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Final Report
of the
Defense Science Board
1988 Summer Study on

The Defense Industrial and Technology Base

October 1988



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OFFICE OF THE SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301-3146

October 31, 1988

DEFENSE SCIENCE
BOARD

MEMORANDUM FOR SECRETARY OF DEFENSE
UNDER SECRETARY OF DEFENSE FOR ACQUISITION

SUBJECT: Report of the Defense Science Board (DSB) Summer Study
Task Force to Study the Defense Industrial and
Technology Base -- INFORMATION MEMORANDUM

I am pleased to forward the final report of the DSB Task Force to study the Defense Industrial and Technology Base, which was chaired by Mr. Robert A. Fuhrman. The objective of this Task Force was to recommend a strategy and specific actions for the Government and industry to adopt that would ensure the defense industry is capable of providing the support required to fulfill our national strategy objectives.

The Task Force found that the industrial and technology base faces new and difficult challenges, including world-wide interdependence on resources, an impending loss of technological leadership, and insufficient long-term investment by industry because of a propensity toward short-term planning. The result is a significant difference between industry's capabilities and the tasks that national security plans assume it can perform. The Task Force makes ten major recommendations to reverse this situation.

Of principal importance is the need to create a high-level forum to ensure the meshing of capabilities and objectives. Obtaining Presidential approval of a National Policy by Executive Order or NSDD, to create an Industrial Policy Committee and make the Secretary of Defense a permanent member of the Economic Policy Council, appears to be the most efficient mechanism.

Additional recommendations are aimed at reversing the detrimental trend, and include increased surge planning, more emphasis on the problems of the technology base, and the development and implementation of integrated acquisition policy to create incentives for long-term industry planning and investment.

I recommend that you read Mr. Fuhrman's transmittal letter and the Executive Summary, outlining the specific conclusions and recommendations.

Robert R. Everett



OFFICE OF THE SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301-3140

October 21, 1988

DEFENSE SCIENCE
BOARD

MEMORANDUM TO THE CHAIRMAN, DEFENSE SCIENCE BOARD

SUBJECT: Report of the Defense Science Board (DSB) Summer Study
on the Defense Industrial and Technology Base

In requesting this study, Secretary Carlucci emphasized his concerns about the apparent diminution of America's technological superiority and the erosion of our industrial and technology base. In our further conversations, the Secretary's clear desire to create a foundation for future national policy gave us the guidance we needed to begin our work. Dr. Costello provided the final guidance we needed when he asked us to review his policy initiatives and the "Bolstering U.S. Industrial Competitiveness" report.

In our study, we have examined a broad array of data and discussed the issues with many experts from government, academia, and industry. Our findings show that the defense industrial and technology base faces new and difficult challenges in the current and expected world market. We found that the defense business is now truly global. America and its allies are interdependent in many industrial resources essential to national security. Furthermore, America faces an increasing loss of technological leadership to both our allies and adversaries. The short-term planning which DoD and industry take for granted is causing long-term problems for national security. The principal problem is a significant difference between industry's capabilities and the tasks which national security plans assume it can perform.

We make ten recommendations for the solution of these problems. Our foremost recommendation is the establishment of a permanent mechanism to compare industrial capabilities and trends with national security needs and to generate new policy initiatives. We have developed a draft national policy which can provide the foundation for future national policies which the Secretary has sought. I appreciate your counsel in the preparation of this report as well as your support in forwarding it to the Secretary.

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Robert A. Fuhrman
Summer Study Chairman

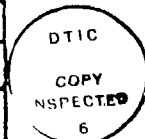


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Executive Summary

THE NEED FOR A LONG-TERM STRATEGY

Our national security is based upon a strategy of deterrence. We have chosen not to match our adversaries soldier for soldier and bullet for bullet. Instead, we have chosen to maintain a degree of technological superiority sufficient to overcome our numerical disadvantage.

The effectiveness of our deterrent depends upon our ability to maintain this technological superiority and our adversaries' belief in that ability. When our ability is questioned, our deterrent is diminished and the threat of war increases.

In the eight years since the last Defense Science Board (DSB) study of the industrial base, the global political, economic, and technological scenes have changed considerably. America's technological superiority has diminished. Many countries, including Japan and the Soviet Union, challenge our leadership in technologies essential to defense. In those same eight years, the defense industries have become global.

Europe is on the verge of a planned economic unification. The Pacific Rim nations are pressing economic expansion in ways which could severely challenge our industries' ability to compete in the global electronic and defense markets during the next century.

The days of Fortress America are past. We are, and will remain, dependent on foreign resources for critical components of our weapon systems. We cannot eliminate foreign dependency in this era of a globalized defense industry. We can and must eliminate the apparent loss of leadership in key defense technologies.

