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RESEARCH MEMORANDUM

INDUSTRIAL PREPAREDNESS PLANNING: A REVIEW OF THE LITERATURE

James H. Quinn
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INDUSTRIAL PREPAREDNESS PLANNING: A REVIEW OF THE LITERATURE

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ABSTRACT

This research memorandum reviews the history of industrial preparedness planning (IPP) as revealed in government directives, past studies, and budget documents. IPP policy development, planning methods, and organizations are summarized, and alternative planning methods proposed by other researchers are presented. The paper identifies problems that impede good planning and presents conclusions that help to explain the dilemma of IPP today. Recommendations from other studies are presented. Navy options for IPP will be presented in a future research memorandum concluding the study.

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EXECUTIVE SUMMARY

The Deputy Chief of Naval Operations (Logistics) tasked CNA to study industrial preparedness planning (IPP) in the Navy to determine how the planning effort could be revised to produce more useful results within resources that are likely to be available. This research memorandum presents findings from a review of the IPP literature, including directives and prior studies. A second memorandum will combine these findings with information collected in the field on contemporary IPP practices and will present options for improving the process.

HISTORY

Industrial preparedness planning began in 1947 when cold-war tensions increased. It was one part of an effort involving many government agencies that sought to prepare the United States for a defense emergency. The government did not pay industrial firms directly for such planning, and they participated on a voluntary basis. These practices generally persist today. Early planning emphasized the conversion of civilian industry to defense production, resembling what occurred at the beginning of World War II. Planners also sought to determine production capacity and allocate it among the competing demands of the armed services.

After the Korean War started, the President created the Office of Defense Mobilization at cabinet level to coordinate the mobilization activities of the executive branch. That elevation gave emergency planning high visibility and influence, but the effect was not lasting. Government attention to planning probably reached its low point when President Nixon abolished the Office of Emergency Preparedness in 1972 and distributed its functions to other government agencies. Congress created the Federal Emergency Management Agency in 1978 as an attempt to recentralize and increase the effectiveness of the dispersed functions.

Following the Korean War, the so-called Vance Committee defined the "D-to-P" concept, under which a strong industrial base capable of reacting quickly to a national emergency would substitute for large stocks of war material, and at lower cost.[1] Implementing D-to-P proved difficult; although the government could maintain the facilities it owned (provided money was appropriated), it never found a satisfactory way to sustain

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1. D-to-P: A logistic planning concept by which the gross materiel readiness requirement in support of approved forces at planned wartime rates for conflicts of indefinite duration will be satisfied by a balanced mix of assets on hand on D-day and assets to be gained from post-D-day production through P-day, when the planned rate of production deliveries to users equals the wartime rate of expenditures.

standby military capacity in the private sector, especially where production lines had shut down.

Long-War vs. Short-War Arguments

Beginning in the mid-1950s, industrial planners had to respond to a series of changes in the policy that stipulated the kind of wars the country should be prepared to fight. In 1955, the Air Force's "force-in-being" concept predicted that a general conflict would quickly become all-out nuclear war in which response from industry would be irrelevant. Keeping deterrence credible by fielding a capable active force took priority over funding the industrial base. Then in 1962, the new administration published its "flexible response" policy, which reemphasized preparation for both nuclear and long, conventional wars. In 1966, the Office of Emergency Preparedness Planning announced that planning should focus on limited war. Guidance changed again in July 1976: wars would be short and fought after a short warning. But in 1981, policy changed once more to emphasize planning for wars of indefinite length, expected to be fought anywhere in the world. Amid those swings in policy, it does not appear that IPP has been helped by two implicit assumptions that underlie long-war thinking: the industrial base and lines of communication to foreign sources of supply would need to remain undamaged.

Planning Methods

Although the government has modified the "how to" of IPP somewhat since 1947, the basic philosophy and methods established then remain today. Armed services procurement planning officers (ASPPOs) in plant representatives' offices and Defense Logistics Agency field offices circulate planning forms (currently the DD1519 series) among prime contractors and their subcontractors. Service buying agencies originate the forms, which specify delivery schedules for items they believe would be needed in a defense emergency. The contractors respond with their estimates of deliveries they could make with existing facilities. They also specify industrial preparedness measures--additions to their stock of material, facilities, tooling, and test equipment that the government could buy--to shorten the delivery schedules. Other IPP methods are available--special studies, direct industrial base planning between the government buyer and the contractor, and funding the contractor to plan as part of a contract for development or hardware.

Beginning in 1979, other organizations proposed alternative approaches to IPP. Rand and the Institute for Defense Analyses (IDA) both studied macroeconomic approaches that evaluate the ability of the industrial base to support surge (Rand) and mobilization (IDA). Surge was defined to be accelerated production of selected items in peacetime. The literature does not show whether the services use the Rand or IDA methods. The General Accounting Office (GAO) employed its own methodology in a 1985 study of six weapon systems. It emphasized getting data on lead times, sources, costs, and histories of production problems in

order to target critical components at each manufacturing tier. It combined that information with a horizontal analysis of production from firms producing critical components. Finally, GAO combined Five-Year Defense Plan data with contractors' plans for expansion and market estimates to determine the peacetime capacity to accelerate production of selected systems in a national emergency.

IPP PROBLEMS

Most observers consider IPP to be ineffective. They believe that it does not produce good information about industry's ability to mobilize and that it does not strengthen the industrial base. Reviewing findings from prior studies reveals many problems that have caused IPP to be ineffective and that continue today. While IPP has changed little over the years, the defense industry and its relations with the government are different. Firms doing business with the government encounter problems absent from commercial markets and an environment that has become increasingly adversarial. These trends have driven many firms from the defense market, and those that remain have faced increasing, government-sponsored competition that makes them even more reluctant to provide free services like IPP. Also, the scope of the government IPP program has usually overwhelmed the resources for the work, a problem made worse by the increasing complexity of many end items.

The services use different methods to determine which items should be included in IPP. And DOD has never been able to determine the total requirements, or their priority for production, for items that the services and defense agencies would expect to order in a defense emergency. Without that information, it is impossible for planners in industry to allocate their production capacity properly, a first step in IPP.

The Army and Air Force have largely dropped the DD1519 method of planning, believing it to be ineffective, but the Navy still uses it for most of the 2,154 items on its industrial preparedness planning list. NAVSEA also uses direct industrial base planning with success, and NAVAIR contracts for special studies when funds are available.

Several factors contribute to planners' inability to motivate their colleagues in government to take IPP seriously:

- Government officials outside the IPP community, ranging from acquisition managers to members of Congress and their staffs, cannot justify spending the large sums required to improve the industrial base when faced by higher priorities. And doing planning to spend money that will not be available makes no sense to officials concerned with more pressing problems.

- Swings in guidance on the length of the war to be fought, particularly those toward the all-out conventional war, diminish the credibility of the policy behind IPP.

- The technology that adds to capabilities of weapons often makes them more difficult to produce and increases the time needed to accelerate their production.

Detailed IPP must be done by industry, and government has usually asked firms to participate voluntarily and absorb the costs in overhead. Asking industry to do perpetual IPP without paying for it suggests there may be problems with the quality of information that will be provided. Further, as industry's relations with government have become more adversarial, often over cost and pricing issues, industry managers have become more reluctant to spend company resources for IPP they see to be ineffective for the nation and without benefit to the firm. Competitive contracting and other government cost-cutting pressure have only increased their reluctance. The government won't even assure a firm that does IPP for a specific item that it will get the contract in a defense emergency. Government once had a policy of contracting in peacetime with mobilization producers as a practical move to enhance the industrial base, even if cost was slightly higher. Today the government competes the contract and awards to the low bidder.

CONCLUSIONS

When IPP began, the government attempted to plan for the conversion of peacetime industry to wartime needs and the allocation of industrial capacity to military requirements. Apparently unable to achieve these difficult objectives, the government passed the IPP function to industry.

Studies by IDA and Rand show alternative ways to plan improvements that could enhance the nation's ability to produce all critical defense items in an emergency.

Maintaining and improving the industrial base has lower priority than do other acquisition ventures. When actions to enhance the industrial base conflict with the need to lower the cost of peacetime procurement, lowering the cost wins. But the government has been unable to develop a coherent policy that recognizes this reality.

Prior studies have concluded that major changes are needed in IPP for it to be effective. The new requirement to support the Joint Chiefs of Staff's Industrial Mobilization Planning Process may raise the visibility of IPP and its problems, but more policy pronouncements without changes in planning approaches cannot improve effectiveness.

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INTRODUCTION

BACKGROUND

Since before World War II, the United States has planned for mobilization of the nation's industrial base to support needs for military material in times of national emergency. Battered by conflicting political objectives and sparse appropriations, planning has rarely achieved good results. After war started in Europe in 1939, the nation had nearly two years to build its industrial base before it needed to fight. Despite that appreciable lead, military operations were delayed when resources diverted to increase industrial capacity slowed the production of weapons. [1]

Postwar planning for mobilization began with the National Security Act of 1947. Some of the procedures and organizations established then are still active today. Defense planners and decision makers continue to state that industrial preparedness planning (IPP),[1] as it is now known, is important to the nation's strategy for responding to defense emergencies of varying character and intensity. Yet IPP is widely regarded as a failure, producing neither realistic, comprehensive estimates of industry's ability to accelerate war material production nor arguments compelling enough to achieve improvements to the defense industrial base. For example, in a previous study examining ways to analyze the aircraft production base, CNA found that despite continuing IPP for the aircraft industry:

- The Navy data base is so poor that the reliability of forecasts of production capability for aircraft in a national emergency is questionable.
- Planning has produced essentially no capability to accelerate aircraft production in an emergency beyond that resulting from peacetime procurement. [2]

From the results of the production base analysis study, CNA postulated that IPP for aircraft--and, by inference, some other commodities--does not work.

