methods were credited with increasing the flying time of planes in the XXI Bomber Command by 30%.[7]

Immediately after the war, Thornton asked McNamara to join a team he was assembling from the statistical control unit to find work together with a large, private corporation. Thornton was able to get his team, including McNamara, hired by the Ford Motor Company. Because of their youth and their intellectual approach to decision-making, the team earned the name "Whiz Kids" shortly after they moved to Dearborn. Thornton left Ford in two years to work for Hughes Aircraft, and in 1953 he left Hughes to form Litton Industries. Meanwhile, McNamara emerged as the member of Thornton's team at Ford with the most talent and drive. The Whiz Kids' methods ruffled some feathers among the old-timers at Ford, who were steeped in the ethos of non-college-educated genius embodied in the company's founder. Nevertheless, the Whiz Kids, and especially McNamara, had the respect and support of Henry Ford II, president of the company since the war. To improve the performance of the company, McNamara's team had to effect major changes in the manufacturing division, headed by Max Wiesmyer. McNamara insisted that management decisions in manufacturing be based on statistical analysis, not on the

---

[6]See Hughes' chapter on "The Spread of the Systems Approach" in *Rescuing Prometheus*, 141-195.

[7]Robert S. McNamara, *In Retrospect: The Tragedy and Lessons of Vietnam* (New York: Random House, 1995), 5-9; David Halberstam, *The Reckoning* (New York: William Morrow and Company, Inc., 1986), 204-205; Fred Kaplan, *The Wizards of Armageddon* (Stanford: Stanford University Press, 1991), 250-251.

personal relationships Wiesmyer had established with his branch plant managers. McNamara was so insistent on the new management approach, and it so went against Wiesmyer's personality, that Wiesmyer suffered a psychological break-down in the mid-1950s. McNamara emerged victorious from the restructuring of Ford management, and the Ford Motor Company named him president in 1960.[8]

Seven weeks after McNamara became president of Ford, on December 6th, Robert Kennedy called to ask him to meet with John F. Kennedy, the President-elect, who then asked McNamara to become the Secretary of Defense. Once in office, McNamara brought like-minded systems analysts into top positions in the Department of Defense, including men like Charles Hitch and Alain Enthoven from RAND. McNamara, Hitch, and Enthoven were as disruptive of traditional ways of doing things at Defense as McNamara and the Whiz Kids had been at Ford. Based on their systems analyses, they halted many of the military's favorite new weapons projects, plowed additional resources into new weapons they believed were better suited to the needs of a modern military, and implemented new methods for managing the military services and their ever more complex weapons systems. One of the key tools of the new management methods was the computer, a technology that had been born at the end of World War II to perform the tremendous mathematical ballistics computations the Army needed in support of its artillery. The computer seemed to give the systems analysts and systems engineers new powers. With these apparent new powers, many of the Defense Department's experts and contractors moved to apply their methods elsewhere in government to solve pressing social problems. They soon learned that problems in society are less easily solved by quantitative analysis that than are the problems of designing and managing complex weapons systems, or of managing automobile manufacturing companies, for that matter.[9]

A. The Roosevelt Administration Mobilizes Industry for War

Much has been written about the new set of government programs and agencies the Roosevelt administration put in place to mobilize American industry for war. A mere summary will suffice here. One thing that must be noted about these programs and agencies at the outset is that Roosevelt created them on the heels of the New Deal, during which the federal

---

[8]McNamara, *In Retrospect*, 10-13; Halberstam, *The Reckoning*, 206-223, 236-244.

[9]McNamara, *In Retrospect*, 13-15; Kaplan, *The Wizards of Armageddon*, 252-257; Hughes, *Rescuing Prometheus*, 160-176, 185-195; David Jardini, "Out of the Blue Yonder: The Transfer of Systems Thinking from the Pentagon to the Great Society, 1961-1965," in *Systems, Experts, and Computers: The Systems Approach in Management and Engineering, World War II and After*, Agatha C. Hughes and Thomas P. Hughes, eds., (Cambridge, MA: The MIT Press, 2000), 311-357; Davis Dye, "The Limits of Technology Transfer: Civil Systems at TRW, 1965-1975," in *Systems, Experts, and Computers: The Systems Approach in Management and Engineering, World War II and After,* Agatha C. Hughes and Thomas P. Hughes, eds., (Cambridge, MA: The MIT Press, 2000), 359-384.

government gained valuable experience in working with firms in private industry. The experience of managing multiple firms working together on giant projects has already been described. In addition the government gained valuable experience during the New Deal in protecting its programs against excess profits by firms trying to take advantage of the situation and in establishing wage and price safeguards in the face of inflationary pressures that could ensure from massive injections of government funds into certain sectors of the economy. The potentials for inflation and excess profits would be even greater during wartime, as government and industry had learned during World War I. Another pitfall both government and industry wanted to avoid was the havoc that befell the U.S. economy following World War I, when reconversion of industry to peacetime pursuits was poorly planned.[10]

Several government organizations for stimulating or coordinating mobilization already existed as war approached. For example, the government had created the Army and Navy Munitions Board in 1922, but it had little money or authority until 1939, when Roosevelt put it under his direct control, giving it a greater role in planning industrial mobilization programs and setting priorities for procurement contracts let by the Army, Navy, Coast Guard, and U.S. Maritime Commission. And the Maritime Commission had already begun to expand the nation's ship-building capacity in the late 1930s. In May 1940, following the surrender of several European nations in the wake of Hitler's *Blitzkrieg*, Roosevelt issued an Executive Order creating the Office of Emergency Management, intended to coordinate the activities of the many government agencies that the government was creating to implement various facets of the mobilization program. He also asked Congress to authorize hundreds of millions of dollars to manufacture fighters and bombers and to build additional bases, depots, hospitals, and other physical plant needed for the anticipated expansion of the military. The burst in mobilization agencies and contracts yielded increasing dissatisfaction among industry, labor, farmers, and Congress, leading Roosevelt to try to reorganize matters. He issued a new Executive Order in January 1941, creating the Office of Production Management (OPM). In the face of continuing squabbles among top Army and Navy officers, industry leaders, and other interests essential to the successful mobilization of the economy for war production, Roosevelt issued another executive order on 16 January 1942, abolishing the OPM and establishing the War Production Board (WPB), to be headed by Donald Nelson, a former executive at Sears & Roebuck who had joined the Roosevelt Administration late in the New Deal.[11]

---

[10]Bokel and Clark, "Acquisition in World War II," 98-103; Burnham Finney, *Arsenal of Democracy: How Industry Builds Our Defense* (New York: Whittlesey House, McGraw-Hill Book Company, Inc., 1941), 5-8.

[11]"Guidebook to Priorities: How They Operate and Who Handles Them," *Business Week* (20 September 1941): 43-56; "Don Nelson: The Man from Sears Goes to War," *Fortune* 24 (November 1941): 86, 153; R.A. Winnacker, "The National Emergency, July 1940 to December 1941," unpublished report in NARA, RG-156, Entry 654J, box 21, pp. 106-112; Gropman, "Industrial Mobilization," in *The Big L: American Logistics in World War II*, Alan Gropman, ed. (Washington, DC: National Defense University Press, 1997), 18-31; Hugh Conway and James E. Toth, "Building Victory's Foundation: Infrastructure," in *The Big L: American Logistics in World War II*, Alan Gropman, ed. (Washington, DC: National Defense University Press, 1997), 204-

To set the tone for the new agency, which he had not yet announced, and to inspire American citizens and companies to rise to the challenge, Roosevelt addressed the nation through his State of the Union Address to Congress on January 6th:

> The superiority of the United States in munitions and ships must be overwhelming, so overwhelming that the Axis nations can never hope to catch up with it. In order to attain this overwhelming superiority, the United States must build planes and tanks and guns and ships to the utmost limit of our national capacity. We have the ability and capacity to produce arms not only for our own armed forces, but also for the armies, navies and air forces fighting on our side. This production of ours in the United States must be raised far above its present levels, even though it will mean the dislocation of the lives and occupations of millions of our own people. We must raise our sights all along the production line. Let no man say it cannot be done. It must be done--and we have undertaken to do.
>
> Only this all-out scale of production will hasten the ultimate all-out victory. Speed will count. Lost ground can always be regained--lost time, never. Speed will save lives; speed will save this nation which is in peril; speed will save our freedom and civilization--and slowness has never been an American characteristic.[12]

In his speech, Roosevelt called on the nation to expand its production goals for ordnance, increasing the goals for airplanes built in 1942 from 50,000 to 60,000 and to 125,000 in 1943, and increasing the goals for tanks to 45,000 in 1942 and to 75,000 in 1943. To arrive at those figures, Roosevelt had arbitrarily revised them upward from levels his advisors had thought attainable. Commenting on the speech, *US News & World Report* said that the figures in Roosevelt's production goals "reached such astronomical proportions that human minds could not reach around them."[13] Reflecting on Roosevelt's speech, Donald Nelson later wrote:

> The meeting at which these figures were first mentioned was inspirational, but also rather awesome. We thought that the goals set by the President were out of the question. But the records will show that he knew his country better than we did.[14]

According to a tally by the Automotive Manufacturers Association after the war, the automotive

---

208.

