Naval War College Review

Volume 45
Number 2 *Spring*

Article 9

1992

Fighting on Our Own Ground: The War of Production, 1920-1942

Thomas Hone

Fighting on Our Own Ground
The War of Production, 1920-1942

Thomas Hone

AS ALAN MILWARD POINTED OUT in his fascinating study of World War II production, the American economy not only produced the material and food needed to wage war and sustain its allies, it also enlarged during the conflict.[1] The economy of the United States did not just surge, it grew. Unlike its enemies and allies, the United States did not have to drain its economy to wage war. As a result, the American economy was the only one to emerge actually strengthened by its wartime experience.

This is a side to World War II often neglected, especially in popular histories. If there is a popular mythology of American wartime production, it is of a nation "rallying round" after Pearl Harbor and "muddling through" the problems of coordinating and managing a wartime economy. The energy and dedication aroused by Japan's surprise attack are, in this mythology, credited with the feats of wartime production. Historians should know better. Patriotism did play a role, an essential and powerful one. The source of American economic victory in World War II, however, can be traced back to 1920, and to the efforts by the army and navy after that year to prepare for the next industrial war.

The Interwar Years

At the end of World War I, the navy and army decided that the confusion and corruption of arms production and supply that they had endured (and helped create) in 1917 and 1918 was an experience they did not wish to repeat. The National Defense Act of 1920 was an effort to create a system of war mobilization planning that would make sure the procurement problems of World War I did not recur. The Act placed the responsibility for mobilization planning in the hands of the assistant secretary of war, thereby both centralizing industrial planning and entrusting it to an office headed by a civilian. The Act also authorized the creation of joint army-navy boards to draw up mobilization timetables and requirements. In addition, the law allowed the military service

Thomas Hone is a professor of acquisition management policy at the Defense Systems Management College, Fort Belvoir, Virginia.

secretaries to place what were called "educational orders."[2] Such orders for equipment could be used to prepare commercial producers for wartime production by underwriting their purchases of special tools and giving their workers experience in working to military specifications.

The Act was an experiment. It assumed that planning for wartime industrial mobilization could be done successfully by small staffs of military officers. As war threatened, the plans were to be implemented by executive agencies whose members would represent both military and civilian organizations. But the Act did not give the army and navy the power to create such organizations or to lay out their structure in peacetime. Though the secretaries of war and the navy acted under the authority of the law to create the joint Army and Navy Munitions Board, or ANMB (to parallel the Joint Army-Navy Board, which coordinated war planning), and though the ANMB was the source of joint mobilization plans before World War II, the plans themselves would be largely thrown aside when the United States went to war in 1941. The assumption basic to the 1920 law that successful planning could be carried on by the services in isolation from industry, labor, and farm organizations was proven false.

There were several reasons why military plans produced by the ANMB could not be successful. First, mobilization planning was closely tied to war planning, and war planning in the 1920s was dominated by the navy's focus on Japan. In such a war the army's role would be subordinate to that of the navy; it followed that "industrial mobilization" would focus on ship construction and (after the late 1920s) the manufacture of airplanes. The army was never happy with this situation and was therefore unenthusiastic about its participation on the Joint Army-Navy Board.[3] It grew even less happy during the late 1930s, as the prospect of a two-front war became a real one. Indeed, only after the start of war in Europe did the president accept a war strategy which not only assumed a two-front conflict but also made the European conflict a higher priority than the anticipated fight with Japan. So the war planning effort, meant to feed mobilization planning, was either off the mark because it did not until very late seriously anticipate a major war in Europe or was just not serious enough (because of army-navy differences).

Second, most of the detail work of mobilization planning was left to the services, and the services either could not do such work or did not want to.[4] To plan for mobilized war production, the services needed to know what their requirements were and where the factories were that could meet those requirements.[5] The requirements themselves were derived from war planning (through the Joint Army-Navy Board, when it functioned) and inferred from the state of technology. When planning and technology were relatively stable (as in 1929), the services could put together a reasonable Industrial Mobilization Plan; they did so for the first time in 1930. However, where technology was rapidly

changing or where the nature of the enemy or enemies was uncertain, requirements were anybody's guess; that was precisely the situation in the late 1930s.