In December 1986, the Deputy Secretary of Defense advised the services and defense agencies of the need to "...look for a better approach to define and quantify our requirements...[including]...a mechanism [to] allow us incrementally to compare requirements against capability--logistics in place plus production base output." [3] In response, the

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1. This paper necessarily uses many acronyms and abbreviations that are unique to the subject. A glossary of them can be found at the end of the main text.

Joint Chiefs of Staff (JCS) are introducing the Joint Industrial Mobilization Planning Process (JIMPP), placing new emphasis on IPP and requiring that the services provide new information to the JCS. Given the resource constraints under which IPP functions and the problems in making it effective, the Navy decided to take a fresh look at the planning system to determine what options exist to revitalize IPP and meet JIMPP requirements.

TASKING

The Deputy Chief of Naval Operations (Logistics) asked the Center for Naval Analyses (CNA) to study IPP and accomplish the following analytical tasks:

- Appraise IPP performed in the Navy by examining planning objectives, how planning is conducted, and what constraints operate to lessen the effectiveness of planning.
- Determine what planning can realistically be done, and how the planning effort should be redefined to produce useful results, given budget constraints.

The Navy also requested that the CNA study consider changes in IPP procedures that may be forthcoming from the Office of the Secretary of Defense (OSD) and the "...impact and ramifications of [JIMPP] on the Navy." [4]

This study necessarily included a review of historical changes in the defense industrial base, but it did not address what improvements need to be made in the base and how to make them, a problem of much broader scope and complexity. Other agencies are studying that problem now.

APPROACH

The CNA study team conducted the IPP study in two phases. First, to understand the evolution of IPP, the team reviewed the literature that describes post-World War II planning history. Part of that search included attempting to find the budget and appropriation history of industrial planning for the past ten years. (The team considered it unlikely that interesting budget data more than ten years old could be found.) The analysis focused on finding the problems with IPP and determining how well the problems were solved. That historical appraisal formed a benchmark telling what accomplishments could realistically be expected from IPP, given the resources that might be allocated.

In phase two, the study team interviewed people in the industrial planning community and collected data on current IPP requirements, practices, problems, and results. The team discussed IPP with people from

OSD, the three services, the Mobilization Concepts Development Center of the National Defense University, the Defense Logistics Agency, the JCS, the Department of Commerce, the Federal Emergency Management Agency, and other organizations with an interest in IPP. The discussions sought the views of those people on the state of industrial planning and began a dialogue to identify ways to improve planning. Officials from OSD provided information on new policy guidance expected to be issued in 1988.

The results of the literature search are presented in this research memorandum. It also introduces some information gathered in the second phase to clarify specific topics. A forthcoming research memorandum will draw lessons from the literature and the contemporary thoughts of planners to develop a series of policy options the Navy could pursue in the future for improving IPP.

ORGANIZATION OF THE REPORT

The report first presents a brief history of IPP policy development to define initial objectives and how they have changed since the Korean War. The discussion describes how the concepts of the mobilization base and "D-to-P," the balancing of war reserves against the capacity of the industrial base, evolved. Next, the effect of changes in policy for procurement and for the kind of war the United States should prepare itself to fight is presented--the "short-war vs. long-war" controversy.

A section on methods and organization for IPP shows how the framework and methods for IPP established after World War II remain, with some modifications, in effect today. It also describes proposals for industrial planning by other organizations--the General Accounting Office, Rand, and the Institute for Defense Analyses.

Problems that impede good industrial planning are next presented in detail. They include inadequate resources and planning methods, conflicting requirements, fragmented government leadership, and difficulties in motivating people in both government and industry.

The report ends with conclusions drawn from the findings in the literature, together with recommendations published by researchers in the last ten years.

A HISTORICAL PERSPECTIVE OF INDUSTRIAL PREPAREDNESS PLANNING

THE DEVELOPMENT OF IPP POLICY

Assessing how effective IPP has been in recent years requires that the history of industrial planning policy be recounted, at least briefly. The material here is drawn from a number of references on the subject, especially [1, 5, 6].

Early Post-World War II Initiatives

As the nation demobilized after World War II, the tensions of the cold war increased, and Congress passed new laws that affected the structure of the national security establishment and how planning would be done for future conflicts. The National Security Act of 1947, in addition to creating the Defense Department, created the National Security Resources Board (NSRB) and formally recognized the Munitions Board, which had been created in 1945. The two organizations were, in effect, long- and short-range planning groups. The latter was assigned the responsibility for planning the military aspects of mobilization. [5]

The law that enabled contracts for defense items to be negotiated and signed quickly was the Armed Services Procurement Act of 1947. It established the statutory requirements for procurement of defense items, and one provision permitted noncompetitive negotiation of contracts when the national defense required the retention of certain facilities and suppliers.

The Munitions Board wrote the detailed Industrial Mobilization Plan of 1947. It provided a "phase I" time period for premobilization activity before the President declared a national emergency. An important function to be accomplished during phase I was determining and allocating existing production capacity to the competing demands of the armed services. The new industrial planning for defense followed these principles:

- Factories that could be *converted* easily (i.e., those not needing major new facilities or equipment) from peacetime production to war production would be identified and enrolled in the program.
- Most planning would be done by the industrial firms. Government would allocate production of items to specific plants.
- Participation by the firms would be entirely voluntary and at no direct cost to the government.

This last principle was noted on Munitions Board form MB 104, which was used to codify agreement between the government and the manufacturers:

> It is understood that our acceptance of this Tentative Schedule of Production is entirely voluntary on our part, and that it in no way binds this firm or the government in any contractual relationship. [7]

The concept of the "planned producer" emerged here. A firm enters into an agreement with the government to produce an item at a certain rate during a national emergency. That voluntary arrangement for doing industrial planning is still the primary method for IPP; as will be seen later, observers believe the voluntary basis is a major cause of IPP's problems today.

Many government bodies participated in comprehensive planning for mobilization during the early postwar years. The government recognized that military requirements needed to be compared to available resources in a test of economic feasibility. The JCS developed strategic plans for the kind of war the nation would probably fight, where it would be fought, and the troops that would be needed. The plans went to the services, which devised their requirements to support the plans; the Munitions Board then screened and coordinated the services' needs for material. In 1948, the government tested the feasibility of JCS plans. The NSRB worked with 21 federal departments and agencies to survey national resources, and the test showed that the plans exceeded the capacity of the economy.

Planning in the 1950s

Two months before the outbreak of the Korean War in June 1950, the National Security Council issued NSC-68, which declared the doctrine of containment of the Soviet Union. Under that doctrine, the United States, bolstered by its military capacity, would lead the forces of the free world. In December 1950, the President declared a national emergency because of the conflict in Korea and created the Office of Defense Mobilization (ODM) to coordinate all mobilization activities of the executive branch of the government. The President appointed a Director of Defense Mobilization to be ODM head and made him a member of the National Security Council with cabinet rank. ODM set goals making it clear that the nation's needs for a defense industrial base extended beyond the immediate demands of the Korean War. The goals included stockpiling enough military goods for the first year of full-scale war, developing basic resources, and expanding industrial capacity.

The government backed its policies with action and incentives to spur the industrial base--accelerated amortization of costs of facilities, guaranteed markets and prices for certain material, financing of defense plants, direct loans, installation of government-furnished

equipment (GFE) in contractor plants, and grants for research and development in manufacturing methods.

Beginning in 1951, the NSRB began to develop further techniques to estimate the ability of the nation to support projected wartime programs. These included:

- Feasibility tests of materials requirements for the free world under conditions of full mobilization
- New interindustry analytical techniques: input-output analysis modeled by the Bureau of the Budget and the Council of Economic Advisors
- Assessments of the impact of new weapons systems on the requirements for resources. [8]

The Mobilization Base

In 1952, the Director of Defense Mobilization defined the concept of the mobilization base, the source of industrial strength from which the nation would draw in an all-out war (now more possible because the Soviets posed a growing security threat):

> The mobilization base is that capacity available to permit rapid expansion of production, sufficient to meet military, war-supporting, essential civilian, and export requirements in event of a full-scale war. It includes such elements as essential services, goods, raw materials, facilities, production equipment, organization and manpower. [9]

In both World War II and the Korean War, it had taken too long to convert from civilian to military production, and much of the initial effort was building *capacity* for weapons production rather than *weapons*. Establishing a mobilization base to speed conversion was a concept dating back to the Mobilization Plan published by the Munitions Board in 1947.