[12]FDR quoted in Nelson, *Arsenal of Democracy*, 186-187.

[13]Nelson, *Arsenal of Democracy*, 187; *U.S. News & World Report* quoted in Goodwin, *No Ordinary Time*, 313.

[14]Nelson, *Arsenal of Democracy*, 187.

industry by itself made 3,250,000 airplane, marine, tank, and truck engines during the war; nearly 6,000,000 guns of various kinds (about 50% of the nation's total production); more than 200,000

tanks and other combat vehicles; 2,600,000 military trucks; 22,160 airplanes; and numerous other items like ammunition, rockets, helmets, water and gas cans, electric motors, etc.[15]

During the war, the Roosevelt administration created a plethora of special agencies and government-owned corporations to manage and engage in facets of the economy. Other umbrella agencies were created to coordinate the activities of agencies managing interdependent facets of the economy. For example, the Office of Price Administration had the authority to control prices in the economy as necessary to prevent inflation. The War Labor Board had the authority to approve or disapprove any wage increases or decreases. The Metals Reserve Corporation purchased ores and metals from neutral countries and then resold those commodities to U.S. manufacturers engaged war production. The Defense Plant Corporation built plants for processing certain strategic materials, like aluminum, manganese, synthetic rubber, and tungsten, and then leased the facilities to private entities who operated them.[16]

One result of all those government programs aimed at diverting materials and supplies to war production, coupled with price controls, was that some goods needed by the civilian population were in short supply. In an effort to keep the shortages from wreaking instances of chaos in the market, the federal government rationed some commodities, like sugar, tires, and gasoline. Although rationing placed some hardships on the U.S. population during the war, it also should be stated that the U.S. applied a smaller proportion of its gross national product to the war effort than any of the Axis powers or our major allies. It was the position of the War Production Board that Americans were "subjected to inconvenience, rather than sacrifice." During the peak years of war production for the U.S., 1943 and 1944, the nation devoted 42% of its gross national product to war purposes (up from 1.4% in 1939). In comparison, Great Britain, Canada, and Japan each spent 51% of their respective gross national products on war purposes in 1944.[17]

---

[15]Automotive Manufacturers Association, *Freedom's Arsenal: The Story of the Automotive Council for War Production* (Detroit: Automotive Manufacturers Association, 1950), 199-201.

[16]For overviews of the various government programs established to manage the production of materiel for the war effort, see Nelson, *Arsenal of Democracy*; Gropman, "Industrial Mobilization," 1-95; Donald L. Losman, Irene Kyriakopoulos, and J. Dawson Ahalt, "The Economics of America's World War II Mobilization," in *The Big L: American Logistics in World War II*, Alan Gropman, ed. (Washington, DC: National Defense University Press, 1997), 145-191.

[17]War Production Board, *Wartime Production Achievements and the Reconversion Outlook, Report of the Chairman* (Washington, DC: Government Printing Office, 1945), 1-2, quoted in Gropman, "Industrial Mobilization," 58; see also John Perry Miller, *Pricing of Military Procurements* (New Haven: Yale University Press, 1949), 24; Losman, et al, "The Economics of America's World War II Mobilization," 159-160.

B. Military Production as War Approaches

The Ford Motor Company's Richmond assembly plant, although a fairly large building in its own right, was but a small cog in the United States' immense homefront system of production that supplied the nation's soldiers, sailors, and airmen with the fighting equipment needed to win World War II. That system was mobilized and managed by the ordnance programs of U.S. Army and the U.S. Navy. The Richmond plant worked under contract to the Army's Ordnance Department, an exhaustive history of which is beyond the scope of this report. A few features of that history are summarized here to provide narrative context for the work accomplished at the Richmond plant.[18]

As the United States entered the 1940s, much of the rest of the world had gone to war. Hitler had attacked and conquered Poland in 1939, and by the end of 1940 Nazi Germany controlled most of the rest of western and central Europe, including France, Belgium, Denmark, Norway, and the Netherlands. Only Great Britain remained as an obstacle to Hitler's dream of dominating all Europe. In Asia, Japan had conquered much of Korea and much of China and southeast Asia. The United States was still trying to emerge from the Great Depression, but it appeared to many in the federal government and the U.S. military that war against the Axis powers was unavoidable. Among the populace, however, feelings of isolationism were strong. Many Americans opposed going to war, and they opposed the military taking steps to prepare for war. In the face of these circumstances, American military planners knew that they had to make preparations for war, should it come to the U.S. They knew, among other things, that they needed to begin mobilizing the nation's manufacturing capacity to produce ordnance, the equipment armies and navies need to wage war.

Several factors made the task more complicated in the U.S. than it had ever been before. Warfare had become much more mechanized. In addition to rifles and artillery, armies now needed tanks and other fighting vehicles, trucks of all sizes, a wider array of communications devices, and for the first time airplanes would play a dominant role in warfare. Moreover, the United States government did not sponsor private companies, such as Vickers Armstrong in England or Krupp in Germany that specialized in designing and manufacturing munitions. In the U.S., responsibility for design and development of ordnance for the Army fell to the Army's own Ordnance Department, which then contracted for most production with private companies as necessary. The Army maintained six permanent arsenals, each of which specialized in a particular class of arms or ordnance, engaging in research and development of future ordnance systems as well as production. The arsenals could meet demand during peacetime, but they did

---

[18]For a very thorough history of the Army's diverse activities during the war, see the Army's published multi-volume series, "United States Army in World War II." Two volumes in the series on the Technical Services are especially useful in documenting the history of the Ordnance Department: Constance McLaughlin Green, Harry C. Thomson, and Peter C. Roots, *The Ordnance Department: Planning Munitions for War* (Washington, DC: Government Printing Office, 1955); Harry C. Thomson, and Lida Mayo, *The Ordnance Department: Procurement and Supply* (Washington, DC: Government Printing Office, 1960).

not have the production capacity to meet wartime needs. They did, however, have the capacity to provide technical assistance to private companies producing ordnance under contract. Another matter was the scale of the impending war was much greater. During the American Civil War, the U.S. Army had had to equip and supply about 1.5 million soldiers. In First World War, the U.S. Army had about 4 million men to equip. It appeared that the scale of the Second World War would be much greater. Finally, America's Army had fought only on the North American continent in the Civil War, and its battles were confined mainly to northern Europe during the First World War. But the Second World War was being fought on several continents. The ordnance the U.S. Army needed to supply its troops had to function reliably under several extremes of terrain and climate.[19]

1. History of the Ordnance Department to 1941

During the Revolutionary War, the Continental Congress kept to itself the responsibility for procurement of munitions, assigning the inspection, storing, and distribution of ordnance to particular officers in the Continental Army. The colonies did not produce much ordnance, so the Continental Congress had to rely on purchases from France, on American privateers who pirated supplies on the high seas, and on the militia and Continental Army, which captured British stores. Other the Keeper of Military Stores, the new nation maintained no ordnance function after the British surrender in 1782 and until 1794, when Congress authorized the President to establish two federal arms factories. They were the Springfield Armory, which began producing muskets in 1795, and Harpers Ferry Armory, which began the next year. To supply the Army and the militia with guns, the government also contracted with private contractors, the most notable of whom was Eli Whitney, who convinced the Army that he could manufacture muskets using interchangeable parts, a concept he and others in the U.S. had learned from French practice. Although Whitney was never able to perfect his concept in practice, the Ordnance Department, established as a permanent part of the Army in 1812, embraced his concept, and it eventually revolutionized armory practice as well as the way the Army maintained soldiers's weapons in the field. Whitney's concept also carried into the private sector, where manufacturers of items like sewing machines and the McCormick reaper perfected a method that Europeans called the "American system" of manufactures. U.S. Ordnance policy thereby contributed significantly to the Industrial Revolution in the U.S.[20]

---

[19]Green, et al, *The Ordnance Department: Planning Munitions for War*, 3-13.