Both services did compile lists of firms that could engage in war production; army and navy members of the ANMB even prepared a *Directory of Allocated and Reserved Facilities*, which divided the available industrial potential between the two services.[6] However, the navy's materiel bureaus did not support the industrial mobilization planning process, and the navy's Bureau of Supplies and Accounts (BUSANDA), charged with drawing up contracts for industry projects, actually resisted responding to the ANMB's plans.[7] For their part, army air corps planners at Wright Field, Ohio, objected even to the use of educational orders on the grounds that aircraft manufacturers would not be willing to share their trade secrets with firms engaged in mass producing items such as automobiles.[8] As I.B. Holley observed, though companies like Boeing, Douglas, and Martin might well have objected to helping the government set up potential competitors through educational orders, that became a very minor issue indeed when set beside the need to win a major war.[9]

Third, Congress was reluctant to support mobilization planning with appropriations for staff, studies, and educational orders—quite the reverse at times. Congress in the 1930s actually prohibited the army from conducting research on motor vehicle standardization, forcing the army to use standard production items from American automobile producers.[10] Congress also placed a ceiling on profits which firms could make from producing such items as ships and aircraft, and did not modify the legislation covering military procurement to allow negotiated (as opposed to sealed-bid) contracts.[11] It would be inaccurate, however, to place all the blame on Congress. The Air Corps Act of 1926, for example, authorized the secretaries of war and the navy to negotiate contracts for experimental aircraft, and the discretion it gave the service secretaries was great enough to allow the integration of research and development into contemporary aircraft designs.[12] Congress also continued to support the navy's own aircraft factory despite manufacturers' claims that a government factory was a threat to the growth of the domestic aircraft industry.[13]

Fourth, there was not in peacetime enough pressure from the White House on the services to plan production of huge numbers of such items as airplanes and tanks. The services were content with smaller numbers because they lacked the trained manpower to maintain many tanks, planes, and ships; also, aviation, armor, and communications technologies were changing so fast in the late 1930s that service leaders were afraid to freeze designs too soon; and, in any case, the services did not have enough people trained in areas like contracting and finance to work effectively with industry.

Procedures for dealing with industry were formal and rigid, and the organizations which supervised production were ineffective.[14] Only White House pressure could have overcome the inertia of the existing procurement organizations,

Naval War College Review, Vol. 45 [1992], No. 2, Art. 9

but that was lacking until the eve of the war. After Pearl Harbor, President Roosevelt shocked military procurement managers by setting what they thought were unachievable production goals for tanks and aircraft. That they were surprised shows how constrained they were even in their planning by old habits and by what Holley calls "rigid time-consuming contractual formalities."[15]

Fifth, the services had not developed means to move innovations quickly from the laboratory to production. Mobilization was not generally understood as a problem both of production and of research and development. Prewar planning had focused on a quantitative approach to mobilization: making a lot of planes, tanks, and ships, and then training the many soldiers, sailors, and airmen required. In the event, modifications and entirely new technologies were as important in an extended conflict as mass producing basic models of ships, airplanes, and tanks.

For example, the navy's Bureau of Ordnance and its contractors were able during World War II to take drawings and specifications developed in Europe by Bofors and Oerlikon for European methods and modify them for American-style mass production.[16] The effort was a great success. Much less successful was the attempt by the army air corps (after 1942, the army air force) to integrate modifications derived from combat experience into ongoing production lines. As early as January 1942, the army paid the major airlines to convert their maintenance facilities to post-production modification centers; by war's end the army had created or funded about twenty permanent modification centers with nearly twenty million square feet of work space.[17] However, producing a plane and then taking it apart again for combat-related modification was expensive: "anywhere from 25 to 50 percent of the total labor spent in turning out military aircraft was actually performed at the centers."[18] The army was more successful in modifying tank production. The shift from the model M-3 medium tank to the M-4, for example, went as smoothly as the shift from one production model automobile to another because the process of mass producing tanks was basically the same as for automobiles.[19] Aircraft were another matter altogether.

Getting new technologies from the laboratory to the production line was also a serious problem. Neither the army air corps nor the navy, for example, made the shift from propeller-driven to operational jet aircraft by the end of the war; even development of new propeller aircraft (such as the B-29) was expensive, fraught with technical problems, and dangerous for flight test crews.[20] There were analogous shortcomings in armored vehicle development. U.S. armored divisions were never given the much-needed capability for night offensive operations, nor did they have by 1944 tanks adequately armed and armored for the assaults on France and Germany. Also, no satisfactory range finder for tanks was developed, despite the best efforts of army ordnance engineers.[21] Charles Baily has argued that there "was a definite lack of a thorough grasp of tank and

tank destroyer development at the highest levels in the U.S. Army," and indeed that "it was difficult to see who was in charge."[22]

"Miracles of Production"

So much for what prewar planning did not achieve. What were the reasons? What was it that planning by the army and navy alone could not do?