In 1953, the Advisory Committee on Production Equipment (often known as the Vance Committee) recommended that the government "substitute, to the greatest extent practicable, production capacity for the stockpiling of military end items." [10] Here the Committee proposed that it would be less expensive to maintain industrial capacity than to stockpile material, making adequate defense feasible at reasonable cost. Facilities would be in place, and production would expand by adding manpower to staff multishift operation. The recommendation, generally in tune with Defense Department thinking of the time, extended the mobilization base idea with the D-to-P concept: stockpiles would only need to

be big enough to fight a war until production rose to meet war consumption. Clearly, the more quickly production could be accelerated, the smaller the stockpiles that would be required, and the less the chance their contents would become obsolete. It would be less expensive to maintain the facilities in readiness than to let them decay and build new ones to support a new war. The mobilization base and D-to-P concepts became primary planning concepts for IPP until the mid-1970s.

Following the Korean War, the government needed to scale back production of war material while maintaining a mobilization base adequate to support the policies of NSC-68. The problem had several aspects: what to do with government-owned facilities, government-owned equipment in privately owned facilities, and facilities and equipment that were solely privately owned. The ODM issued Defense Mobilization Order VII-7 in August 1954 to address those issues. In summary, (and clearly subject to Congress appropriating money each year) it provided that:

- The government would buy defense material from essential mobilization suppliers. (DOD subsequently announced it would pay more than low-bid prices if the national security would benefit.)

- Government-owned facilities and tools would be maintained in standby status.

- Government tools in private facilities would be maintained in "packaged form" in those facilities, together with a cadre of people to activate them; alternatively, they would be packaged and stored in a central location. Sponsors would attempt to upgrade the packages to fill gaps in their capacity.

The government never was able to maintain the privately owned base satisfactorily. After the Korean War, there was not enough peacetime procurement to support the active base that planners had envisioned. Once orders wound down and production lines went cold, there was no way to maintain their capacity. Neither legislation authorizing contracting to maintain standby production lines nor appropriations to do so were available. [6] Government enthusiasm for owning and maintaining its own industrial facilities has waned over the years. In recent years, the government has sold, scrapped, or transferred to industry many of its industrial assets, including facilities, tooling, and special test equipment. The Navy continues to do so. [11]

Following the Korean War, the Army and the Navy followed OSD policy for using the mobilization base concept. (However, the policy really didn't apply to shipbuilding.) The Air Force announced its "force-in-being" concept in 1955, postulating the importance of deterrence and forecasting that a future war would be totally nuclear, fought with forces on hand at the beginning. From 1958 through 1967, it

dropped industrial planning for emergencies completely, believing that industry could not accelerate production in time to make any difference. The Air Force approach ran counter to the intent of NSC-68, which emphasized a strong *conventional* capability to preclude resorting to *nuclear* forces. Here began the short-war, long-war argument (discussed in a later section).

Planning During the Vietnam Period

In 1962, DOD announced the policy of "flexible response," requiring that the services prepare to fight a war of indefinite duration, conventional or nuclear. As a result, the Air Force again began planning with industry, but only for spare parts, not complete systems.

The Office of Emergency Planning (OEP) succeeded the ODM, and in 1966 it published a ***Resource Mobilization Plan for Limited War***. In one and one-half decades, thinking had shifted from preparing for either nuclear or conventional war to all-out nuclear war, then back to conventional or nuclear war, then to limited war, defined to be a conventional war of *any* scale. [6]

The Vietnam War brought renewed emphasis on planning for national emergencies. Executive Order 11490 of October 1969 made the Secretary of Defense responsible for:

- Planning with industry to ensure that selected military supplies could be quickly produced in an emergency
- Solving the problems of maintaining the needed mobilization production base.

A few months earlier, DOD began to strengthen its industrial policy. The Secretary of Defense issued a memorandum on 24 July 1969 that stated:

> The primary objective in establishing a viable and realistic industrial mobilization production planning program within the DOD is to have the industrial base necessary to meet a *limited* [emphasis supplied] war need.... Information dealing with mobilization production requirements and lead time for industry to reach the required mobilization rate of production are particularly important. Lack of such data presents many uncertainties as to inventory requirements or facilities that should be maintained.

Note that this policy applied to limited war--conventional conflict at all levels up to global war like World War II. The program continued to be voluntary on industry's part, and its success would depend heavily on industry's willingness to participate. [12] The new program was promulgated in a DOD planning manual published in December 1968. [13]

DOD made another important policy change during the Vietnam War. To reduce costs, contracts were awarded to low bidders whenever possible, rather than to planned producers. That practice varied significantly from the post-Korea practice of attempting to maintain the industrial base by giving priority to planned producers when awarding contracts.

The Changes of the 1970s

The D-to-P approach to planning remained in effect for two decades, amid changes in the estimate of the type war to be fought, nuclear or conventional, limited or all-out. Beginning in the mid-1970s, two important policy changes occurred that profoundly affected planning. Policy planning changes and their impact are summarized in table 1. First, D-to-P was superseded by the "D+6" concept in July 1976: DOD directed the services to buy war reserves adequate for six months of combat consumption. Here DOD assumed that the war would be short, conveniently accommodating the fact that industry could not accelerate production to equal consumption in six months. Second, the administration extended that logic further in its guidance for the 1979-1983 Program Objectives Memorandum (POM). Previously, the services had been permitted to build facilities that would permit production at wartime production rates, assuming around-the-clock operation. Since the war would be short, that capacity would not be needed.

TABLE 1

PLANNING POLICY CHANGES

Period	War length	Impact
Before July 1976	Potentially long conflict	Services attempted to stock enough items for combat until production could accelerate; IPP important.
After July 1976	Short-warning, short-war scenario	Responsiveness from industrial base no longer needed; IPP deteriorated, especially in the Navy and Air Force; Army retained much of its planning capability because production of consumable material like ammunition must be capable of rapid acceleration.
After early 1981	Conflict of indefinite duration anywhere on the globe	Responsiveness of industrial base again important; 6 March 1982 DEPSECDEF policy statement on industrial preparedness stressed ability to meet surge and mobilization requirements.

SOURCE: [23].

Guidance evolved over several POMs, finally limiting facility size to that needed to deliver the planned five-year buy on a multishift basis. That meant that manufacturers would have to add facilities before much production increase could occur, increasing the time between the exhaustion of war reserves and the arrival of newly produced material in an all-out conventional war.

Recent DOD Initiatives

In early 1981, DOD proposed substantial changes in IPP to the services. New policy would require planning agencies to:

- Integrate IPP planning for current systems into system project management and procurement functions rather than having the planning done by people outside the project office
- Submit plans for the industrial base to OSD annually
- Select the items to be included in IPP on a total system/end-item basis rather than in piecemeal fashion; reduce the number of items approximately 50 percent from the 2,000 then allotted to each agency
- Include funds for detailed planning with line items on procurement contracts
- Include planning for surge (rapid acceleration of production under peacetime conditions). [14]

In March 1982, the Deputy Secretary of Defense followed those proposals with a strong policy statement. He articulated the importance of the industrial base and set forth specific objectives for its revival--efficiency, surge capability, sustainability, and integration of IPP funding into the planning, programming, and budgeting (PPBS) system. The policy represented a return to the D-to-P concept that was discarded in the 1970s. [15] The President issued a National Security Decision Directive requiring that manpower and material on hand be adequate to guarantee the nation's ability to mobilize, deploy forces, and sustain military operations. Expected actions would include:

- Expanding military forces from partial through full to total mobilization
- Deploying forces to theaters of operations and sustaining them in *protracted* conflict. [16]

DOD published detailed IPP guidance to the services and the Defense Logistics Agency in 1985. The guidance directed:

- Surge and mobilization planning

- D-to-P planning
- Integration of IPP into the production management function by acquisition managers
- Annual analyses of the production base
- Additional choices of planning methods
- Identification of foreign dependencies. [17, 18]

THE SHORT-WAR VS. LONG-WAR CONTROVERSY

The length of a potential war is an important assumption from which to begin IPP. Planning depends upon how long policymakers believe a war would last, and the issue has been contentious in DOD since at least the mid-1950s. Short-war advocates say there would be little warning before the war began. The focus would probably be on a single theater where conventional forces might initially contain the Soviet enemy. But as they exhausted their material reserves they would turn to tactical nuclear weapons, and the conflict would quickly escalate to a general nuclear war. Since industry would not be able to respond in time to affect the initial campaign, scarce resources should be put into modernizing and maintaining the near-term readiness of forces in being to enhance their deterrent effect.

The contrary logic is that too many uncertainties exist to ignore the possibility of other kinds of conflict. A long buildup of world tensions might precede a war, providing time for the United States to augment its forces. The action might be contained if both sides feared to escalate to nuclear weapons, and the broad issue of sustainability would become important. If the opponent were other than the Soviet Union, a need might arise to build stocks of certain materials quickly, for example, munitions and other combat consumables. A strong industrial base, bolstered by periodic modernization of facilities to enhance firms' ability to accelerate production, would be a hedge against uncertainty. [5, 19]

At least two reasons exist to challenge the ability of a strong industrial base, once built, to sustain a long conventional war:

- First, the industrial base would need to remain undamaged for prewar investments to make sense. While the U.S. was not vulnerable to attack during World War II, a wide variety of Soviet systems can strike the U.S. today.
- Second, it is unlikely that the U.S. can ever free itself from its increasing dependency on foreign sources of material and components for weapons. Thus, those foreign sources and the means to transport material to the U.S.