[20]Green, et al, *The Ordnance Department: Planning Munitions for War*, 14-16; David Hounshell, *From the American System to Mass Production, 1800-1932: The Development of Manufacturing Technology in the United States* (Baltimore: The Johns Hopkins University Press, 1984): 3, 28-32; Merritt Roe Smith, *Harpers Ferry Armory and the New Technology: The Challenge of Change* (Ithaca, NY: Cornell University Press, 1977), 106-107; Smith, "Army Ordnance and the 'American System' of Manufacturing, 1815-1861," in Merritt Roe Smith, ed. *Military Enterprise and Technological Change* (Cambridge, MA: The MIT Press, 1985), 39-86.

The Ordnance Department of the Army had several responsibilities during the nineteenth century. One was the design and adoption of new weapons. In this regard, Army conservatism tended to delay the acceptance of new weapons systems, such as the breech-loading rifle, which the U.S. Army did not adopt until after the Civil. Another responsibility was the inspection of arms and other ordnance produced by contractors for the military. A third was to supply Army units in the field with the ordnance they needed. In part because of the United States' location on the North American continent, the capabilities of the Ordnance Department were not severely tested until World War I, when the American Army had to pit its weapons against the Europeans.[21]

When the European war erupted in 1914, most Americans did not believe the United States would become involved The Chief of Ordnance was concerned that should the U.S. be drawn into the war the government arsenals were ill-equipped to produce conventional ordnance on the scale that would be necessary, and the American arsenals had little capacity at all to make tanks, large artillery, and other new kinds of ordnance that were appearing on the battlefield. Congress refused, however, to contract with private manufacturers unless they could beat the costs at the government arsenals, something that rarely happened. The only reason that American manufacturers were prepared to aid in the American war effort, when the U.S. finally entered the war in 1917, was because they had taken orders from European governments for ordnance, and those contracts yielded only limited preparedness. Moreover, the Ordnance Department did not have enough trained officers to implement a program for the supply of America's war effort. Thus, with the exception of rifles and rifle ammunition, the American Expeditionary Force depended mainly on British and French suppliers for its ordnance needs. Toward the end of the war, though, the Ordnance Department was able to greatly improve its procurement of ordnance from private manufacturers. This improvement came as a result of two new approaches: the decentralization of authority to eleven district offices around the country, and putting civilians in charge of those district offices.[22]

The man put in charge of organizing the new system of ordnance districts was Col. Guy E. Tripp, who before the war had been chairman of the board of directors at Westinghouse Electrical and Manufacturing Company. He chose local industrialists to head the districts. Although the legal work and final approval had to take place in Washington, DC, the Army gave the district chiefs authority to conduct the preliminary negotiations leading to contracts with manufacturing firms in their districts. The district chiefs also supervised the work done under contract and then inspected the ordnance delivered. Because the district chiefs were acquainted, if not personally then at least in terms of professional culture, with the managers of the firms with which the Ordnance Department was doing business, the chiefs were able to foster a sense of cooperation with industry. Shortly after the Ordnance Department had put the system of district in place, military production began to increase markedly. Although the district chiefs were not solely responsible for that performance, the Ordnance Department was impressed

---

[21]Green, et al, *The Ordnance Department: Planning Munitions for War*, 18-20.

[22]Green, et al, *The Ordnance Department: Planning Munitions for War*, 20-27.

enough with the success of the plan that it created two more ordnance districts before the war ended. Following the end of the war, the ordnance districts brought their activities to a close and ceased to exist in 1919. Over the next few years, as the Army review its programs during the war, it realized that the system of ordnance districts had been one of the more effective developments of the war. The Ordnance Department re-established the districts in 1922.[23]

Brig. Gen. Clarence C. Williams became the Chief of Ordnance in May 1918. In the aftermath of the war, he and other national leaders recognized that the nation had been poorly prepared for war. He determined to improve the organization of the Ordnance Department after the war. Yet other segments of society sought to insulate the United States from future foreign entanglements, leading in the short term to Congress refusing to join the League Nations, and leading over the ensuing twenty years to minimal investment in new military equipment. In the period between 1919 and 1939, under the system of organization created by Williams, the Ordnance Department had three divisions: Administration, Manufacturing (or Industrial Service), and Field Service. The Manufacturing Division was in charge of design, development, testing, production, procurement, and inspection of all ordnance acquired by the Army, whether made by the arsenals or produced under contract by private industry. When re-established in 1922, the ordnance districts fell under the direction of the Manufacturing Division. Field Service had charge of the storage, maintenance, and distribution of ordnance owned by the Army. There was also a Technical Staff, comprised of officers and civilians who kept abreast of both domestic and foreign ordnance developments and who advised all the divisions, working most closely with the Manufacturing Division, especially in the testing of new equipment at the Aberdeen Proving Ground. Williams served as Chief of Ordnance until 1930. Meanwhile, planners elsewhere in the government determined that surplus ordnance produced during and after the war as well as enemy equipment captured during the war should be stored to maintain a level of preparedness not previously sought.[24]

Budgets for Ordnance Department between the wars are a gauge of the agency's levels of activity. In 1920, 1921, and 1922, Congress appropriated $21 million, $23 million, and $13 million, respectively, for the Ordnance Department. Annual appropriations then dropped to about $7 million for the years 1923-1927. For the next eight years, appropriations held fairly steady at about $12 million per year before rising to $17 million and $18 million in 1936 and 1937, respectively. Those appropriations rarely rose above 4% of total War Department appropriations for the years 1920-1935. Another gauge of Ordnance Department activity between the wars is employment. In 1921, as post-war activities were still drawing to a close, the department had about 4,000 military workers and over 14,000 civilian employees. The following year, those figures declined to about 3,000 military and 8,000 civilian, respectively. From 1923 until the mid-1930s, the number of military workers at the Ordnance Department held steady at about 2,500, while the number of civilian workers dropped below 5,000 in the

---

[23]Green, et al, *The Ordnance Department: Planning Munitions for War*, 26-27; Levin H. Campbell, Jr., *The Industry-Ordnance Team* (New York: Whittlesey House, 1946), 18.

[24]Green, et al, *The Ordnance Department: Planning Munitions for War*, 26-27, 30-34.

mid-1920s and then gradually rose to about 10,000 in the mid-1930s. A third measure of Ordnance Department activity is the extent to which it met its ten-year plan, launched in 1925, to equip the Army with new weapons. The Army had set itself fairly modest goals, for example, to re-equip itself with artillery. By 1933, however, it was only halfway to its goal for the 75-mm howitzer and the 3-inch antiaircraft gun and a third of the way there for three other kinds of artillery. For five other kinds of artillery, the Army had yet to receive any weapons or, in some cases, even receive appropriations to have the weapons made.[25]

As noted above, appropriations for ordnance began to increase somewhat after 1935. President Franklin D. Roosevelt was growing concerned by hostile conditions brewing abroad, and he began to forcefully urge Congress to appropriate sufficient funds to allow the Army to correct the ordnance deficiencies it had identified. Congress authorized $24 million for fiscal year 1938, during which year the situation in Europe appeared to grow even more grave. FDR sent Congress a special message in January 1938 itemizing additional weapons and other ordnance the nation's military needed to prepare for possible war, and he also asked the Army to prepare a mobilization plan, accompanied by an estimate of what it would cost to implement. Congress appropriated $112 million for fiscal year 1939, which the Army was able to begin spending in July 1938. The funding allowed so great an increase in Ordnance Department activity that Assistant Chief of Ordnance, Brig. Gen. Earl McFarland recalled in 1950 that the war had actually begun for the Ordnance Department in 1938. Based on the Army's estimates, Roosevelt requested and received from Congress in 1939 an appropriation of $477 million for fiscal year 1940, most of which was allotted to the Army Air Corps to help the aircraft industry expand its industrial plant. As mentioned above, Albert Kahn designed several of the new airplane factories.[26]

In preparing for possible war and the necessary mobilization of the nation's industrial infrastructure, one of the Ordnance Department's most important tasks was to plan how it would procure needed arms, ammunition, and equipment. The department based its procurement plan on data supplied by the arsenals and the ordnance districts (now thirteen in number). Even though the ordnance districts each had only three or four people on staff during most of the inter-war period, one of their most important tasks was to survey the capabilities of firms in their districts in terms of physical plant, labor, and engineering and managerial expertise. The districts had to assess the suitability of firms' resources to meet various ordnance manufacturing needs, and the districts had to up-date their surveys periodically. Some districts were better at keeping their surveys up-to-date, with the New York district having one of the best records. Among the data the districts collected were informal agreements from manufacturers, in the form of schedules, stating how much orders for specific quantities of military weapons or equipment would cost. By 1937, the districts had negotiated with more than 645 industrial plants to

---

[25]Green, et al, *The Ordnance Department: Planning Munitions for War*, 40-47; Gropman, "Industrial Mobilization," 10-12.