Investors believe that defense industries operate in a highly unstable and excessively complex business environment characterized by high risk, restricted cash flow, and low returns. Thus, funding the investments in research, productivity, and modernization, which DoD and the future demand, is beyond the capability of industry alone.

These challenges must be met by new policies which link military and industrial strategy to assure the existence of the industrial and technological resources on which our military strategy relies. The purpose of this report is to provide the basis for government to establish and implement policies to enable both government and industry to invest in and plan for the long-term security of the nation. (S. 11)

PRINCIPAL FINDINGS

- Of greatest importance is the fact that the continued deterioration of the industrial and technology base diminishes the credibility of our deterrent. It is a national problem requiring a coordinated response by government and industry. If our nation is to ensure its security for the coming decade and beyond, it must adopt a strategy which links military strategy with a policy to ensure the availability of the industrial and technological resources on which operations plans rely.
- Globalization of U.S. defense markets has made our nation partially and irreversibly dependent upon foreign sources. At the present time, neither DoD nor industry has the means of specifically defining the scope of this dependence or of identifying all the systems and components which are affected. Current acquisition policies and strategies do not give sufficient recognition to this problem.
- A pattern of inadequate long-term investment by prime and subtier suppliers is a primary cause of the increasing deterioration of the defense industrial and technology base. This inadequate investment can be attributed to:
 - Pressure on defense industries to provide short-term returns equal to those available from lower risk investments;
 - Uncoordinated effects of national economic and defense acquisition policies which further reduce the resources available for investment;
 - Increasing uncertainties surrounding the defense budget and acquisition process; and,
 - The capital markets' perception of an imbalance between the risks taken and the possible rewards in defense business.
- Because each directly affects the others, the making of national economic, defense, and foreign policies requires greater coordination of those policies in the Executive Branch and in Congress. The performance and capabilities of the defense industrial and technology base is directly affected by changes to tax, trade, environmental, and socioeconomic policies. Policymakers must find the means of measuring and coordinating these effects before they act.

- The maritime industries have deteriorated to the point where they cannot support national security objectives. Whether the war be a short Persian Gulf war or a long European war, or anything in between, the necessary maritime assets are not available and cannot be produced in time.
- Some members of the subcontractor and supplier portion of industry, ranging from very large manufacturers down to small high-technology companies, either refuse defense business or segregate older technology and older production lines from their commercial business to apply to defense. DoD acquisition policies engender this behavior. This portion of industry has grown to be large enough to be of concern; defense does not have access to all the technology it needs.
- There is a lack of central management of the DoD technology base programs. Until they are brought under a more active management, with sufficient accountability for efficient expenditure of resources, the program will not achieve the significant benefits it is capable of producing.

CONCLUSIONS AND RECOMMENDATIONS

-----I-----
Significant differences exist between industry's capabilities and the tasks which national security strategy assumes industry can perform. Therefore, a cabinet level forum involving appropriate Executive Branch Agencies should be created to ensure that these problems are examined and resolved.

Therefore,

The Secretary of Defense should recommend that the President sign an Executive Order or a National Security Decision Directive which requires the creation of an Industrial Policy Committee, chaired by the National Security Advisor, which would:

- Compare the tasks which national security plans assume industry can perform in peace and in war with industry's capabilities and current actions; and,
- Develop and recommend to the President specific legislative, regulatory and resource initiatives which would resolve the differences.

(A draft Presidential Directive appears in Appendix A.)

The Secretary of Defense should take an active role in formation of national economic policies (to include tax and trade) that affect national security capabilities.

- SECDEF should request formal membership on the Economic Policy Council (EPC) and the establishment of a Defense Working Group under the EPC.

-----II-----

Surge planning and capabilities must be improved to account for the realities of the threats we face and the dependency we have on foreign sources. Currently, there is neither an accepted statement of surge needs nor any inter-service integration of surge priorities. The ability to surge must be demonstrated and exercised. To be effective, surge should begin on warning, before our forces are committed to a conflict. At present, there are no accepted criteria for judging when surge should begin.

Therefore,

The Secretary of Defense should:

- Integrate surge capability and planning in the acquisition process by using the Program Objective Memorandum (POM) and Program Decision Memorandum (PDM) processes to guide programming and budgeting decisions and demonstrate a commitment to surge;
- Ensure the further development and expansion of the Joint Chiefs' "Joint Industrial Mobilization Planning Program" (JIMPP) to assure setting interservice priorities for industrial base capabilities and the linkage of these capabilities to executable military strategy;
- For selected critical systems, identify, price, and purchase an 18-month buffer stock of critical foreign-sourced components to protect work in process from vulnerability to interruption of foreign supplies.