> would need to be secure for the U.S. to be able to prosecute a long war. If they were lost, the minimum impact would be the time needed to duplicate foreign production lines in the U.S.

Planners faced an inescapable problem, which was succinctly stated by Under Secretary of Defense (Policy) Fred Ikle:

> The assumption that industrial mobilization is irrelevant because it would come too late stems from a peculiar habit of thought common among our defense planners--"short war" thinking. Because of budget stringencies over many years, our military stockpiles today could support a major conventional war for only a couple of months or so. This puts our planners in a quandary: either they have to assume a short war, or envisage fighting a war without suppliers. Understandably, they choose to "plan for a short war." In a short war, lo and behold, the mobilization of American industry would come too late; the war would have ended before Detroit could produce the new tanks. [20]

The shift in philosophy from long war to short war and back that began with the Air Force's forces-in-being concept in 1955 has occurred several times. A DOD sustainability study in the late 1970s helped short-war advocates win the day, and subsequent guidance emphasized improving near-term readiness. Although the DOD recently sought to overturn the prevailing short-war mentality, it is not clear that other elements of the national security structure followed the administration's lead. DOD attempted to begin expanding the capacity of the base when it put $500 million into the budget, to be spread over the Five-Year Defense Plan (FYDP) years, beginning in 1984. The funds would be used to provide capacity to surge production of selected weapons systems. But improvements in the industrial base could not compete in Congress with the higher priority to modernize and expand forces in being; little money was appropriated. (See the discussion of funding contained in the research memorandum that concludes this study.)

METHODS AND ORGANIZATIONS FOR INDUSTRIAL PLANNING

Initial Planning Framework

In Annex 47 to the Industrial Mobilization Plan of 1947, the Munitions Board established the kernel of IPP: a dialogue between DOD and industry in which firms agree to produce certain items to specific schedules in a national emergency, and DOD declares its intent to buy those items from those firms. With that dialogue, the Munitions Board intended to preallocate the country's manufacturing capacity to fit

wartime needs of both the armed forces and the home front. As noted earlier, emphasis in the early days was on converting plants producing civilian goods to production for wartime, since the United States had never had a standing armaments industry. The goverment did not coerce any firm to join the program, relying instead upon patriotism and national pride, a legacy of World War II.

The planning program had a lengthy list of objectives that may be summarized as:

- Educating industry and gaining its cooperation to execute the program
- Locating and tracking the condition of the facilities where the needed material could be produced
- Expediting and allocating material production to civilian and military claimants in a national emergency.

Industry had to do the detailed planning. Only company teams of managers and industrial engineers having detailed knowledge of the techniques and problems of converting production lines would be able to develop realistic mobilization schedules. But the government needed officials in the field to represent its interests, provide continuity in its relations with industry, and act as a focal point for the government-industry dialogue. The Mobilization Board created positions for what were called Armed Services Production Planning Officers (ASPPOs) as field representatives of the military establishment. Their functions were described in Annex 47. [7]

An ASPPO was hired by the service that was chief customer of the plant at which his primary assignment lay, but he served other services and agencies as well. He functioned as a coordinator and expediter, surveying plants and facilities to meet the needs of all claimants, obviating time-consuming site visits from buying commands, and monitoring the capacity and readiness of the plants in his area. The ASPPO's tools were administrative skill, tact, and persuasion, for he could provide firms with no tangible benefits coming from his ASPPO authority. There was no way to pay firms directly for the cost of planning--they would have to absorb those costs in overhead, although the overhead charges should be allowed as costs by the government.

Government buyers submitted forms to the Munitions Board requesting that specific plants become planned producers. Following its detailed planning, each participating firm agreed to a tentative production schedule and formally became a planned producer by completing a series of forms that were signed by the buyer and a company representative. Part of the prime contractor's submission was a list of the subcontractors that would supply material. The government obtained similar agreements from the subcontractors. If required, the Munitions Board balanced and

allocated subcontractor capacity against the competing needs of prime contractors. [7]

In 1965, the Defense Contract Administration Service (DCAS) absorbed many of the ASPPOs (though some continued to work at plant representative's offices that reported to a service). [6] Currently, about half the former group that had reported to industrial planners in the services now report to the Defense Logistics Agency. ASPPOs usually perform other duties in addition to IPP. In 1968, The Defense Department published a detailed mobilization planning manual. As already discussed, the armed services' needs and enthusiasm for planning underwent major changes in the years after the Korean War, depending on the kinds of material they needed and their views on the war to be fought. Yet, the new directive required planning in depth. Planning was to be divided into *accelerated* (using existing facilities) and *expansion* (buying new production equipment) categories for current sources. Other planning categories were *conversion* (of plants producing only commercial products) and *open* (using idle capacity). [13]

Form DD1519

By 1968, a new form, the DD1519, had replaced the forms introduced in 1947. The DD1519 was used by the ASPPO and the prime contractor for planning. Government procuring offices initiated the form for each item that they wanted included in IPP. They specified the month-by-month production schedule required during a national emergency and listed the major subassemblies and pacing components that they believed required planning by subcontractors. Then the ASPPO, consulting with the firm's management, entered the schedule that could be attained using existing facilities. He also entered a schedule that could be attained if industrial preparedness measures (IPMs) were implemented before M-day. Those would include such measures as buying additional material inventory and special tools and test equipment.

Again consulting with plant management, the ASPPO completed a form DD1519-1 for each major subassembly and pacing component. The form for components contained the same information that the DD1519 provided for end items. The ASPPO mailed the forms to subcontractors designated by the prime contractor. Each subcontractor then contacted the ASPPO responsible for his plant, who worked with firm representatives to furnish the requested information. Ideally, the first-tier subcontractor identified his critical suppliers in the second tier and mailed DD1519-1 forms to their ASPPOs, and so forth.

Finally, form DD1519-2 was used by firms to describe their facilities and give their current and maximum production capabilities for all items.

As an alternative, the 1968 manual described a direct planning system, one in which the procuring activity negotiated mobilization

requirements directly with the prime contractor instead of having the ASPPO perform that service.

A revised manual that incorporated recommendations of the Industry Advisory Council (24 industry executives who met with high DOD officials three times each year) was published in 1972. The revision simplified the description and procedures for the planning process. For example, the DD1519 replaced the DD1519-1 for subcontractor planning, and the latter was eliminated. It also discarded certain provisions of the planning process and removed some of the lengthy detail contained in the earlier version. However, there was no fundamental change in the approach to planning--voluntary, unpaid participation by contractors with the ASPPO coordinating field planning. [21]

A new manual was published in 1985, and it continued to retreat from detailed description of the process. It codified two new methods for planning that had been introduced after 1972: special studies and use of the data item description (DID). Those methods allowed procuring activities to fund a study contract to perform IPP as prescribed by a new clause in the Defense Acquisition Regulations. Or, they could buy IPP as part of a development or production contract, requiring the contractor to deliver the report of planning results as a data item on the contract. The choice of which of the of the four planning methods (DD1519, direct planning, DID, or funded study) to use was left to the discretion of the government planner. The new manual also directed that government planners use the Commander-in-Chiefs' (CINCs') Critical Item List (CIL) in determining items for which planning should be conducted. [22]

There are ways for the government to get information about the state of the industrial base other than through formal IPP. Program management offices usually contract for a specific production rate and have, or can easily get, ad hoc information about total production capacity and constraints on accelerated production from their contractors. The Department of Commerce's Bureau of Economic Analysis produces special DOD spending impact studies, and its International Trade Administration does competitive assessments of segments of U.S. industry. Those sources (except for program office data) do not tell capability to produce specific items. But they do provide data and analyses on broad industry capabilities and trends. Industrial planners can use the information to forecast the ability of the United States to accelerate the production of classes of items, such as aircraft and precision guided munitions. [23]

ALTERNATIVE METHODOLOGIES FOR IPP

Other authors have recognized the inherent problems in IPP as practiced by the Defense Department over the years. They have proposed alternative methodologies that they believe would produce more accurate data, given reasonable resources. In addition, several macro-level economic models exist that can assess the ability of the industrial base to respond to a national emergency. Several of those are described here.

GAO Methodology

In 1985, GAO originated a new method to do IPP and tested it on six weapon systems. [23] The method called for both the vertical planning needed to assess constraints on the production of individual weapons and the horizontal planning needed to determine where capacity shortfalls would occur within industries. GAO defined constraints to be factors that "limit the production rate or would limit production if the intended rate were slightly higher."

GAO first used a combination of mail surveys and site visits to do vertical analyses through the subcontractor tiers of each weapons system. It began by getting a list of the components used by the prime contractor to produce the item. It identified the critical components at the first subcontractor tier, then planned to fan out through the lower tiers, repeating the process for each critical item. The criticality criteria were:

- Long or growing lead time
- High or increasing unit cost
- One or few suppliers
- Item obtained from a foreign source
- History of production problems and constraints.

In practice, GAO found working through the lower tiers to be time consuming and difficult (more will be said of that problem later). It proposed and apparently used an alternative approach: simply collecting and analyzing lead-time and cost data for as many items on the prime manufacturer's bill of material as possible. It ranked the items by cost and lead time to yield a tentative critical-item list, then combined that list with lists of items that the contractors and local DOD officials believed to be critical. Then GAO gathered additional information on foreign dependency and production problems, for those items initially believed to be critical, to yield a final list.