Preparing the Presidency. First, the presidency itself had to be readied for the war. In the summer of 1939, President Roosevelt finally brought under his direct supervision as commander-in-chief the army chief of staff, the navy's chief of naval operations, the Aeronautical Board (which linked service aviation organizations with the National Advisory Committee on Aeronautics), the Army-Navy Munitions Board, and the Joint Economy Board (which brought together the military departments with the heads of Treasury and Commerce).[23] Only that September did Congress pass the Reorganization Act of 1939, which established the Executive Office of the President. With the authority of that law Franklin Roosevelt created the plethora of alphabet-soup agencies which he used (and at times ignored) to direct war production.

Economist Eliot Janeway, who was part of that effort, argued after the war that Roosevelt ran war production and mobilization the same way he ran New Deal agencies: by creating multiple centers of power with overlapping jurisdictions. When the new agencies could not agree on a course of action (as Roosevelt understood they often would not), they appealed to the president, giving him in effect final authority over their actions (and over the general policies they were supposed to implement). In 1939, however, Roosevelt was feeling his way cautiously, careful to not step too far ahead of public and congressional sentiment. He took the authority Congress had granted him and used it, but did not demand more. For example, Congress authorized the services in 1939 to negotiate cost-plus-fixed-fee contracts for new base construction. The services would have liked to negotiate similar contracts for weapons production, but the White House did not ask for that authority for another year; even after granting it, Congress limited the fixed fee to seven percent of the estimated cost.[24] This legal limit on the use of negotiated cost-type contracts for weapons production was not lifted until after the attack on Pearl Harbor.

Janeway would also argue that Roosevelt's approach to wartime mobilization, cautious and inefficient (based as it was less on plans than on the measure of public sentiment), was the only sensible one he could have pursued in light of the division in the country regarding American participation in the war. In Janeway's view, Roosevelt knew that once fully committed the nation and its private institutions would produce what was needed in the time allowed; what he had to do, then, was wait while public opinion moved toward supporting a

Naval War College Review, Vol. 45 [1992], No. 2, Art. 9

war. Put another way, Roosevelt's mobilization policy was not to bypass partisan politics but to allow it to work. The president knew that even with public support for a war policy his administration would have to deal with the social and political divisions that crisscrossed American society.

To Janeway, then, the conflicts which plagued the civilian-led mobilization agencies were inevitable, unavoidable, foreseen by the commander-in-chief, and were absorbed by these same institutions. But these institutions could not do either their political or their economic work unless the president could create them, so the willingness of Congress in 1939 to increase the power of the presidency was essential to mobilization and to victory. Essential, too, was Roosevelt's willingness to continue politics during the war in the area of mobilization. As far as grand strategy and the actual fighting were concerned, Roosevelt was commander-in-chief. In the "war of production," however, he was a politician, moving cautiously and cleverly to guard his authority and that of his office while passing the immediate direction of war production to the leaders of private industry (many of these his political enemies), labor, and agriculture.

Making the federal war production agencies both effective and representative was a problem. To be effective, they had to have data on what U.S. industry and agriculture could do, be able to anticipate the kinds and numbers of items needed by the fighting forces, have control over civilian manpower, have a means to control scarce resources, maintain a stable currency (by monitoring and controlling prices, wages, and savings), and work closely with the agencies implementing foreign and fiscal policy. To do these things, war production managers would need the support of the president and the public, the cooperation of the armed services, and the necessary knowledge. Yet it was not entirely clear to Roosevelt and his advisors how to create a hierarchy of politically legitimate and responsive institutions which were nonetheless able to perform necessary mobilization tasks.

This explains the start-stop, trial-and-error progression of war production agencies, from the War Resources Board of 1939 to the Advisory Commission to the Council of National Defense in 1940, to the Office of Production Management in 1941, to the War Production Board in 1942. As the country moved closer to war, the weakness of the prewar plans developed by the army and navy alone became clearer. The services just could not have been expected to plan for the political problems arising in a directed economy of such size and potential. President Roosevelt understood that the productive potential essential to winning the war existed, and also, if Janeway's account is correct, that the economy could not be managed from the White House. Roosevelt's intuitive appreciation of the productive power of the economy was matched by his understanding that directing the economy would be difficult from both a technical and a political perspective.