[26]Green, et al, *The Ordnance Department: Planning Munitions for War*, 48-49; Gen. McFarland's recollection is cited on p. 49. See also Gropman, "Industrial Mobilization," 12-17.

generate 2,500 such schedules. The 1939 appropriation gave the Ordnance Department the funds to allow the ordnance districts to greatly increase their staffs, which jumped from a handful of employees to dozens, and as many as 51 in the case of the Philadelphia district. The districts immediately set to work up-dating their surveys. The surveys, coupled with expanded staffing,

allowed the districts to achieve impressive results with the greatly increased number of procurement contracts they let in 1939 and 1940.[27]

Another governmental entity, the Army and Navy Munitions Board, also worked with the National Machine Tool Builders Association to monitor the nation's capacity to produce machine tools. The nation's manufacturers of machine tools usually operated at below capacity. That capacity was large enough to supply industrial needs during small peacetime booms, but it could not meet the anticipated demand of full industrial mobilization for war. For example, a 1937 estimate showed that with mobilization the Army would require more than 20,000 additional lathes, 16,000 of which would be needed by the Ordnance Department. With their increased staffs after 1939, the ordnance districts began to report shortages of machine tools at the plants producing weapons, ammunition, and equipment under the new contracts of 1939 and 1940. The nationwide shortage of machine tools was the major bottleneck preventing contract schedules being met under expanded program of ordnance production in 1939 and 1940, and the problem continued for some time after the U.S. entered the war following the attack on Pearl Harbor.[28]

Another program that helped the nation's industrial firms prepare to mobilize for war was the Educational Orders Act of 1938, in which Congress appropriated $2 million in additional funding for the Ordnance Department to place small orders with companies, principally to give them experience in manufacturing munitions. The Act authorized the Secretary of War to solicit bids from firms for educational orders and to award orders to firms not on the competitiveness of their bids but rather on their capability, in the Secretary's judgement, to be able to undertake large wartime contracts. The Ordnance Department awarded the first four educational orders in 1939 to Winchester Repeating Arms Company of New Haven for M1 rifles, to R. Hoe & Company of New York for recoil mechanisms for 3-inch antiaircraft guns, to S.A. Woods of Boston for machining 75-mm artillery shell casings, and to American Forge Company of Chicago for casting 75-mm artillery shell casings. In 1939, Congress authorized an additional $32.5 million for educational orders. In 1939 and 1940, the Ordnance Department placed 76 more educational orders, most of them for ammunition. After February 1940, the department also started awarding contracts for production studies. These were smaller contracts, and they gave firms the opportunity to study what was involved in producing ordnance for the military.[29]

Hitler's Germany invaded Poland on 1 September 1939, and two days later England and France declared war on Germany. On 8 September, President Roosevelt declared a state of limited emergency, authorizing the Army to build itself up to full strength. About the same time,

---

[27]Harry C. Thomson, "Organization of the Ordnance Department, 1940-1945," unpublished report in NARA, RG-156, Entry 948, box L239, pp. 8-10; Green, et al, *The Ordnance Department: Planning Munitions for War*, 53-57.

[28]Lucius D. Clay, "The Army Supply Program," *Fortune* 27 (February 1943): 96-97, 225-232; Green, et al, *The Ordnance Department: Planning Munitions for War*, 56-57.

[29]Green, et al, *The Ordnance Department: Planning Munitions for War*, 57-59; Bokel and Clark, "Acquisition in World War II," 103-104.

the Ordnance Department put place a $6 billion plan to meet its procurement responsibilities under the Protective Mobilization Plan for the Army. As the Ordnance Department continued placing orders with private firms for materiel, those and many other American firms began doing a brisk business with the French and British armies, which desperately needed weapons and equipment. Indeed, in 1939 and 1940, American companies produced more weapons, ammunition, airplanes, and other military equipment for foreign armies than they did for the United States Army. Concerned that such a large volume of sales might endanger U.S. neutrality, Congress passed legislation in November 1939 requiring that all sales be for cash. In spring 1940, Nazi Germany conquered Norway, Denmark, Belgium, and the Netherlands, and in May Hitler's army invaded France. Although the American public and Congress still hoped to avoid war, Congress recognized the growing threat and appropriated hundreds of millions of dollars for ordnance procurements. With the increased appropriations, the Ordnance Department also developed procedures to hasten negotiation and execution of contracts with private firms. France surrendered in July 1940, and the following June Hitler invaded the Soviet Union. Each worsening situation in Europe led to greater appropriations and calls for more speed in mobilizing the Army and in mobilizing industry to meet the Army's needs.[30]

Several other programs implemented by the United States government also acted to spur the mobilization of industry and to alter the stores of ordnance available to the U.S. Army. As the German army approached the English Channel and the British effected the evacuation of their troops at Dunkerque, most of the British equipment had to be left behind in France. President Roosevelt and his military advisers decided to designate old ammunition and obsolete equipment as surplus so that it could be given to Britain to replace some of its lost materiel. Within two months, the U.S. shipped vast quantities of guns and ammunition to Britain to aid in the island's defense. This action made shortages for the U.S. Army more acute, but the Ordnance Department was intended to address the problem by accelerating procurement. At the same time, American firms continued to make equipment for the British Army, which differed from what the American Army used. By autumn 1940, Britain agreed to accept American designs for ordnance, thus streamlining American industries production of materiel for both armies. When Britain ran out of cash to purchase American ordnance, Congress passed the Lend-Lease Act, and the United States started financing British purchases. Even though most items now being produced were standardized, whether for the Allied war effort or for equipping and training U.S. troops, the two delivery streams complicated matters for the Ordnance Department, stimulating more steps to manage production more efficiently.[31]

Throughout this period, one of the greatest impediments to American industry meeting

---

[30]Green, et al, *The Ordnance Department: Planning Munitions for War*, 65-69; Gropman, "Industrial Mobilization," 18-20.

[31]Green, et al, *The Ordnance Department: Planning Munitions for War*, 72-80. For a general overview of the Lend-Lease Program, see Marcus R. Erlandson, "Lend-Lease: An Assessment of a Government Bureaucracy," in *The Big L: American Logistics in World War II*, Alan Gropman, ed. (Washington, DC: National Defense University Press, 1997), 265-292.

the demand of the Ordnance Department and the British Purchasing Commission continued to be the shortage of machine tools, demand for which was about twice what American machine-tool makers could produce. Shortages in machine tools in turn led to delays in the delivery of ordnance, especially small arms ammunition. In its effort to respond to the shortage, the machine tool industry greatly expanded its capacity in the early 1940s, with half of the financing for expansion coming from the industry itself. In 1940, the industry produced less than $500,000,000 in machine tools; by 1942 it was able to produce more than $1 billion in machine tools. Ordnance also worked with industry to locate existing machine tools that were under-utilized and could be diverted *in situ* to war production. Ten of the thirteen Ordnance Districts established Machine-Tool Panels to locate such machine tools and redistribute (not physically but in terms of task assignments) them to work on Ordnance contracts, often by means of sub-contracts.[32]

Overall organization of the Ordnance Department had not changed since 1920. It still featured four sections, the General Office, Technical Staff, Industrial Service (which supervised procurement and production), and Field Service (which supplied Army units with what they needed). The Industrial Service was the largest of the sections, especially with industry mobilizing for war. In 1940, Maj. Gen Charles M. Wesson was Chief of Ordnance. As the demands for industrial production grew, Wesson decided to de-emphasize research and development in favor of bolstering the management of production. He therefore broke the Industrial Service into three operating units, putting a Colonel in charge of each. He named Col. Burton O. Lewis assistant chief for production and procurement, transferred Col. Gladeon M. Barnes from being chief of the Technical Staff to serve as assistant chief of the Industrial Section for engineering, and named Lt. Col. Levin H. Campbell, Jr. assistant chief for facilities. These three men each held the informal title of vice president within the Industrial Service, titles in keeping with Wesson's sense that Ordnance had come to resemble a giant corporation. The vice presidents supervised the expansion of their respective units from 1940 onward. The Ordnance Department maintained this structure through 1942 with only moderate change. The most important changes occurred in July 1941, when Wesson abolished the Technical Staff entirely, distributing its tasks and staff among the units of the Industrial Service. Technical Staff functions went primarily to Barnes' division, and his title changed to assistant chief for research and engineering. Wesson also added a division and a fourth vice president: Brig. Gen. Richard H. Somers became assistant chief for inspection, having charge of testing at Ordnance proving grounds and of all inspection work conducted by the Industrial Service.[33]

2. The Ordnance Department During World War II

---

[32]Green, et al, *The Ordnance Department: Planning Munitions for War*, 76; Campbell, *The Industry-Ordnance Team*, 133-143.