Next, GAO did a horizontal analysis that evaluated competition for the production resources of each firm on the list. GAO visited each firm to examine company records and interview managers. It determined:

- The production levels for different defense and commercial-sector products
- The demand for the firm's resources that those products exerted

- The percentage of the production base that each critical item represented

- The contractor's plans for expansion.

By combining that information with the results of the vertical analysis, GAO showed how a "correlation matrix" of firms, products, and supported systems could be devised that would show the competing demands for the same production resources.

Finally, GAO performed a future-production analysis. It used data from the FYDP to estimate future production rates for the systems. Contractors supplied their estimates of future changes in demand for products that now compete with defense products. Combining that information with contractors' plans for expansion, GAO estimated whether future production requirements could be satisfied. The analysis also provided some insights into problems that would occur if the government asked the contractor to accelerate production in a national emergency.

The GAO method attempts a comprehensive survey of demand, both private sector and defense, industrial capacity, and contractor intentions. Results can then be used to forecast the capacity of the industrial base to produce specific items in a national emergency. The vertical analysis is similar to the DD1519 method, except that more resources are needed to gather in-depth data. The method requires many qualitative judgments, and it does not take into account many variables that affect production.

Rand Methodology

Rand Corporation has also studied the defense industrial base, focusing on the capability of the lower tiers to meet both peacetime and surge needs of defense. Its results were published in the late 1970s. [24] Rand's comparison of what an IPP system should do with what the current system does is shown in table 2. Unlike most contemporary methods of IPP, which focus on item analysis, Rand used macroanalysis to determine the ability of the economy to meet the need for defense items.

In the first step, Rand used the Department of Commerce's 367-sector breakdown of U.S. industry to identify 13 industries that produce defense products. These were in three groups: whole systems, spares and replenishments, and munitions. Rand then looked at the remaining 354 sectors to identify those that supported the 13, finding 86. It continued by assuming that there would be a 100-percent increase in demand for the defense products over the 1975 level. (DOD was unable to provide Rand an estimate of demand for the surge scenario.) It then used input-output analysis to determine the increase in output that would be needed from the 86 industries to support the doubled production in the defense sector. Finally, it compared the output needed from the 86 industries to Census Bureau data on capacity utilization, concluding that 85 of the 86 industries could supply the material needed.

TABLE 2

RAND CORPORATION ASSESSMENT OF IPP REQUIREMENTS

Current planning system	Required planning system must examine
Evaluates firms producing end items only	Extent of lower-tier involvement in defense production
Generally evaluates industries producing end items for defense only	Interrelations between defense and nondefense industries: effect on one industry of the demand for different products
Assumes peacetime practices would continue in a national emergency	Effect of peacetime business practices on defense production
Not examined	Potential for nondefense firms to begin defense production
Assume supplies firms need will be available	Realistic assumptions
Produces poor information at unknown cost (because firms develop IPP information using overhead funds)	Enough data to obtain good information at low cost

SOURCE: [24].

Next, Rand sent questionnaires to an industry sample--3 of the 86 industries that supply defense prime contractors (they were nonferrous forging, semiconductor, and optical instruments/lens firms). The questionnaires asked them how much they could increase production for defense; how they would achieve the increase (through use of capital, labor, or alternate methods like subcontracting); and what the constraints would be. To firms in the industries that were not currently producing for defense, Rand asked for qualitative information that would give some indication of their ability to convert to defense production. From the responses, Rand was able to assess the potential for industry to expand defense production and to identify industry-wide constraints. (However, note that 3 of 86 supplier industries is a small sample.) Rand concluded that problems with intermediate suppliers would be of secondary importance, a conclusion that could be different had a larger number of industries been examined. Surveying 86 industries would be a formidable task, particularly for a study. It illustrates the problems

that IPP has in obtaining comprehensive subtier data with which to assess potential for producing one end item.

The capacity information from the Census Bureau can become stale quickly as economic conditions change, and the results of the Rand analysis might need to be updated after any major change in the economy. Also, the Rand methodology assumed that all unused capacity in the 86 industries would be allocated to surge defense production. Since surge has been defined as a peacetime increase in defense production in which no extraordinary priorities and allocations or regulatory changes are granted for defense, the results of such analysis should be used cautiously.

Other Models

Other models developed for analyzing the effects of defense spending on the economy may be useful in mobilization planning as well. The Institute for Defense Analyses (IDA) summarized the characteristics of three models in a 1983 report and found that two of them would be useful to forecast the capability of industry to react to a national emergency. [25] These are the Revised Growth for Industrial Potential (REGRIP) model, written by Battelle Pacific Northwest Laboratories for the Federal Emergency Management Agency, and the Industrial Mobilization Planning Model (IMPMOD), developed at IDA. These models use the same method (input-output analysis) and data to translate estimates of DOD spending into production demands on each industry. The characteristics of the models as they existed in 1983 are shown in table 3.

REGRIP determines those industries having inadequate capacity that would slow mobilization and includes a procedure to program investments in those industries. It considers manpower and material constraints that would probably be encountered in a major expansion. IDA believes it to be the preferred choice for analyses like estimating the effect of producing the Joint Strategic Planning Document Planning Force because such a strategy would require a much higher spending rate than that of the FYDP.

IDA also believes REGRIP is the best model with which to consider the problems of mobilization in which civilian demand is curtailed and civilian industry's production is converted to defense. However, it has only a two-year forecasting horizon (by design, to minimize demands on computer capacity), and it does not consider production lead times. IMPMOD can simulate the impact of production lead times in the lower-tier industries on end-item hardware deliveries. IDA therefore recommended that analysts use IMPMOD to estimate the effects of lead times on production. In a separate study, IDA combined the IMPMOD and REGRIP methodologies to "examine the readiness of the U.S. industrial base to support the requirements associated with a major conventional [nonnuclear] war of three years' duration." [26]

TABLE 3

SUMMARY OF CHARACTERISTICS OF IMPMOD AND REGRIP MODELS

Characteristic	REGRIP	IMPMOD
Basis for macroeconomic forecast	Chase macro model	DRI macro model
Methodology to generate DOD final demands	Chase macro model	DRI macro model
Methodology to generate civilian final demands	"Essential" demands specified	DEA bridge table
Methodology to predict industrial requirements	Standard input-output	Dynamic input-output
Methodology to forecast capacity expansion	Dynamic linear programming model	Straight line extrapolation
Number of industry sectors presented:		
All industries	115	236
Manufacturing industries	84	183
Number of occupational groups forecast	40	None
Forecast horizon:		
Number of years	4[a]	10
Simulation period	Semiannual	Monthly[b]
Responsible organization	Federal Emergency Management Agency (FEMA)	OUSDRE(AM) Industrial Resources
Operating agency	FEMA	Institute for Defense Analyses
Point of contact:	Mr. Lawrence Salkin	Dr. R. William Thomas
Total development cost	$130,000	$75,000

SOURCE: [25].

a. Limited to two years by the capacity of the FEMA computer system. The system was to be installed on the OJCS computer without this limitation.
b. Weekly or quarterly periods are a user option.

PROBLEMS THAT IMPEDE GOOD INDUSTRIAL PREPAREDNESS PLANNING

BACKGROUND

When DOD published the new *Industrial Mobilization Production Planning Manual* in 1968, it announced the first major update of industrial preparedness planning (IPP) since the period following the Korean War. [13] Since then, different organizations ranging from industry associations to congressional committees have periodically studied the problems of planning the industrial base. Reviewing those studies in sequence can be depressing, because little progress has been made over the years in solving the problems of IPP, let alone those of the base itself. The findings of some of the major studies are summarized here, followed by a description of today's problems.

At the height of the Vietnam War in 1968, the need for IPP commanded reasonable attention, and some progress towards a workable system could have been expected. However, in 1969, the American Ordnance Association's progress report on the success of the new techniques during their first year revealed that they were meeting difficulty. The problems foretold troubles yet to come. Lower-level industry managers did not support planning with the same enthusiasm that their bosses embraced in public. Subcontractors did not respond to requests from prime contractors for IPP data unless the ASPPO for the prime contractor intervened with the ASPPO for the subcontractor. Subcontractors who had no current production for an item simply refused to plan. Some ignored requests to plan specific items because they had not been asked to plan production for other items they knew would be needed in an emergency. The backlog of unplanned items grew because ASPPOs were charged with other responsibilities, such as contract administration and preaward surveys. Many subcontractors were overwhelmed with planning requests from prime contractors and became uneasy when they received no requests to plan end items they made themselves.

In 1970, the National Security Industrial Association advised the President that plans to cut back defense programs should leave some minimum industrial base intact. The Industry Advisory Council raised the issue with DOD, and the Deputy Secretary of Defense appointed a committee to assess the industrial base and the adequency of mobilization base planning. Representatives from the Office of the Secretary of Defense (OSD), other government agencies concerned with mobilization, and industry formed the committee. It found:

- Planning had not had continuous and strong emphasis over the years
- The services were trying to plan for different kinds of wars fought over different time frames
- The system was trying to plan too many nonessential items.