-----III-----

DoD's technology base is threatened by an inability to attract and retain high quality scientists, engineers and technical managers in the laboratories and R&D centers.

Therefore,

The Secretary of Defense should:

- Propose the transition of selected facilities to private sector operation as federally funded R&D centers or government-owned, contractor-operated facilities; and,
- For facilities not appropriate for private sector operation, support the urgent implementation of procedures required to compensate adequately and reward high quality technical talent.

-----IV-----

Uncertainty about acquisition policies and strategies contributes to the pressures on industry to plan for short-term investments and avoid long-term risks. This uncertainty is compounded by the strong belief that the varying acquisition policies used by the services reflect continued instability.

Therefore,

USD(A) should implement a set of consistent and integrated acquisition policies. USD(A) should review the services' acquisition policies to determine inconsistencies and variances with DoD policy. Direct actions should be taken to eliminate these differences and to impose specific objectives for industrial and technology base needs.

-----V-----

Because DoD currently does not have the in-house capability to conduct the complicated financial analyses of the many acquisition, tax, and other economic policy changes affecting the industrial and technology base, it is virtually impossible for DoD to ensure that its incentive systems will accomplish their stated goals.

Therefore,

USD(A) should support the use of incentives in acquisition strategies and policies which would encourage long-term industry investment in new technology, improved production processes, and modernized facilities.

As the foundation for these incentives, DoD must establish an in-house capability to perform standardized financial impact assessments of existing and prospective regulations, legislation, and acquisition strategies which affect capital formation and long-term investment.

-----VI-----

Independent Research and Development (IR&D) has had a profound influence on the ability of industry to meet DoD's future needs. It has been a primary source of competitive approaches to the tactical and strategic problems which the DoD has faced. Current budgetary and policy challenges to the IR&D system must be resolved through the personal leadership of the Secretary.

Therefore,

The Secretary of Defense should:

- Reaffirm the importance of IR&D to DoD;
- Determine IR&D cost recovery ceilings in the context of a long-term assessment of technological requirements, not in specific proportion to budget levels; and,
- Retain the existing method of IR&D cost recovery.

-----VII-----

Competition has, through overzealous implementation of Congressional direction, come to mean awarding contracts on the basis of price alone. This emphasis has resulted in diminished quality, and a de-emphasis on innovation and technology.

Therefore,

Procurement policies must give sufficient emphasis, not only to cost competition, but also to competition based on total product quality, including such things as maintainability and operability and contractors' past performance. The USD(A) should establish total product quality as a major source selection criterion in major acquisition strategies.

-----VIII-----

The decline of the U.S. maritime industries has reached the stage at which they can no longer deliver America's forces or supplies to the theater of war. As our deterrent strategy shifts to emphasize conventional forces, the inability to assure needed sea lift assets becomes more critical. This problem will require firm commitments of support from our allies.

Therefore,

The Secretary of Defense should define the capacity of the maritime transportation system, including allied capacity and commitments necessary to meet national security objectives and develop a means to ensure a balance between capacity and requirements.

-----IX-----

DoD's recent efforts to reform the use of best and final offers ("BAFOs") imposed higher level controls on the use of second or third BAFOs in a single procurement. In effect, before contractors can be required to resubmit additional price offers and technical revisions, the head of a contracting activity would have to approve the action. The Task Force believes that although this restriction is a positive step, it will not effectively limit the over-usage of BAFOs.

Therefore,

The USD(A) should convene a high-level joint government-industry working group to consider further modifications of regulations that would further reduce the use of best and final offers to an absolute minimum and that would eliminate repeated BAFOs.

-----X-----

In a recent letter to industry leaders, Secretary Carlucci wrote, "I am committed to taking whatever steps are necessary to assure that Defense business will be conducted at the highest levels of integrity and honesty. I ask you to join me in this commitment." The Task Force believes that the Secretary can take actions to implement that idea.

Therefore,

The Secretary of Defense should ensure that all defense contractors, suppliers, and consultants adopt and adhere to suitable codes of ethics to govern their business operations. Companies should form ethics committees, comprised of outside directors, to craft and administer these ethics codes. Further, the codes of ethics should ensure that consultants disclose sufficient information to both government and industry so that conflicts of interest can be avoided.

EXECUTIVE SUMMARY

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I.

The Changing Defense Acquisition Environment

The 1980 DSB study of the industrial base found a trend toward the globalization of the defense markets. The principal change in the environment since 1980 is the arrival of globalization.

Globalization of the defense industrial base has occurred.

Globalization implies an interdependence of allied nations for the technologies and even the components of defense systems. For the past 40 years, America has assumed that globalization was a one-way street; we had the superior technology. Our allies were expected to rely on our advanced systems for equipping their forces. Today, because of the evolution of the world economy, that is no longer true.