Yet as commander-in-chief Roosevelt was obliged to take responsibility for mobilizing production. To retain ultimate control while shielding himself (as partisan political leader) and the institution of the presidency from blame, the president created a set of agencies, gave each limited but overlapping responsibilities and powers, put ambitious and talented people in them, and trusted in the resourcefulness of private industry. He became the audience, along with the public, and let his new agencies perform. When they worked (or appeared to work), he left them alone. When they lacked authority or seemed to be failing, he replaced them or their leaders—usually after allowing them to serve as lightning rods for public dissatisfaction.

Donald Nelson, head of the War Production Board, tells a revealing story in his memoirs. There was a dispute over which firm would get the contract for mass production of the jeep. There were three primary contenders, according to Nelson: Willys, Ford, and Bantam Car (which had pioneered the jeep design). Ford argued that its competitors could not produce jeeps fast enough, but Nelson believed that Willys could in fact produce the vehicles at the required volume, and he was instrumental in seeing to it that Willys got the contract.[25] What Nelson did *not* mention in his memoirs was any idea that Bantam might deserve the production contract because it was the jeep's designer; the army chose not to award the contract to Bantam because it did not believe the firm could produce enough of the vehicles to meet the need. As a result of this decision, rational as it was, Bantam did not reap the benefits of an item it had developed, and suffered after the war.

The story demonstrates the managerial dilemma facing the War Production Board: there was no way the Board could really manage the whole war production effort (let alone the whole economy). First, there was no way the Board and its staff could understand all the details of what was going on; second, there were few legal, established means both to compensate fairly a firm like Bantam and to free the army to rationalize its war production by limiting the number of producers of specific pieces of equipment. This was the sort of issue which should have been resolved before the war, but it was also one that the army and navy lacked the authority to resolve on their own. Because it had not been resolved by 1942, the war production effort was often inefficient.

The production timetables produced by the Army and Navy Munitions Board had already been rejected as inadequate even by the services themselves. In their place the president had set incredible production goals; in February 1942, for example, he had directed the army to procure 105,000 medium tanks—169,000 tanks of all types—in one year.[26] This was a tremendous number, double what was eventually produced during the whole war; it sent production and ordnance experts reeling, and ignored the need to produce ships, trucks, artillery, and aircraft. But the army had to respond, and respond it did: with an investment in production facilities that was double the amount eventually deemed necessary.[27]

Naval War College Review, Vol. 45 [1992], No. 2, Art. 9

In response to protests from his senior military advisors, Roosevelt modified the tank production goal: to 136,000 in April 1942, 121,000 the following September, and 99,000 by November.[28] But the services had already begun to respond to his original direction. If the president's effort to spur the mass production of war items had had the beneficial effect of forcing military and civilian wartime procurement managers to face the magnitude of their problem, it had also revealed how hard it was to manage a wartime production effort. "Commanding" production levels made no sense if the services, empowered by law and by executive order only to negotiate and manage contracts, could not draw on the economy for the resources and manpower they needed. It made even less sense if equipment once delivered could not be supported and serviced. But the services could not be let loose to compete for resources as they had been in World War I; there had to be some coordination. Otherwise, war production would be chaotic, and priorities in resources, electric power, and labor would be set by a series of *ad hoc* negotiations between crowds of public and private executives. Instead of being directed by constitutionally authorized authorities and performed in pursuit of definite war aims, war production would then be unregulated and inefficient.

The Controlled Materials Plan. The solution to this problem was not obvious, even to Roosevelt, that master of political and bureaucratic manipulation. Congress was not a problem after 7 December 1941. The laws restricting negotiated contracts were waived with the emergency war powers granted after Pearl Harbor. As early as 1940 Congress had suspended the requirement that profits on shipbuilding contracts be limited to ten percent.[29] The real problem was how to coordinate the wartime economy without managing it from the White House or tolerating a series of essentially political deals among the major producers and the services. The solution was suggested by Ferdinand Eberstadt, an associate of navy under secretary James Forrestal. It was called the "Controlled Materials Plan," and it balanced the need for central coordination of war production with the fact that the production itself had to be decentrally managed, industry by industry.