Finally, the committee declared that DOD's approach to planning and maintaining the industrial base was filled with anomalies. DOD wanted a strong industrial base, but it was selling government-owned plants and wanted private industry to provide the capital. It wanted quality planning from industry, but it did not want to pay for it directly. It wanted a strong system of voluntary planned producers, but it would not give them preference in awarding contracts. The low bidder would still get the job. [5]

In 1977 and again in 1981, the General Accounting Office (GAO) studied the nation's industrial preparedness planning program. The first study found that

> The Department of Defense's planning with individual contractors to produce and support the military materiel required for American defense forces in a national emergency is, in GAO's opinion, inadequate. Contractors' capacity projections to meet wartime requirements are generally unreliable, and little is done once the data is received by the services to overcome forecasted production problems. The overall adequacy of industries' capability to meet mobilization requirements is, in many instances, unknown. [27]

Four years later, GAO found that "DOD has reevaluated the program, but no significant improvement has resulted...." [14]

IPP PROBLEMS TODAY

It is difficult to get industry to be enthusiastic about planning for improbable events like global conventional war. Since the late 1940s, the relationship between government and defense industry has become increasingly adversarial, rooted in the government's drive for lower cost. In this environment, industry is even less interested in doing persistent and effective IPP.

A discussion of specific problems must be prefaced by observing that the principles that govern IPP have not changed since post-World War II. Industry participation in IPP is still *voluntary*. When done well, it is expensive, and it has usually *not been funded* by the government, although there are now ways to pay contractors for IPP. However, the defense industry and the relations between DOD and that industry have changed substantially. Beginning in the late 1960s, many large prime contractors and their major suppliers no longer concentrated on defense manufacturing, for they had become conglomerates active in many markets. The defense divisions of those companies now had to compete internally for investment capital. Their managers were not always successful, because top management believed that the instability of the defense market made investment risky. And civilian markets were more

attractive because it was often easier to operate there, and with potential for higher profit. [5]

Meanwhile, many suppliers left the defense market completely because of the difficulties. In 1980, the Ichord Panel of the House Armed Services Committee investigated the condition of the defense industrial base. The chief executive officer of United Technology Corporation testified that the number of companies active in aerospace declined from 6,000 to 3,000 between 1967 and 1980. Half of those 3,000 had entered the industry between 1978 and 1980. [28] (Evidently the exit of disillusioned firms from defense did not dissuade some new enterprises.)

Companies withdraw from defense work for many reasons. They must deal with an amorphous customer whose decision making power is dispersed across a broad bureaucracy in all three government branches. Profit is tightly controlled, orders are small, and specifications are rigid. The government imposes strict accounting standards on the contractors, demands detailed cost and pricing data (with potentially criminal penalties for errors), and forces contractors to participate in costly social programs as a condition of doing business. And all this effort must be extensively documented, adding to overhead costs. [28]

While the privately owned sector of the industry was changing, it began to constitute an increasing portion of the total defense base because the government was selling its plants. By 1980, there were only 83 government-owned facilities left in a base of 25,000 to 30,000 prime contractors and over 50,000 subcontractors. [28]

Those changes in the defense industry and its relations with government have added to the problems that frustrate efforts to do good industrial planning today.

Planning vs. Resources

After OSD provided new direction for IPP in 1968, the services attempted to do IPP for a vast number of items. ASPPOs initially negotiated 12,000 planning schedules in 11,500 different plants, but they could not accomplish much subcontractor planning. By 1969, a backlog of 2,000 items had not yet been planned for. [29] The volume of planning attempted clearly exceeded the resources available.

DOD now requires the services to plan to surge production of 25 critical components and consumable items and accelerate production of 50 munitions and secondary items within one year of a decision to do so. However, the guidance is ambiguous and can be interpreted to require planning for *all* items on the CINCs' critical item list. [30] The Navy is currently attempting to do IPP for 2,154 end items and components, including spares and spare parts. [31]

As systems have become more complex, IPP for an individual end item has become more complicated. Grumman produces the F-14 with material supplied by 320 subcontractors that Grumman classifies as "critical" and thousands of other suppliers in the subcontractor tiers. [32] Those tiers usually extend for at least five layers. Trying to track thousands of items below the first tier is a formidable task. One author stated that trying to *manage* that process (to afford a true capability to accelerate production quickly) would be like putting a man on the moon. [33]

In 1985, GAO reviewed the planning for a number of end items including the Phoenix missile made by Hughes Aircraft. Hughes uses an "indentured parts list" of over 6,600 items required to make the missile. As discussed earlier, GAO attempted to simplify the process by devising criteria that would limit IPP to only critical components. It then found that 14 critical items supplied by first-tier subcontractors met the criteria. But just one of those items had nine potentially critical parts supplied from the second tier.

IPP for some other end items is not as hard; GAO found, for example, that the TOW-2 missile had only 498 parts, many easily obtained. But clearly, even streamlined IPP for one of today's complex end items is a large task, especially if planning information is to be kept current as capabilities change in the subcontractor tiers. [23]

Government Leadership

In the years following World War II, the government agencies chartered to do emergency planning had status and visibility. In 1947, the National Security Resources Board operated from the Executive Office of the President; in 1950, the President created the Office of Defense Mobilization and made its head a member of his cabinet. As the Korean War receded from memory, frequent organizational changes downgraded the authority of the agencies responsible for emergency planning. The low ebb probably occurred in 1972 when President Nixon abolished the Office of Emergency Preparedness and distributed its functions to other government agencies. Congress created the Federal Emergency Management Agency in 1978 in an attempt to again centralize many of the functions, but emergency planning still does not have the role it once held. [6]

Executing a good IPP program is hindered by the absence of "unified and concentrated leadership in the area of IPP at the highest levels of government." [5] Despite the existence of FEMA, responsibility continues to be divided among congressional committees and departments and agencies of the Executive Branch without effective central leadership. Many of the civilian agencies have difficulty focusing on mobilization planning when they face more urgent and political day-to-day issues. [5] The same can be said for the Department of Defense. The GAO report concludes that "Other than the general cyclical processing of various planning forms, DOD and service management have not set

intermediate goals or milestones for the program. The planning process repeats itself each year without a sense of direction or demonstrable progress toward any well-defined goal." [14]

IPP Requirements Are Erratic and Conflicting

In the recent past, the services used different methods to determine what items should be included in IPP. Table 4 summarizes one author's narrative of the methods the services used in the early 1980s to determine the requirements that drive the planning process. [1] Inevitably, the different approaches confused people in industry and further reduced the credibility of the IPP program.

In 1981, five Navy commands used five different methods to select items. For example, The Naval Supply Systems Command (NAVSUP) had directed its field activities to select items from a mobilization deficiency list, but the Aviation Supply Office (ASO) instead used lists of repairable items from the list of government-furnished equipment (GFE) provided to airplane manufacturers. The rationale was that the deficiency list was too long and could not be adequately analyzed by the available staff. ASO planners excluded consumable items from the list for the same reason. Another Navy command simply used the previous year's list. [14]

Part of the problem then was that OPNAV had not developed item requirements, although OPNAV now publishes surge and mobilization production rate targets for major items. The introduction of the CINCs' critical item list (CIL) has also helped in picking items to plan for, although it is unclear that the CIL has helped NAVSUP's subordinate commands, ASO and the Ships Parts Control Center (SPCC), which are currently trying to do IPP for 1,623 items. [31]

DOD has never been able to define the priorities of end items and quantities that would be needed during either surge or mobilization. The services independently ask producers to define schedules for items they would need in an emergency. They do not tell the producers what the priorities are among the items, nor do they negotiate schedules that consider existing capacity and reasonable ability to expand. Thus, the industry manager is faced with an extraordinary problem. For each item, he must plan schedules without knowing the requirements for other items, and his suppliers do not know what their production priorities would be. Nor does he know how long it would take him to expand his facilities when the asked-for production rate clearly outstrips his peacetime capacity (as it normally does).

TABLE 4

SERVICE METHODOLOGY TO DETERMINE IPP REQUIREMENTS

	Army	Navy	Air Force
Model	Theater warfighting model analyzes equipment demands for first 180 days of war, according to primary planning scenario; maintenance factor included.	OPNAV: no standard method; NNOR model computes monthly level-of-effort consumption rates for each program based on FYDP-approved force fighting in DG scenario. ASO: takes mobilization inputs from systems commands, assesses prior 24 months of peacetime demand, applies mobilization factors, considers carrier losses and repair requirements to reach final requirements. SPCC: takes second 90 days of conflict; assesses historical demand data for equipment, applies war surge factor, adjusted for existing stocks and repairables due out in 90 days.	Requirements determination suspended but could be revived using input from operational planners who analyze combat sorties and flying-hour requirements for FYDP years 4 and 5 using sortie rates, durations, and attrition factors. Output is flying hours per sortie, by aircraft type. Serves as input for material and equipment requirements planning.
Force level	(1) Current programmed force; (2) force approved in FYDP year 5	FYDP-approved force	
Assumptions	Force fully equipped at beginning of conflict		
Output: demand on industry	Equipment to sustain force at combat consumption rates	Time-phased demand for level-of-effort ordnance	

TABLE 4 (Continued)

	Army	Navy	Air Force
Updates	Take outputs, estimate requirements for four two-year periods (FYDP + 3), average the four to determine requirements		
Comments		Old method: producers of threat ordnance asked to determine schedules to get to their maximum rates; hold rates until all needed weapons produced	AFSC/AFLC developing planning techniques and computer models

SOURCE: [1].