[33]Thomson, "Organization of the Ordnance Department, 1940-1945," 1-2, 11-13; Green, et al, *The Ordnance Department: Planning Munitions for War*, 83-88.

Gen. Wesson's term as Chief of Ordnance expired in spring 1942, and President Roosevelt replaced him with Gen. Levin H. Campbell. A 1909 graduate of the U.S. Naval Academy, he resigned the Navy to work in private industry before re-enlisting as an officer in the Army. He served in the Ordnance Department during World War I and then continued at various Ordnance postings during the 1920s and 1930s working on the engineering and production of artillery, tanks, and ammunition. He received praise for successfully introducing automatic machinery to the artillery ammunition assembly line at the Frankfort Arsenal in 1939 and 1940. Then as assistant chief for facilities in the Industrial Service, he supervised the planning and construction of new Ordnance plants. When he was promoted to Chief of Ordnance in May 1940, Campbell not only shuffled some of the administrators in the department; he also reorganized it in some significant ways. He appointed an advisory staff comprised of four prominent industrialists: Bernard Baruch, who had chaired the War Industries Board during World War I; K.T. Keller, president of Chrysler Corporation; Benjamin F. Fairless, president of U.S. Steel; and Lewis H. Brown, president of Johns-Manville Corporation. He also established three new operating divisions at the level of the Industrial Service and the Field Service. They were named the Military Training, Technical, and Parts Control divisions.[34]

Campbell also reorganized the Industrial Service, now called the Industrial Division and under the supervision of Maj. Gen. Thomas J. Hayes. By the time he had become Chief of Ordnance, each of the four divisions had developed staffs, he believed, that could manage their responsibilities without needing the supervision of assistant chiefs. Another change Campbell inaugurated for the Industrial Division was to decentralize some of its supervisory offices. One such decentralized office he created was the Field Director of Ammunition Plants (FDAP), which he located at St. Louis next door to the office of the St. Louis Ordnance District. The FDAP had administrative charge of some 60 ammunition factories that were owned by the government and operated by contractors. Another decentralization was even more consequential. In July 1942, the Army decided to transfer all automotive activities to the Ordnance Department. Heretofore, development, production, distribution, and maintenance of the Army's cars and trucks and related components like engines, transmissions, and axles had been the responsibility of the Quartermaster Corps. Combat vehicles like tanks, armored cars, and personnel carriers on the other hand had been the Ordnance Department's responsibility. Campbell combined the two streams of procurement under a new Tank-Automotive Center (T-AC) headquartered in Detroit. The overhauled organizational structure Campbell gave the Ordnance Department served to administer ordnance production totalling more than one billion dollars per month by December 1942.[35]

Prior to the Army's administrative reorganization of tank and automotive procurement, the Quartermaster Corps had also been in the midst of a tremendous procurement program (see

---

[34]Thomson, "Organization of the Ordnance Department, 1940-1945," 22-23; Green, et al, *The Ordnance Department: Planning Munitions for War*, 95-96.

[35]Thomson, "Organization of the Ordnance Department, 1940-1945," 23-24, 46-57; Green, et al, *The Ordnance Department: Planning Munitions for War*, 98, 106-108.

section below describing the development of the jeep). Between July 1940, when the Quartermaster Corps reorganized to create a Motor Transport Division, and August 1942, when the duties of procurement and maintenance were shifted to Ordnance's T-AC in Detroit, the number of trucks in the U.S. Army increased from about 20,000 to about 500,000. By that time, the Motor Transport Division had been reorganized as the Motor Transport Service, and there was talk within the War Department of making the Service a separate branch of the Army (a shuffle recommended by Gen. Dwight D. Eisenhower). Although officials of the Quartermaster Corps argued against transferring Motor Transport away from their control, the Army ordered that procurement and maintenance of motor transport vehicles be moved to Ordnance.[36]

The transfer of the Motor Transport Service from the Quartermaster Corps and its merger with the Tank and Combat Vehicle Division of Ordnance's Industrial Division was easily the most monumental change made to the division's responsibilities during the war. The Motor Transport Service had charge of the Army's motor pools, automotive supply depots, and schools for training auto mechanics. In addition, the Motor Transport Service was administering more than 4,000 contracts worth about $3 billion, which had to be folded into Ordnance's already mammoth list of contracts. Campbell established the new Tank-Automotive Center at Detroit so that it could readily coordinate with the nation's auto industry. Campbell wanted to avoid too much concentration of Ordnance activities at the nation's capital, and he wanted develop the best possible relationships with auto industry leaders. After a false-start in organizing the top leadership at the T-AC, Campbell placed Brig. Gen. A.R. Glancy in charge with Brig. Gen. John K. Christmas as his deputy. Glancy was an industrialist with experience in military procurement. He received a reserve commission to become a brigadier general. Christmas had spent most of his career in the Army designing and engineering tanks. Glancy organized the Detroit operation into five branches: Development, Engineering, Manufacturing, Supply, and Maintenance.[37]

Nearly all the functions of the Ordnance Department were represented in the Detroit office, a fact recognized during the course of the war by the renaming of the center as Office, Chief of Ordnance-Detroit (OCO-D). Campbell was so intent on decentralization that he intended to assign full operating authority to OCO-D, although some of the divisions in Washington, DC, had difficulty relinquishing authority. This caused some inefficiency and discord within the Ordnance Department during the war, but after the war officers in the department generally considered the experiment in decentralization of the Tank-Automotive Center to have been a success, to which the tremendous production of military vehicles was largely attributable. During the course of the war, nearly half of the Ordnance Department personnel moved to Detroit. The staff there grew from 40 officers and about 600 civilians in September 1942 to 500 officers and nearly 4,000 civilians by February 1943. At the peak of

---

[36]Vernon Carstensen, "Motor Transport under the Quartermaster General, 1903-1942," unpublished historical report in NARA, RG-92, Records of the Quartermaster General, Entry 2116H, Box 1, p. 75-77, 167-181.

[37]Green, et al, *The Ordnance Department: Planning Munitions for War*, 108-110.

employment, 5,000 civilians worked at OCO-D, which was responsible for the manufacture of more than three million military vehicles. Almost half of the Ordnance Department's total expenditures during the war was spent by OCO-D.[38]

Another of Campbell's important organizational changes occurred at the level of the ordnance districts. Since WWI, civilian chiefs had headed the district offices, and that continued to be the case into 1942. Although the chiefs were prominent industrialists, they were also volunteers who did not work full time at their district offices. With industries and their managers being more taxed to meet military production demands and with the district offices facing greater work loads in administering procurement at the local level, Campbell decided to assign experienced Ordnance officers as district chiefs, retaining the former civilian chiefs as policy advisors.[39]

Ordnance contracted with firms for many kinds of items beyond combat vehicles, such as were processed by Ford's Richmond branch, or weapons.[40] Through the San Francisco Ordnance District, for example, Ordnance contracted with such firms as Rogers Super Tread Tire Service of Yakima, Washington. Founded in 1936, the father-and-son firm owned a small tire recapping plant. Specializing in tires for large construction equipment, their business grew and was in position to be low bidder on an Ordnance contract in 1942 to recap tires for the contractors that were building military installations in Alaska. The Army then awarded Rogers contracts and sub-contracts for recapping tires for military vehicles. Rogers processed tens of thousands of tires throughout the war. During the peak of its work in 1944, Rogers had as many as 80 men working in its union shop.[41] Another example was American Box Corporation, a company representing the merger of several California-based box and lumber companies, the oldest being the Stockton Box Company of Stockton, founded in 1910. American Box's stock in trade was wooden boxes used for shipping fresh, dried, and canned fruits and vegetables. The company also produced some industrial boxes. American Box's first military contract was with the Quartermaster Corps in 1941, when the company helped the Corps design wooden foot lockers for use in military training camps and then produced 136,666 of the items. American Box was soon under contract to build boxes for Ordnance as well, including more than a million boxes for transporting artillery munitions, bombs, and small arms.[42]

---

[38]Green, et al, *The Ordnance Department: Planning Munitions for War*, 110-113.

[39]Green, et al, *The Ordnance Department: Planning Munitions for War*, 105-106.

[40]The National Archives in College Park, MD, RG-156, Entry 646, holds an extensive collection of contractor's histories prepared by the various Ordnance Districts. The summaries following are just a small sample.