1942 was the key year. It began with Congress granting the president impressive and sweeping powers. In response, Roosevelt created the War Production Board, Office of Price Administration, National War Labor Board, and the War Manpower Commission (all in January) to support the work of the already active Office of Production Management. But the creation of these organizations and a host of lesser offshoots did not solve the basic problem of giving sensible direction to the war-related economy, nor did the president's effort to set targets. The targets constituted a kind of plan, but the emergency organizations did not have a means to turn the plan into reality. They did not

even know what information they needed to decide if and how the specifics of the president's production goals needed to be revised.

The Stabilization Act of late 1942 was the first step toward a solution. The law created the post of Director of Economic Stabilization, and Roosevelt persuaded James Byrnes to leave the Supreme Court and take the job. Donald Nelson, head of the War Production Board, had not found a way to balance central direction with decentralized action to Roosevelt's satisfaction, but the president apparently wanted to avoid pushing Nelson aside and thereby admitting that the war production effort was faltering. So Byrnes, a close confidant, was brought in above Nelson. In October 1942, Byrnes, Roosevelt, secretary of war Henry Stimson, and navy secretary Frank Knox accepted Eberstadt's Controlled Materials Plan, which was formally adopted at the beginning of November.[30]

The Plan was deceptively simple: it controlled the flow of steel, aluminum, and copper, and left other materials alone. It did not attempt to regulate wages or prices directly. Civilian rationing, for example, was left to the Office of Price Administration, and the Office of Production Management continued to try (not very successfully until 1943) to balance the needs of the services against those of allies, as it was intended to do.[31] What the Controlled Materials Plan did was leave the bulk of war production decisions to officials in the services and in the industries with which the service officials negotiated. The Plan was the second positive action which had to be taken to overcome obstacles to effective war production.

In the navy, for example, the Office of Procurement and Material (OP&M) enforced the quotas set by the War Production Board. Navy acquisition bureaus (such as Ordnance, Ships, and Aeronautics) could not negotiate contracts which required a violation of the Controlled Materials Plan quotas. OP&M, headed by a vice admiral, had the power to review and reject all major material contracts being negotiated by these bureaus; once the Controlled Materials Plan quotas were set, there was no appeal over its head. If bureau officers could find a substitute for steel, copper, or aluminum, then they could proceed and OP&M would not interfere; if not, then the bureaus' uniformed leaders knew from the start they could not get OP&M permission. Under the Controlled Materials Plan, OP&M's standards were known ahead of time by bureau officials working with industry. OP&M staff did not have to revise major material contracts because the bureaus knew up front what they could and could not get away with.[32]

After the war, Janeway argued that the Controlled Materials Plan "doubled the economy's finished, usable production in 1943 without curtailing consumer expenditures, and while slashing plant expansion from its inflated 1942 peak. . . ."[33] The Plan did not solve every war production problem, however. Manpower allocation remained a major problem all through the war despite prodigious

efforts to expand the industrial labor force. Controlling wages and prices and administering rationing (indirectly related to production efficiency) were difficult and controversial. Coordinating production with transportation was also difficult. Donald Nelson, for instance, had an uphill struggle persuading the major railroads to invest in sufficient locomotives and railroad cars to ship resources to factories and finished products to service depots. As it happened, the railroads were able to double their capacity with just ten percent more locomotives and twenty percent more freight cars, but that was an unanticipated stroke of luck and not the consequence of good planning.[34]

Roosevelt's faith in American industrial productivity and innovation was vindicated. Examples abound. During the war, the army's Detroit tank arsenal and other sources produced over 45,000 M-4 medium tanks in fifteen variations. In 1941, German factories produced 3,256 tanks; U.S. factories, 4,052. In 1942 the numbers were 4,098 and 24,997, respectively, and the Germans—despite efforts which more than doubled production levels—never came close thereafter.[35] In 1943 alone, U.S. factories made over 4.4 *billion* .50 caliber machine gun cartridges.[36] In 1940, Congress authorized a "two ocean Navy," and navy planners believed at the time that by the end of 1945 they would have thirteen large aircraft carriers and five escort carriers. The actual numbers were twenty-seven large carriers, nine light carriers (built on cruiser hulls), and eighty-five escort carriers (with merchant hulls). Aircraft production was so great that it was often measured in pounds, not numbers delivered. But the numbers were staggering either way: 324,750 planes were turned out in the years 1939 through 1945.[37] A total of 2,089,436,000 airframe pounds were produced, with yearly totals as follows:[38]