The problems that industry faces because DOD cannot provide coherent requirements were concisely stated in the Air Force 1985 Production Base Analysis. The report cited the need for:

- A priority system identifying which hardware systems would be needed by the warfighters
- The total picture of the requirements to be placed on industry, including all services across all product lines, and initial and replenishment spare parts
- A triservice, coordinated approach to surge and mobilization planning (many firms told the Air Force that each week they got different data requests reflecting different requirements and scenarios from different DOD and government agencies)
- A planning scenario on how surge or mobilization would proceed; for example, what warning might be expected, would the national stockpile of material be immediately available, and what civilian items would still need to be produced? [34]

Excessive Reliance on DD1519 Planning

DOD policy currently permits four planning methods to be used for IPP: the DD1519, direct industrial base planning (DIBP), data item descriptions (DIDs) on development or production contracts, and special studies. Use of the DD1519 has been heavily assailed in past studies of IPP. Critics believe that it rarely goes deep enough into the subcontractor tiers and thus fails to identify bottlenecks. The system is voluntary, and lower-tier contractors frequently refuse to participate because they are unwilling to bear the cost.

Two GAO studies documented the poor quality of the data resulting from the DD1519 approach to planning. In 1977, GAO found that the system did not adequately measure either the existing capacity of specialized aerospace contractors or their ability to expand production. Industry's analysis of its ability to project future production was also judged to be inadequate. [27] In its 1985 update [23], GAO stated:

> ...it has become clear that the DD1519 apparatus is inadequate... [failing to yield] the consistent, complete, and accurate data needed by industrial preparedness planners.... We found near unanimity among contractors, weapon system program managers, and authors of previous studies that the data [from DD1519 forms] were incomplete and unreliable.... DOD needs a method for screening the very large number of weapon system components and materials so as to focus

> rapidly on the specific items likely to cause production problems.... Planners should consider the extent to which information and production problems occur at the subcontractor...and actions that can be taken to improve the armed services' understanding of and response to problems in the defense industrial base.

The Air Force and the Army have discontinued use of the DD1519, but the Navy still uses it for most of the items it plans.

DIBP allows government planners to interact directly with the contractor doing the planning and to get a first-hand sense of production problems and capacities. But since many contractors must be covered, the government would need to assign large numbers of planners if the method were widely used. Moreover, DIBP normally does not pay the contractor for his effort, and government planners must persuade their industry counterparts to participate for it to be successful.

Motivating Government Officials

To be effective, advocates of IPP need to convince a large number of their associates in government that IPP is worthy of support. The list of people they must persuade is formidable--staff officers, acquisition and program managers, service sponsors, budget analysts in the services, OSD/OMB staff, and members of Congress and their staffs.

Of the reasons why advocates have failed to motivate other members of government, perhaps the most compelling has been that the deficiencies of IPP and the problems of the industrial base demand complementary solutions. Realistically, money to improve the base must come from the same constrained budgets that pay for material purchases. Improving the base thus conflicts with the primary objective, deterrence, which many observers believe is best achieved when scarce dollars buy more forces in being. Other factors--changing policy and the short-war, long-war argument--reinforce the effect that competition for funding has on IPP. The resulting inability of the government to develop a consistent program for improving the base inevitably diminishes the credibility of the planning process.

Government officials fear that, even with adequate capacity, firms would probably need more lead time to accelerate production of today's sophisticated weapons than was needed for earlier weapons. Thus it becomes even less likely that production could be speeded up in time to affect a war's outcome. Paradoxically, advances in system technology have shortened the time in which an all-out war could develop, allowing even less time to accelerate the production of war material. Also, the advancements in technology that allow the rapid spread of war once hostilities have begun are so costly that they discourage investments in the industrial base. [33, 35]

Technology has also made large-scale conversion of civilian industry in an emergency more difficult. Weapons are increasingly made with automated tooling and test equipment, and large quantities of those items, and the know-how to operate them, would need to be acquired by civilian plants converting to defense production. Thus the barriers to entry into defense production appear higher than they once were. [36]

In a recent speech at a mobilization conference, Larry Korb, a former Assistant Secretary of Defense, related anecdotes and reasons why it is difficult to motivate government to do effective planning for an industrial policy:

- The issue has no glamour or urgency. High-level members of a DOD mobilization working group normally sent their deputies to meetings, themselves unwilling to spend time planning for low-probability events.

- Government officials are reluctant to expend political capital to address hypothetical mobilization problems.

- While it is easy to budget industrial capacity for surge and mobilization at a program's milestone I, these good intentions are overwhelmed by the more pressing problems of cost, schedule, and performance that occur as a system nears production.

- The National Security Advisor to the President once asked DOD to prepare a mobilization budget; but he cancelled the request when told of the difficult issues it would raise and that it could only be accommodated in a larger defense budget.

- The subject is misunderstood by the public, a vocal segment of which tends to "shoot the messenger," fearing a self-fulfilling prophecy. [37]

Motivating Industry

In 1969, the American Ordnance Association sponsored a symposium to discuss early results of the DOD planned producer program ordered by [13]. One speaker pronounced the program to be workable, but noted that DOD would need to take many actions to make it effective. DOD would have to convince industry of the need for the program and its benefits. Given the past failures of unsuccessful IPP programs, industry was reluctant to spend more for planning, especially when the money could only come from overhead or, on competitive programs, profit. At the same time, other voices in DOD were pressuring industry to reduce overhead costs. Each firm noted the enormous expense required to do effective vertical planning in subcontractor tiers. Could smaller companies at the lower tiers afford to participate? Sometimes having a lower return

on equity, often having less financial stability, smaller firms may not have the resources to justify doing IPP. [29]

Although there are ways for the government to pay contractors for IPP, industry has generally been asked to absorb those costs in overhead. Following World War II, that was the only funding source for IPP costs. Government mobilization officials told firms that the overhead charges would be allowable costs for tax purposes, but government auditors may not have agreed. Firms need to be convinced that planning has real value and a business payoff if they are to spend the money needed to do it effectively.

If a company sells its products largely on a competitive, fixed-price basis, it resists providing free IPP services to the government. It must keep its overhead low to be competitive, hence the cost of IPP might have to come from profit. That helps to explain why the lower-tier subcontractors are even more reluctant to participate in IPP than the prime contractors. They normally must compete for fixed-price business from the primes, and they lack the financial resources of the larger firms. While mobilization planners in major buying commands might be able to convince large firms to participate, the ASPPOs in the field have been less successful with subcontractors.

The issue is more than monetary cost. With the possible exception of very large prime contractors, firms rarely hire planners just to do IPP. Instead, the planners must schedule IPP in with their other work that supports ongoing programs. Understandably, IPP is rarely allowed to interrupt work that helps to produce revenue.

Despite public warnings from high DOD officials of the vital need to improve IPP, industry knows that the government has not been able to develop a comprehensive IPP policy. After World War II, planning was helped by companies' patriotism, but industry observed the floundering of government policy after the Korean War. As government advocates failed to get money to improve the industrial base, it was clear that the effort industry devoted to planning had achieved few results. Why should industry continue to bet on the government's dead horse?

The concept of gaining cooperation from planned producers, conceived in 1920, remains a basic concept of IPP today. One of the practical ways that government could show its interest in maintaining a strong base would be to give producers who contribute to IPP preference when awarding peacetime contracts. Instead, at the outset of the Vietnam War, government shifted to competitive bidding to reduce cost. That policy, together with the poor record of the IPP program, undermined whatever support IPP had in industry. Planned producers often were not the low bidders, and the government moved its equipment to winners' plants, destroying the mobilization base concept. The policy removed any sense of urgency from the IPP concept, since it put firms' military and civilian markets on an equal footing. Companies would not

give up business in the more stable civilian markets where it was easier to operate. [5, 36]

The "buy from the low bidder" policy remains in effect today. The DD1519, the only vehicle that a firm can use to become a planned producer to government, says:

> Notwithstanding the foregoing basis for acceptance, the signatures hereon in no way bind the named firm(s) nor the government in any contractual relationship, nor is acceptance to be construed as an agreement by industry to maintain production capability as indicated herein. The signature of industry does not obligate the named firm to accept a military contract if one is offered nor is the government obligated to convert production planning schedules to contracts, to contract with the named firm if procurement of the items specified herein is required, or to convert planned subcontract support to subcontracts if the planned production is converted to prime contracts.

Industry's lack of enthusiasm for IPP is understandable when government will not seize opportunities for tangible actions to prove its good faith.

CONCLUSIONS

Performing effective IPP is difficult; how difficult is shown by the subtle changes that the government has made in IPP requirements since the program began. In the late 1940s, government planners believed that they could plan for the conversion of civilian industry and allocate production capacity among competing demands from the armed services. Conditions in 1947 may have made that approach feasible, but it is not today. The government would need agreements from producers of specific items from a roster of prime and subcontractors whose composition shifts continually as competing companies move in and out of the marketplace. Many of those companies manufacture abroad. None of this could occur until government had defined coherent requirements for all the services. But government's attempts to plan at that detailed level have stopped.