[41]D.M. Middlekauf, "Rogers Super Tread Tire Service," unpublished historical report dated 6 February 1946 in San Francisco Ordnance District, Addenda to Industrial Division, Tank-Automotive Branch, Contractors' Histories, NARA, RG-156, Entry 646, box A603, contractors' histories file.

[42]Walter S. Johnson to Col. K.B. Harmon, letter dated 21 November 1944, and Johnson, "American Box Corporation Report on Army Ordnance Production," both in I. Engle,

The San Francisco Ordnance District created its Historical Section in 1942 in response to Ordnance Department order no. 337 dated 21 September 1942. District Chief Col. Harmon instructed the members of his Historical Section:

> The San Francisco Ordnance District has been charged with compiling a complete history of the District's activities since it inception. This history will be a factual record and will not only be a laudatory account, but will include known mistakes, their elimination, and suggestions for improvement in any phase where the need is apparent.[43]

The District Historian wrote and directed the writing of numerous historical summaries that chronicle the histories of the many activities the District supervised. These histories, and those of other Ordnance Districts, comprise several large series of records in the National Archives' Record Group 156, the Records of the Office of the Chief of Ordnance. To compile the histories, the Historian had commanding officers at installations write monthly and quarterly historical reports; dispatched employees on assignments, like the trip Fern Hurley made to the Richmond Tank Depot to interview workers and write a chapter on the depot in her report, "Women Man the Battle Stations" (see section below on women); and wrote letters to contractors asking them to write brief histories of their activities under contract to Ordnance (Rogers Super Tread and American Box are two examples). Actual primary documents are not always included in the histories, but often the historian had typed copies of primary documents appended to reports as exhibits. Official histories of the Richmond Tank Depot comprise a significant portion of the documents cited in this HAER report. There is considerable additional information available in the histories on other aspects of Ordnance activities during World War II.[44]

B. Ford's Conversion to War Production

One of Ford's first big military contracts was for the production Pratt & Whitney aircraft engines. The company signed a contract with the government in October 1940 to build a new

---

"Contractors' Histories," undated historical report in San Francisco Ordnance District, Ammunition - Small Arms Branch, Contractors' Histories, NARA, RG-156, Entry 646, box A603, contractors' histories file, pp 10-23.

[43]K.B. Harmon to "Gentlemen," letter dated 10 November 1942, exhibit A, p 4 in I. Engle, "Contractors' Histories," undated historical report in San Francisco Ordnance District, Ammunition - Small Arms Branch, Contractors' Histories, NARA, RG-156, Entry 646, box A603, contractors' histories file.

[44]I. Engle, "Contractors' Histories," undated historical report in San Francisco Ordnance District, Ammunition - Small Arms Branch, Contractors' Histories, NARA, RG-156, Entry 646, box A603, contractors' histories file, pp 1-3.

facility costing $23,000,000 at the Rouge plant to build 4,236 engines. In December 1940, as the building was nearing completion, Ford executive Sorensen reported to the government that machine tools were slow in arriving, delaying Ford's ability adapt other tools to the new task and ultimately to produce engines. A year later, as the U.S. formally entered the war, the Office of Production Management reported that the Ford aircraft engine plant still had only about 28% of the machine tools it needed. Labor shortages also prevented Ford from meeting its schedule. Even as Ford was training young men in the skills necessary to make aircraft engines, draft boards were taking them into active military service. Increases in production also left Ford short of experienced foremen. Difficulties with unions also slowed production, as men facing strenuous production schedules filed grievances and initiated work slowdowns and strikes. Despite such difficulties, Ford completed its initial contract for aircraft engines in October 1942, by which time it was producing about 800 units per month. Yet the government wanted Ford to increase its output to 3,400 engines per month. The Rouge plant did not have the capacity for production at that scale. In an effort to meet the government's wishes, Ford assigned the production of some parts to plants elsewhere in the country, and the company steadily worked to increase productivity. As the first contract was being completed, it took Ford workers 2,331 hours to build an engine. By the end of 1944, Ford workers could make an engine in only 1,028 hours. During the war, Ford's Rouge plant produced 57,851 aircraft engines, 7.2% of the national total.[45]

Perhaps Ford's most famous ordnance factory during WWII was the plant at Willow Run, near Ypsilanti, built to produce B-24 bombers, or Liberators. Ford began construction of an entirely new plant in March 1941. Cost of the new building and equipment was $47,600,000. By May 1942, 15,500 employees worked there, 1,874 of them women. The contract schedule called for the Willow Run plant to make parts for 405 airplanes per month. Ford would initially ship parts for 100 bombers to a Douglas assembly plant at Tulsa and parts for 155 to a Consolidated Aircraft plant at Fort Worth. Ford would assembly the remaining 150 Liberators monthly at Willow Run. Eventually, Ford was to assemble most of its planes at Willow Run. The plant shipped its first parts to Tulsa in July 1942. The first assembled plane to fly away from the Willow Run plant departed two months later. By January 1943, Willow Run employed 30,000, of whom 10,000 were women. Thereafter, men were leaving Willow Run's workforce at a greater rate than Ford could hire them. Some were entering military service. Many other men, and women as well, quit because there was insufficient housing near Ypsilanti and the commute from Detroit was too taxing. At the peak of employment, the Willow Run bomber plant employed about 47,000 workers, and outside factories supplying Willow Run with parts employed another 22,000. Willow Run's peak month of production was August 1944, when it made 428 Liberators. By June 1945, the plant had assembled 6,791 B-24s and sent parts for an additional 1,893 bombers to other assembly plants.[46]

---

[45]"Speeding National Defense," *Ford News* 21 (April 1941): 87; "Defense Projects Progressing Rapidly," *Ford News* 21 (July 1941): inside front cover; Nevins and Hill, *Ford: Decline and Rebirth, 1933-1962,* 200-203.

[46]"Speeding National Defense," *Ford News* 21 (April 1941): 87; "Ford Looks Forward to 1942," *Ford News* 21 (October 1941): 257; Nevins and Hill, *Ford: Decline and Rebirth*, 208-

As a company with numerous plants abroad, Ford was involved in war production elsewhere as well. The Ford Motor Company of Canada, Ltd., for example, had begun negotiations with the Canadian Department of National Defense in 1938 to prepare for possible full mobilization in the event of war. When the war started in 1939, the Ford plant at Windsor, Ontario, converted nearly its entire capacity to producing military vehicles for Britain and its allies, and it quickly became the largest single source of military transport vehicles for the armies of Britain and its former colonies, like Canada, Australia, and South Africa, which soon joined Britain in the war. The Windsor plant employed 11,000 workers, and by March 1941 they had produced more than 50,000 vehicles for the military. They included light trucks, heavy-duty tractors for pulling artillery and tank carriers, and a tracked vehicle called the universal carrier, used for transporting troops. One assembly line at the Windsor plant continued to produce civilian cars and trucks to help keep Canada's industrial capacity moving.[47]

Although one of America's "big three" automakers at the time, Ford did not produce as many military vehicles during WWII as did the other two. For example, while Chrysler produced more than 20,000 tanks and tank destroyers and GM's Fisher Body produced more than 16,000 tanks, Ford produced only 1,683 M-4 tanks and 1,035 M-10 tank destroyers. During the war, U.S. manufacturers produced 2,665,196 vehicles, of which Ford made 387,737 (14.5%). Ford's contributions were not necessarily in the nature of finished vehicles, as was the case in America's peacetime auto industry. Rather, much of Ford's productive capacity was devoted to other facets of the larger system of ordnance production. In addition to aircraft engines and bombers, Ford made nearly 27,000 tank engines, which it then shipped to other companies' assembly plants. Ford produced steel armor plate for other ordnance projects. And two of Ford's branch assembly plants, Richmond and Chester, served as tank depots, receiving tanks from other manufacturers, outfitting them with communications equipment and armament, and preparing them for shipment to overseas battlefronts.[48]

After Japan attacked Pearl Harbor and the U.S. declared war on Japan, President Roosevelt asked Americans for an all-out effort to win the war. From Americans working in industry he asked a seven-day work week. He asked that existing plants be expanded, and he asked that new plants be built. Even though Ford and the other automobile manufacturers were already producing vehicles, aircraft engines, and artillery shells, the government asked them to speed production on those contracts so that new contracts could be entered. Government agents also asked companies to embark on projects to produce new kinds of equipment. For example, twelve days after Pearl Harbor, representatives of the National Defense Research Committee showed preliminary plans for an amphibian jeep to officials of the Ford Motor Company at Dearborn, asking the company to develop the concept into a workable vehicle. Ford agreed, further engineered a small three-man vehicle that could travel on land or water, and tested it to

---

226.

[47]"Ford of Canada Aids the Empire," *Ford News* 21 (March 1941): 62-63.