Year	Pounds
1940	20,279,000
1941	68,064,000
1942	239,858,000
1943	542,397,000
1944	797,120,000
1945	421,718,000

Such production levels were supported by advances in logistics. Chrysler, for example, sent a "package" of 460 spare parts boxes to the army with every hundred 3/4-ton trucks. Every box could be carried by one man, except for those which carried spare engines. Each box was labeled on all six of its sides, and the 460 were arranged so that they could be set up in numerical order, opened, and then function as "a working parts depot." Each group of 460 boxes had a 267-page "double indexed directory" so maintenance personnel could identify and find parts quickly. Finally, the boxes were packed to allow parts personnel to work their way systematically down through them from top to bottom.[39]

Ties to Industry. The key to such massive production and innovative support, as economists as different as Janeway and J.K. Galbraith recognized, was just the right balance between central direction and decentralized production. Such a balance could be achieved because the industrial and managerial potential was already in place, there was overwhelming support for the war production effort, Roosevelt and the business community recognized the need to keep the civilian economy strong even while war production boomed, the strategy of burying the Axis in mass produced war machines had its desired effect, the United States was never threatened with attack, and finally, because the army and navy—especially the latter—had quietly worked with industry before the war to develop means for expanding production. Though prewar army and navy plans were largely useless by 1941, both services had by then developed means to communicate their needs to industry, and both had cultivated sets of manufacturers who expected to increase production in the event of mobilization. The development of regular ties to industry was the third factor which allowed the United States to overcome the obstacles to effective war production.

The navy, for example, had had extensive experience by 1941 influencing and supporting major shipbuilders. In the years after 1933, as the Roosevelt administration and Congress sustained a steady program of military and merchant ship construction, commercial yards were encouraged to identify potential "second sources" for wartime needs. Navy shipbuilding contracts were also spread around in the lean years of the 1930s despite federal legislation which required the Navy Department to award shipbuilding contracts through a process of "sealed bids."

In this procedure the navy was supposed to prepare a package of ship specifications and circulate them to interested yards. The yards would then submit a confidential bid along with proof of their ability to build what the navy wanted. The winning shipbuilder was supposed to be the one with the lowest bid. Theoretically, this system would drive down costs by giving an advantage to efficient firms. Having won a contract by bidding competitively, an efficient builder would get better over time at estimating and controlling costs, thereby reducing both the government's outlay and the number of firms able to bid (unless the losers could find contracts building commercial hulls). The hitch was that the navy did not want to reduce the number of yards able to build its vessels. Quite the reverse: the navy wanted to cultivate the major shipyards, spreading the available business among them so that a large pool of skilled shipbuilders would exist when the decision to mobilize was finally made.

The navy got around the intent of the law by taking advantage of the first of the two steps of the "sealed bid" process. In that first step, yards had to convince the navy they were qualified to build the ship type wanted. To keep some potential bidders out of the running, the Navy Department ruled that firms were not qualified to bid unless they had already built the kind of ship involved. To

Naval War College Review, Vol. 45 [1992], No. 2, Art. 9

spread the work around, on the other hand, the department evaluated the ability of a yard to produce the numbers wanted, so that even the lowest bidder might only get a few ships. The law allowed the navy to award multiple contracts if the lowest bidder could not build all the ships authorized, and the department consistently did so. The navy, forced by law to award fixed-price contracts, rarely allowed one yard to walk away, for example, with all the destroyer or cruiser contracts for a year. The result was a "stable" of competent builders, each of which was required to identify emergency expansion yards for potential use in wartime.