As late as 1972, the concepts of acceleration, conversion, expansion, and sustention planning appeared in government IPP directives. The words collectively addressed whether firms were producing required items at the beginning of an emergency, whether new firms would be employed, what production rates would be, etc. Those concepts, too, have disappeared. Government has not been able to manage the preallocation of its requirements among firms in the industrial base (here and abroad). Nor has it shown it can plan the details of how production of military items would be dispersed amongst the firms making up the industrial base.

Unable to determine requirements and allocations for mobilization production itself, the government implicitly passed the problem to industry. It now asks individual firms to generate delivery schedules for specific items without telling them what the priorities would be. Were the country to mobilize, intense competition for production capacity would probably occur among the services, and planning done under today's rules would be largely obsolete. That situation accounts, at least partially, for the illusory nature and ineffectiveness of IPP today.

The policy swings on the kinds of war the country should prepare to fight have also hindered good planning. When nuclear war became accepted as the most likely end to hostilities that begin with conventional fighting, IPP became more dispensable. Why plan to spend money better used to bolster the deterrence that standing forces offer? Although subsequent (and current) policy called for more flexibility about the kinds and length of war to prepare for, the lingering possibility of nuclear war helped dampen enthusiasm that the defense community might otherwise have for IPP.

If a primary objective of IPP--gathering information that would help to accelerate the production of *specific items* in wartime--is conceptually flawed, what should its objectives be? IDA and Rand used macroeconomic approaches to depart from traditional IPP techniques. [24, 25, 26] Rand noted that item planning as practiced today does not work.

The best hope may lie in understanding which particular sectors of the industrial base are overcommitted. Planning that helped to solve capacity problems in those sectors, either before or after a national emergency occurred, could minimize the time required to increase production of *all* critical defense items. Clearly, solving the capacity problems before a national emergency occurred would do the most to shorten the time, but based on history since 1947, that is unlikely.

In the 1950s, the government backed its IPP requests to industry with supporting action. The original Armed Services Procurement Regulations allowed negotiated contracts with firms designated to be mobilization base producers. The government financed plants, encouraged contractor investment with accelerated amortization of capital investments, made loans, and installed government equipment in plants. But the government became cost conscious during the Vietnam War, opting for competitive bidding whenever possible rather than awarding contracts to planned mobilization producers. Since then, reducing the cost of peacetime procurements wins the argument when it conflicts with actions that would increase cost but improve the industrial base. An acute example of this cost consciousness was the policy begun in the late 1970s that required that new production facilities be sized to operate on a multishift basis. It saved money, but it deprived new programs of the capability to accelerate production by hiring more workers and moving to a multishift schedule.

These two policies--reduce cost now, but maintain a strong mobilization base--are incompatible. If the government tried to reconcile them, it would be presented with a dilemma: how to create a strong industrial base for mobilization in competition with more fiscally and politically attractive national goals. Strong policy statements supporting IPP are reissued periodically, but all participants tacitly understand that policy alone, unsupported by commitment and action at the highest government levels, will never yield substantial improvements to the industrial base.

Recommendations from selected documents published in the past ten years are shown in table 5. (The CNA research memorandum to be written following phase two of this study will present recommendations developed from the results of both phases.) The recommendations in table 5 deal with changes in both IPP and the government's oversight of the industrial base. The format of the recommendations is different in each report, but their substance has been categorized to provide a basis for comparison.

Certain themes emerge from the prior research:

- Policymakers at the highest levels of government should make major changes in objectives for maintenance of the industrial base.

TABLE 5

INDUSTRIAL PREPAREDNESS PLANNING RECOMMENDATIONS FROM THE LITERATURE

Source	Year	Policy	Content	Implementation
GAO [27]	1977	Establish priority that industrial mobilization base has in overall defense strategy.	Downscope planning to match available resources. Consider two alternatives: (1) item planning and (2) sector planning.	
Rand [24]	1979		(1) Discard current IPP and substitute demand analysis; (2) selectively study potential problem industries; and (3) use JLC as IPP focal point, with task forces from services.	
ADPA [36]	1980	Give higher priority to readiness of current force and industrial base than to developing new weapons systems.		
ICAF [19]	1981		Improve DOD planning: (1) reduce scope; (2) pay industry for planning; and (3) improve feedback to industry.	
DSB [38]	1981	(1) Establish plan and investment policy for DIB and (2) increase priority for war reserve stocks.	(1) Select and prioritize items for planning; (2) reduce 6,000 poorly planned items to 200 well-planned consumables; and (3) integrate IPP into acquisition process.	(1) Include IPP and IPMs as line items in production contracts, or (2) establish quick-reaction standby contracts, and (3) define preagreed, standby waivers of EPA/OSHA regulations.

TABLE 5 (Continued)

Source	Year	Policy	Content	Implementation
GAO [14]	1981	(1) Congress and executive branch establish clear national policy on industrial preparedness, and (2) SECDEF define IPP funding and priority relative to other programs and scenarios to which industrial base should respond.	(1) Limit number of items planned; or limit vertical planning to a few items, and do sector analysis to identify potential mobilization problems; and (2) scale IPP to available funds and priority.	SECDEF develop program to implement policy.
IDA [25]	1983		(1) FEMA perform annual mobilization analysis using REGRIP; (2) maintain IMPMOD operational in current configuration; (3) continue studies to make better estimates of capacity in key defense industries; (4) Census Bureau orient plant capacity surveys to determine limits in full mobilization; and (5) study material and labor requirements for major weapon systems.	
Korb [33]	1983		Determine time-phased investments to increase size of specific combat components over designated time periods; replan every three years.	Contractors for new systems bid on capacity to meet increases in combat component sizes as part of (development and production) contracts.

TABLE 5 (Continued)

Source	Year	Policy	Content	Implementation
Gill [1]	1984	Use JSPD planning force to create mobilization requirement.	JCS estimate time and resources to produce the planning force.	
GAO [23]	1985		(1) Select most important systems and components for analysis, and expand critical criteria; (2) obtain better data using GAO method, reduce DD1519 collection effort, and use program management, plant officer, and other service officials for resources; (3) improve data verification (use site visits as one tool); (4) establish comprehensive data base that highlights production and supply trends; (5) focus on cooperative, interservice efforts; (6) perform composite production analysis; and (7) collect and analyze DIB data in a central activity like the Army Industrial Base Engineering Activity.	

- The government has not adequately defined the priority that the defense industrial base holds in defense strategy, nor has it defined executable policies for maintaining the base.

- Planners should change their IPP methodology and reduce the scope of the planning effort to a more manageable level.

- Acquisition managers should be involved in IPP.

Finally, concerns about IPP are lost in the growing worry about damage to domestic manufacturing caused by foreign competition. But IPP remains a tool that, properly used, could expedite defense material production in a national emergency, ***beginning with whatever industrial capacity existed at that time.*** The new JIMPP requirement may increase the visibility of IPP, but alone it cannot make IPP more effective. The record shows that periodic pronouncements of new defense industrial policies have not been implemented by the defense management infrastructure and have not improved either planning effectiveness or the industrial base's capability.

GLOSSARY

ADPA	American Defense Preparedness Association
AFLC	Air Force Logistics Command
AFSC	Air Force Systems Command
ASPPO	Armed Services Production Planning Officer
ASO	Aviation Supply Office
CIL	critical item list
CINC	Commander in Chief
CMC	Commandant of the Marine Corps
COMNAVSEA	Commander, Naval Sea Systems Command
DCAS	Defense Contract Adminstration Service
DEPSECDEF	Deputy Secretary of Defense
DG	Defense Guidance
DIB	defense industrial base
DIBP	direct industrial base planning
DID	data item description; DOD document that specifies content of a contractually required document
DPA	Defense Production Act
DSB	Defense Science Board
D-to-P	A logistic planning concept by which the gross materiel readiness requirement in support of approved forces at planned wartime rates for conflicts of indefinite duration will be satisfied by a balanced mix of assets on hand on D-day and assets to be gained from post-D-day production through P-day when the planned rate of production deliveries to users equals the wartime rate of expenditures[1]
FEMA	Federal Emergency Management Agency

1. Source: [13].

FYDP	Five-Year Defense Plan
GAO	General Accounting Office
GFE	government-furnished equipment
ICAF	Industrial College of the Armed Forces
IDA	Institute for Defense Analyses
IMPMOD	Industrial Mobilization Planning Model
IPM	industrial preparedness measure
IPP	industrial preparedness planning
JCS	Joint Chiefs of Staff
JIMPP	Joint Industrial Mobilization Planning Process
NAVAIR	Naval Air Systems Command
NAVSEA	Naval Sea Systems Command
NAVSHIPSO	NAVSEA Shipbuilding Support Office
NAVSUP	Naval Supply Systems Command
NSRB	National Security Resources Board
NNOR	nonnuclear ordnance requirements
ODM	Office of Defense Mobilization
OEP	Office of Emergency Planning
OSD	Office of the Secretary of Defense
Planned producer	A firm that agrees to accept a contract to build an item under surge/mobilization conditions to a schedule it completes on a DD1519
PBD	program budget decision
POM	Program Objectives Memorandum
REGRIP	Revised Growth for Industrial Potential model
SPCC	Ships Parts Control Center
Title III	Title III of the Defense Production Act

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