[48]Nevins and Hill, *Ford: Decline and Rebirth*, 204-205.

the Army's satisfaction in the Huron River. In June 1942, Ford received a contract to produce 5,000 of the novel vehicles.[49]

As Ford and the other automakers had been preparing for war by turning ever greater portions of their productive capacity to military production, the government also began imposing quotas on the numbers of passenger cars and light trucks the companies could make. In January 1942, the War Production Board issued an order that all production of civilian cars and trucks must cease. The last Ford car for private use rolled off the assembly line on February 10th.[50]

The elimination of civilian auto manufacturing freed Ford's extensive system of branch plants for other uses in the war effort. At the beginning of the war, Ford had 34 domestic branch plants, of which 16 were assembly plants and 18 were units in the parts distribution network. During the war, Ford operated only 15 of the branch plants, selling or leasing the rest to the government, which in turn put the branch facilities to other uses in the nationwide system of ordnance manufacturing, often to be operated by contractors. Ford also owned three old branch plants it was not using at the beginning of the war; these it leased to aircraft manufacturers. On the West Coast, for example, Ford leased the plant at Long Beach to the government and sold the plants at Portland and Seattle to government. The only plant on the West Coast that Ford continued to operate during the war was in Richmond. Elsewhere in the country, Ford converted the branches at Kansas City and Memphis to its Pratt-Whitney aircraft engine program. The Chicago branch assemble armored cars. The Twin Cities branch was part of both the aircraft engine and armored-car assembly programs. The Dallas, Edgewater, and Louisville branches made trucks for military transport, and those three plus the Richmond plant participated in Ford's contract to build jeeps. Ford operated the Richmond and the Chester branches as tank depots under contract to the Ordnance Department.[51]

The Ford branch at Somerville, Massachusetts, had one of the unique contracts in the Ordnance Department's nationwide system. The plant was the only one in the U.S. to build universal carriers, and it did so during the entire war. As previously mentioned, the Ford Motor Company of Canada was already producing universal carriers at the Windsor plant according to a British design for the British Army. The Windsor plant could not meet the demand, so the Ordnance Department began negotiations in February 1942 to convert the Somerville branch to carrier production. The Ordnance Department gave Ford engineers some latitude in studying the design of the carrier, both to improve its performance and to expedite production. At the end of the summer, Ordnance approved Ford's changes and in September contracted with Ford to build 21,000 universal carriers of the modified design. The original carrier was designed by Vickers-Armstrong, Britain's ordnance manufacturer. It was little more than a small steel box with a capacity of two soldiers and a machine gun sitting on caterpillar tracks and powered by a Ford

---

[49]Nevins Hill, *Ford: Decline and Rebirth*, 197-198.

[50]Nevins and Hill, *Ford: Decline and Rebirth*, 198-199.

[51]Nevins and Hill, *Ford: Decline and Rebirth*, 199; "General Statement of Branch War Time Operations," unpublished report (n.d.) in HFM Acc. No. 672, Box 1, pp. 2-6.

Model-T engine. Vickers-Armstrong redesigned the vehicle to give it greater capacity and a new engine, the Ford V-8. The British used the new vehicle in many theatres of WWII as a personnel carrier, scout car, and mortar carrier. Ford's newer version featured a Ford-Mercury engine with 100 hp. It could travel at speeds up to 55 mph. British forces used it as a light armored vehicle to move machine gun and mortar crews into position. Because the vehicles were much heavier than cars and trucks, Ford had to completely remove its conventional assembly-line equipment at Somerville and design, fabricate, and install an entirely new assembly line, complete with painting systems, ovens, conveyors, and jigs. The Somerville plant produced its first universal carrier in March 1943.[52]

Ford's two main contracts at the Richmond branch were W-883-ORD-2676, the tank-depot contract for the processing and modification of combat vehicles, and W-374-ORD-2862, the largest of the five jeep assembly contracts at Richmond. The jeep contract ran from February 1942 to July 1945. When Ford originally entered the jeep contract with the Army, it was under the auspices of the Quartermaster Corp, and the contract number was W-398-QM-11424 (later revised to W-398-QM-13538). When responsibility from manufacturing trucks was transferred from the Quartermaster Corps to the Ordnance Department in July 1942, Ford's jeep contract received the new ORD nomenclature. The tank depot contract ran from July 1942 to November 1945. During the course of World War II, the Richmond Tank Depot processed and shipped 55,904 vehicle units, or 17.2% of the total 324,565 vehicle units shipped by all the tank depots.[53]

With the advent of war production at the Richmond branch, security became more serious. Security in and around the plant fell under three jurisdictions. Security on the water adjacent to the plant was the responsibility of the U.S. Coast Guard. Security on land beyond Ford's property line was under the jurisdiction of the Internal Security Command. Ford was responsible for security on its own property, but Ford's security measures had to conform to recommendations issued by the Army's Plant Protection Office, based at the Presidio in San Francisco. In June 1942, Major Edmund Sawyer of the Plant Protection Office inspected the

---

[52]"The Universal Carrier," unpublished report (n.d.) in HFM Acc. No. 435, box 13, pp. 1, 8-11.

[53]"General Statement of Branch War Time Operations," 15; "San Francisco Ordnance District, Vol. I, Part 3, History 1939-1942," unpublished historical report in NARA RG-156, Entry 646, box A576, p. 120; "Richmond Tank Depot, Vol. VI, October 1945," NARA, RG-156, Entry 646, box A601, p 6; "Industrial Service Tank Depot Operations (Final Issue), January 1942 thru December 1945," unpublished report in NARA, RG-156, Entry 962, box L303, tables p. 2.

"Richmond Tank Depot," Vol. VI, October 1945, reported that the Richmond Tank Depot shipped 30% of the total number of combat vehicles that the U.S. sent overseas. The statistic derives from verbal communication to the commanding officer at the Richmond Tank Depot from the Office of the Chief of Ordnance - Detroit. The statistic cannot be verified, however, in tallies of vehicles processed and shipped by all the tank depots during the war, as presented in "Industrial Service Tank Depot Operations (Final Issue), January 1942 thru December 1945."

Richmond branch, by which time the plant employment office had fingerprinted all the employees. Sawyer made some recommendations for enhanced security, including: 1) contacting all caterers, utilities, and other companies that sent regular visitors to the plant, recommending that they fingerprint their employees and provide them with proper identification cards; 2) installing bullet-proof glass on the guardhouse at the main gate; 3) equipping guards with badges and side arms; the installation of an air-raid siren in addition to the existing fire alarm; and 4) that Ford equip its emergency responders with gas masks and helmets. Because the Richmond plant was owned and operated by the Ford Motor Company, of course, the Plant Protection

Foreman at Richmond had to obtain authorization from Dearborn before he could implement Sawyer's recommendations.[54]

C. Jeeps

The jeep is one of the most storied vehicles to come out of World War II. The brand still exists, and the vehicles Daimler-Chrysler now builds under the Jeep brand-name still owe some of their stylistic character to the WWII vehicle developed by the Army's Quartermaster Corps. This section describes the history of the jeep's development before providing details the Richmond Tank Depot's role in the production of jeeps during the war.

1. The Quartermaster Corps & Motor Transport for the Army

The history of the Quartermaster Corps goes back to 1775 and the appointment of a Quartermaster General by the Continental Congress during the Revolutionary War. Thereafter, the Quartermaster Corps' organization evolved during peacetime and wars as it sought to supply the Army's material needs. It was generally responsible for procurement, storage, and transportation of supplies. It was always responsible for food, clothing, and camp equipment, and during some early periods it was also responsible for arms and ammunition. By the end the 1930s, when much of the rest of the world had gone to war, the Quartermaster Corps had an extensive infrastructure of supply depots throughout the nation, and it also had the facilities for making certain items itself, such as the uniform factory at the Corps' Philadelphia Depot. In 1939, the Corps was staffed by about 12,000 military personnel and 37,000 civilian employees, who supplied a standing army of about 200,000.[55]

With the fall of France in 1940, Congress authorized the Army to expand to 1,400,000. More than the Ordnance Department, however, the Quartermaster Corps was prepared to supply an expanded army on short notice, so the increase in staffing and procurement by Quartermaster Corps in the early 1940s, although marked, was not as dramatic as that of the Ordnance Department, and the effort to mobilize American industry to satisfy Quartermaster needs was not so remarkable. Because of the nature of the items needed by the Quartermaster Corps, in fact, the nature of the mobilization was quite different. Whereas the Ordnance Department, for example, needed to help facilitate the expansion and conversion of heavy industry in industrialized parts of the country, often in the face of severe equipment and labor shortages, the

---

[54]Plant Protection Foreman to Charles Bernard, Dearborn, memorandum dated 2 June 1942, HFM Acc. No. 371, box 16, folder 4; Col. John W. Thompson to Ford Motor Company, Richmond, letter and attachments dated 25 May 1942, HFM Acc. No. 371, box 16, folder 4.