The navy also won support in Congress for expansion of the merchant marine. As early as 1934, the Shipping Board Bureau of the Department of Commerce began development of "standard types of merchant vessels acceptable to the Navy."[40] Navy participants in this process of designing new commercial shipping later assumed responsible positions in the Maritime Commission, an organization created by the Merchant Marine Act of 1936. The purpose of the Act was to grant federal subsidies to shipping companies so that they could afford the more expensive American-built ships. In return for federal support, U.S.-owned firms bought ships of designs standardized by the Maritime Commission and the navy. Finally, the Navy Department was able to persuade President Roosevelt that ship construction was a form of public works, and therefore eligible for support under legislation such as the National Industrial Recovery Act.[41]

All this prewar work paid off handsomely when Congress authorized increases in the navy's strength in 1938 and 1940. Yet the navy faced the same basic production problem after 1941 as did the army air corps: would it convert other industries to make what it needed, or would it simply expand the existing base? Like the air corps, it did both. That is, the navy and Maritime Commission supported and financed the expansion of existing yards and also the development of new ones. The same policy was followed by the army in procuring tanks: existing facilities were expanded and brand new facilities were purpose-built. Aircraft were procured according to the same strategy by both the army and the navy. What forced both services to modify their prewar production surge plans was the need to manufacture such unexpectedly great numbers of tanks, planes, and ships, as well as the need for so many specialized if technologically unsophisticated items such as landing craft.

Indeed, for the army, war production was a kind of revolution, particularly in areas such as tanks and, especially, aircraft. The number of tanks and planes required to defeat the Axis was so great that making them overwhelmed the old habits of army procurement officials. Within a matter of months these officials, traditionally cautious in dealing with industry and trained in formal and slow methods of contracting, had to change completely the way they did their work. I.B. Holley's *Buying Aircraft* tells in detail the dizzy story of the army's effort to break free from its old ways and from its reliance on a small number of airframe

and engine manufacturers. Only three factors made the change possible: a conscious decision to freeze what were essentially prewar designs (such as the B-17) for wartime use; an unanticipated ability of the U.S. automobile industry to support aviation production; and hard, long, exhausting work by army air corps procurement officials.

Interestingly enough, the same factors sustained the navy. Very few major combat ship types, for example, were actually developed during the war; new designs were largely confined to amphibious types and auxiliaries. Only two major combatants, the escort carrier and the destroyer escort, were in fact developed after 1939. Both types could be made in great numbers because their designs were suited to quantity production. Neither was especially favored by the navy, because the service knew that mass-production ships (like the Eagle antisubmarine patrol boats of World War I) would have little value after the war in a fleet which would get few replacements for perhaps two decades.[42] It took pressure from civilian leaders (the president and Under Secretary Forrestal) to move senior navy officers to accept the escort carrier and destroyer escort, just as it took the president's extreme 1942 war production goals for aircraft to get the army to question its commitment to expanding the aircraft industry (with which it had close ties) as opposed to converting the automobile industry to aircraft production.

What both army and navy military leaders wanted was the freedom to put their prewar plans into effect. What President Roosevelt recognized was that the prewar plans—to say nothing of the mentality which produced such plans—were unsuitable. On the other hand, civilian leaders, simply because they *were* civilians, had no monopoly on understanding the essentially political nature of the "war of production." Aroused after Pearl Harbor, American workers, engineers, and managers pulled off what seem now to have been miracles of production. This immense effort could not have been successful if the services had not learned something from their World War I experience. The difference between the army and navy was that the latter had had more opportunities to create linkages which, during the war, helped speed war production.

Winning the War of Production

So what really won the war of production? Prewar planning? A consensus among American political and industrial leaders that the mistakes of World War I would not be repeated? Patriotic fervor? The answer is: all of these and more.

Though prewar plans produced by the army and navy were unrealistic as to numbers and means, prewar efforts to plan and maintain bases of supply in American industry proved invaluable. Moreover, as Milward shows, the American strategy of mobilizing assumed that the civilian economy needed to be kept strong as a necessary support to war production. The general acceptance

of this assumption was a key to victory and to success after the war. Because the assumption was shared so widely, Roosevelt did not have to abandon his New Deal, and business for its part could participate enthusiastically in the war effort. Furthermore, as Janeway argued, partisan politics was not suppressed in war production direction; politics, as the legitimate competition among different individuals and interests over social priorities, was deliberately carried right into the war mobilization agencies.

The president was able notwithstanding to retain control of the direction of the mobilization effort because he stood aside from the day-to-day direction of the economy. Roosevelt also realized that the White House was not suited to managing war production, that war production was best managed at a much lower level. The task facing the government was to direct that management, but not in detail. American managers, workers, and farmers could and did manage and innovate on their own. The navy and army had to train thousands of firms to produce items to government specifications, but many firms willingly and successfully took on what had been strictly government responsibilities such as test and evaluation of, for example, tanks and airplanes in development. This grass-roots eagerness to produce, save, recycle, and innovate is now a major American myth. What is so impressive is that much of the myth is quite true.