[55]The early history of the Quartermaster Corps is summarized in another volume in "The Technical Services" series of the "United States Army in World War II," Erna Risch, *The Quartermaster Corps: Organization, Supply, and Services* (Washington, DC: GPO, 1953), 3-7.

Quartermaster Corps relied on manufacturers and suppliers who could fairly easily make the transition to production in support the military. And the Navy and the Maritime Commission needed to focus their expansion of shipbuilding on coastal areas, whereas the Quartermaster Corps could make procurements anywhere in the interior of the country. Therefore, to help relieve the stresses placed on coastal and industrialized areas by war production, the Quartermaster Corps preferentially awarded contracts, when possible, to small manufacturers operating in parts of the country that still had labor surpluses. At the end of the war, the Quartermaster Corps had 500,000 military personnel and 75,000 civilian employees.[56]

Until 1942, as previously mentioned, the Quartermaster Corps was the organization within the U.S. Army that was responsible for providing motorized transportation. The Army had purchased its first motor vehicle, an Oldsmobile passenger car, in 1903. Four years later it bought a truck.[57] Yet the Quartermaster General was not immediately impressed with those trial vehicles:

> Tests made of automobiles for military purposes and reports received as to their utility and cost of maintenance do not argue in favor of their substitution for any of the standard means of Army transportation. These vehicles can rapidly transport persons and supplies over city streets or well-kept roads, but at the very best the cost of such transportation for army work is excessive. The high initial cost of these machines, the liability of damage to their complicated mechanism, tires, etc., with consequent disabling of the cars and frequency with which breakage or disabling accidents occur, together with the great expense of repairs, high wages of the necessary skilled chauffeurs, and their impracticability of operation over any but the best of roads and the smoothest of terrain will, it is thought, prohibit use of the existing types as a substitute for any of the present means of army transportation.[58]

The Quartermaster General's remarks indicated, however, a recognition that the capabilities of motor vehicles could change, as indeed they did, while the Quartermaster Corps continued to purchase cars and trucks and the Army sought ways to integrate them into its operations. By 1911, the Army was using commercial trucks to move supplies at several of its posts, and that year the Quartermaster General put Captain A.E. Williams in charge of two important new programs. One was to develop a truck capable of working with troops, thereby replacing horse- and mule-drawn wagons. The other was to work with manufacturers in an

---

[56]Risch, *The Quartermaster Corps: Organization, Supply, and Services*, 7-9, 243-282.

[57]Vernon Carstensen, "Motor Transport under the Quartermaster General, 1903-1942," unpublished historical report in NARA, RG-92, Records of the Quartermaster General, Entry 2116H, Box 1, p. 1.

[58]*Annual Report of the Quartermaster General to the Secretary of War for the Fiscal Year Ended June 30, 1907,* 32, quoted in Carstensen, "Motor Transport under the Quartermaster General, 1903-1942," 1.

effort to have them make standardized trucks for the Army. Given the nascent character of the automobile industry, Williams had little success in the latter program. Undaunted, he continued to have Army units use various truck models in experimental field maneuvers to try to find appropriate rolls for motor vehicles. By 1913, the Quartermaster Corps was ready to issue general specifications that manufacturers had to meet in supplying the Army with trucks, and in 1915, some units of the Quartermaster Corps began to organize motor truck companies, motor car companies, and motor cycle companies.[59]

With the U.S. entry into World War I, Army purchases of motor vehicles increased tremendously and the Army decided to establish a new Motor Transport Corps. After the war, the Army abolished the Motor Transport Corps and returned responsibility for motor vehicles to the Quartermaster Corps. Camp Holabird became the Quartermaster Corps' central spare parts depot for Army cars and trucks and also housed the Quartermaster Transport School to train mechanics for keeping the Army's fleet of vehicles in repair. Because of the huge surplus of vehicles left by the war, however, the Quartermaster Corps made few purchases during the 1920s. By the 1930s, most of the Army's vehicles were obsolete. The Army decided to eliminate horses and mules and to completely motorize its units, and the Army also soon had responsibility to purchase trucks for the Civilian Conservation Corps. Limited testing for new kinds of trucks to meet those needs took place at Holabird.[60]

Therefore, the Quartermaster Corps greatly expanded its purchasing program for motor vehicles, but not without a skirmish over the issue of standardization with the Ordnance Department, which held responsibility for purchase of combat vehicles. The Quartermaster General believed that standardization of transport vehicles throughout the Army was essential to ensure effective maintenance in the field during wartime. The Chief of Ordnance advocated allowing each organization of the Army to determine specifications for trucks it needed. The Quartermaster General prevailed initially, and in 1931 the Army embarked on the purchase of a standardized fleet. Ordnance and the Corps of Engineers continued to resist the policy, and some manufacturers also balked at responding to bid requests citing the new standardized specifications. The Army's Comptroller General ruled in 1933 that the Quartermaster Corps' standardized specifications violated the War Department's procurement regulations, so truck manufacturers were allowed to submit competitive bids on vehicles, responding only to general specifications. By 1936, when the old fleet of vehicles had been largely replaced, Col. Brainerd Taylor, the commander at Holabird, reported to the Quartermaster General that the Army owned and operated 360 distinct models of vehicles. Holabird could not maintain so many different types of spare parts, so the Quartermaster Corps' centralized system for spare parts at Holabird disintegrated.[61]

---

[59]Carstensen, "Motor Transport under the Quartermaster General, 1903-1942," 2-7.

[60]Carstensen, "Motor Transport under the Quartermaster General, 1903-1942," 28-35.

[61]Carstensen, "Motor Transport under the Quartermaster General, 1903-1942," 33-59; Risch, *The Quartermaster Corps: Organization, Supply, and Services*, 141-142.

Some truck manufacturers recognized the peril this situation placed upon the Army. The previous year, the Motor Transport Branch of the Quartermaster Corps convened a meeting with the Assistant Secretary of War, the Quartermaster General, several of his top assistants, and representatives of forty truck manufacturers. Several companies, including the White Motor Company, Moreland Truck Company, and the Marmon Herrington Motor Truck Company, agreed with the Quartermaster General's position that the Army needed standardized trucks, but they were also cognizant of the pitfalls, articulated by a representative of the Four Wheel Drive Auto Company. He recognized that if the Army conducted tests on a particular patented device and then decided to incorporate it in its standard specifications, competitors of the company that owned the patent would try to use political connections to have the specifications changed to remove the patented device. Nevertheless, some means of overcoming that competitive barrier had to be found for, as A.W. Herrington of Marmon Herrington observed,

> if the kind of motor transport recently purchased for the Army were used [in the next war], it would be necessary to abandon any thought of automotive repair in the field and to adopt a policy of abandoning unserviceable vehicles and replacing them with new vehicles.[62]

Col. Taylor was in complete agreement with Herrington, telling the Quartermaster General that simplifying automotive repair was "one of the most important problems in modern war planning." Taylor continued to press his superiors in the hierarchy of the War Department on the need for standardization, and in 1938 Assistant Secretary of War Louis Johnson took up his cause. Over the next two years, Congress at Johnson's urging made important progress toward authorizing the Army to purchase standardized trucks. Germany's invasion of Poland in September 1939 helped to stimulate that progress. By mid-1940, many components in a system of standardization were in place, leading the Army to accept a couple kinds of truck that were to become well-known during America's participation in World War II: the Dodge 4 x 4 1-1/2-ton truck and the General Motors 6 x 6 2-1/2-ton truck. The Quartermaster Corps made all-wheel drive the norm and established five standard chassis types for 1/2-ton, 1-1/2-ton, 2-1/2-ton, 4-ton, and 7-1/2-ton trucks. There would be certain variation in body types to accommodate particular uses, but all would be designed to minimize variability in spare parts. In order not to discourage bidders, however, higher authorities in the War Department still allowed some minor variations in the trucks bidders could propose to build.[63] Against this background, the determination of the Quartermaster Corps to insist that the jeep be completely standardized can be better understood.

---

[62]Carstensen, "Motor Transport under the Quartermaster General, 1903-1942," 63.

[63]Carstensen, "Motor Transport under the Quartermaster General, 1903-1942," 59-74; Taylor is quoted on p. 63. See also Risch, *The Quartermaster Corps: Organization, Supply, and Services*, 142-143.