Perhaps the primary lesson that had been learned by military officers managing procurement in World War I was that there was no insurmountable obstacle to tapping the productivity of American industry, labor, and agriculture in wartime. Indeed, it was recognized in 1920 that the U.S. advantage in war was the country's ability to bury its enemies in machines manned and maintained by healthy, well-fed, and well-trained personnel. This vision was not lost between the wars. What was never quite worked out in peacetime—and probably could not have been—was the precise relationship of public to private institutions during mobilization, and the proper and effective relationship between the military services and the civilian agencies of government which would have to guide them.[43]

Notes

1. Alan Milward, *War, Economy and Society, 1939-1945* (Berkeley: University of California Press, 1977).
2. I.B. Holley, *Buying Aircraft: Materiel Procurement for the Army Air Forces* (Washington: Office of the Chief of Military History, Department of the Army, 1964), p. 151.
3. The U.S. Naval Institute will publish this year an exhaustive study, prepared by E. Miller, of navy "War Plan Orange" planning.
4. Holley, pp. 153-155; Robert H. Connery, *The Navy and the Industrial Mobilization in World War II* (Princeton: Princeton University Press, 1951), pp. 38-53.
5. Holley, p. 155.
6. *Ibid*, p. 152.
7. Connery, notes, p. 39.
8. Holley, p. 160.
9. *Ibid*.

10. H.C. Thomson and L. Mayo, *The Ordnance Department: Procurement and Supply* (Washington: Office of the Chief of Military History, Department of the Army, 1960), p. 269.
11. Holley, p. 35.
12. *Ibid.*, pp. 89-92.
13. W.F. Trimble, *Wings for the Navy: A History of the Naval Aircraft Factory, 1917-1956* (Annapolis: Naval Institute Press, 1990), p. 85.
14. Connery, p. 125; Holley, p. 107.
15. Holley, p. 109.
16. Buford Rowland and William Boyd, *History of the Bureau of Ordnance in World War II* (Washington: U.S. Government Printing Office, 1953).
17. Holley, pp. 530-531.
18. *Ibid.*, p. 532.
19. W.W. Stout, *Tanks Are Mighty Fine Things* (Detroit: Chrysler Corporation, 1946).
20. Thomas Collison, *The Superfortress Is Born: The Story of the Boeing B-29* (New York: Duell, Sloan and Pearce, 1945).
21. C.M. Green et al., *Planning Munitions for War* (Washington: Office of the Chief of Military History, Department of the Army, 1955), p. 342.
22. C.M. Baily, *Faint Praise: American Tanks and Tank Destroyers During World War II* (New York: Archon Books, 1983), p. 145.
23. Eliot Janeway, *The Struggle for Survival: A Chronicle of Economic Mobilization in World War II* (New Haven: Yale University Press, 1951), p. 44.
24. Connery, pp. 66-67.
25. D.M. Nelson, *Arsenal of Democracy: The Story of American War Production* (New York: Harcourt Brace, 1946).
26. Thomson and Mayo, p. 64.
27. *Ibid.*, pp. 255-257.
28. *Ibid.*, p. 64.
29. Connery, p. 268.
30. Janeway, pp. 315-316.
31. *Ibid.*, pp. 197-204.
32. Connery, pp. 393-398.
33. Janeway, p. 317.
34. *Ibid.*, p. 353.
35. Thomson and Mayo, p. 263.
36. *Ibid.*, p. 65.
37. Holley, p. 548.
38. *Ibid.*
39. W.W. Stout, *Mobilized* (Detroit: Chrysler Corporation, 1949), p. 111.
40. F.C. Lane, *Ships for Victory: A History of Shipbuilding Under the U.S. Maritime Commission in World War II* (Baltimore: Johns Hopkins University Press, 1951), p. 24.
41. R.H. Levine, *The Politics of American Naval Rearmament, 1930-1938.* (New York: Garland Publishing, 1988).
42. Norman Friedman, *U.S. Aircraft Carriers: An Illustrated Design History* (Annapolis: U.S. Naval Institute Press, 1983), and *U.S. Destroyers: An Illustrated Design History* (Annapolis: U.S. Naval Institute Press, 1982).
43. T.J. Gough, "Origins of the Army Industrial College: Military-Business Tensions After World War I," *Armed Forces & Society*, Winter 1991.

Ψ