Globalization implies a major dependence on foreign manufactured components.

Globalization not only means dependence on foreign sources for raw materials but also for manufactured products. Raw materials unavailable in the United States have been stockpiled for use in the event of an emergency, but more and more, defense systems require foreign manufactured components and assembly. The most visible examples of this dependence includes tactical missiles such as TOW, Maverick, Sidewinder, and Sparrow. It is these "consumables" which would be in greatest demand in a conventional war, and most at risk, because of dependency on foreign sources.

Increased perception of mismanagement breeds micromanagement and adversarial relationships.

The DSB found that many changes in the acquisition environment were related more to the highly regulated and controversial nature of defense acquisition systems than to the technology and defense systems themselves. The perception of mismanagement by industry and government is accepted as true by a large segment of the public and by many legislators and elements of the media. The resulting micromanagement of industry and DoD has led to an increasingly adversarial relationship between industry and DoD.

Exercising its monopsony power, the government has created a regulated industry, similar to a public utility.

A number of factors define the environment. For example, the defense industry does not conduct business in a free enterprise system. It is characterized at the prime contractor level by a single buyer (the government) and relatively few suppliers. Exercising its monopsony power, the government has created a regulated industry, similar to a public utility. An analysis of this similarity was recently completed by the Congressional Research Service. Their analysis shows a comparable level of regulation in almost all of the areas examined (see Appendix B).

The government demands that industry react as though it existed in a free enterprise system of many suppliers and many buyers. Industry wants to operate in a free enterprise system, but wants the government to assume much of the risk inherent in such a system. The government wants the defense industry to act like commercial businesses but promulgates uncoordinated regulations and policies to such a degree that any observer schooled in basic business theory must be surprised the system works at all.

Restricting defense-related business is wide-spread enough that it denies needed technology to the DoD.

As a consequence, there are some members of the subcontractor and supplier portion of industry who elect to eliminate or restrict their defense-related business. Small high-technology businesses do not have the staff or the financial backing to cope with the acquisition policy and procedures. Some very large manufacturers segregate older production lines for defense from new, higher technology commercial product production lines. If this behavior were rare, it would not be of concern. But it appears to have grown to be wide-spread enough that it denies technology to the DoD that the DoD needs.

Too many programs are chasing too few dollars.

The environment is further complicated by the realities of the defense budget. As stated in the Packard Commission Report, too many programs are chasing too few

dollars. Mandated competitive acquisition policy, limitations on progress payments and limits on allowable costs, requirements for special tooling purchases, changes in tax laws, and regulated profits creates a cash flow shortage and reduced profitability. Company owners (i.e., share holders) demand greater return on their investments and, because of the perception of reduced profits, are driven off by high risk levels assumed by defense contractors. The result is restricted access to capital and a continuing downward spiral in the long-term viability of the defense industrial base.

The relationship between government and industry must become a goal-oriented businesslike arrangement.

Because defense budgets will not grow in the foreseeable future, we must change the environment if we are to have a leaner defense industrial base and restore the public's faith in the defense establishment. We must change the highly adversarial relationship between government and industry into a goal-oriented, businesslike arrangement. The government must recognize that only by working in an atmosphere of mutual trust can we maximize the return on our defense investment.

Industry must recognize the special responsibility it has to restore and maintain the public trust.

Finally, industry must recognize the special responsibility it has to restore and maintain the public trust. We can change the environment in which the defense industrial base exists. It will not change quickly, but only through a sustained, long-term effort with involvement by all.

The U.S. is losing technological leadership in many areas.

Consider the examples of computer and semiconductor technology. While American computer technology is still competitive with foreign systems, we are losing out in the semiconductor field. Because of this, foreign computers could surpass us in the immediate future. Those technologies are the foundation of every defense system, either as a part of the system itself or in its design and development.

Too often both the government and industry ignore the effects of their own management philosophies.

Short-term planning manifests itself in an emphasis on:

- products
- profits now
- investment return

Other critical technologies further demonstrate our loss of leadership. The numerically controlled machine tool industry is now led by Japan. Their lead in flexible manufacturing systems, a key to many complicated manufacturing tasks, is growing each year. Similarly, America has lost its leadership in precision optics in the past two decades. We cannot retain battlefield superiority without assuring we have access to technological leadership in those fields.

This loss of technological leadership can be attributed to many political and economic factors. Too often both government and industry ignore the effects of their own management philosophies. Recent studies, such as the one being conducted by Professor Bruce Scott, of Harvard, point out the disadvantages of those philosophies in comparison with those of countries such as Japan, the European Economic Community, and Korea.

Professor Scott's works characterize America's loss of technological leadership in terms of competitiveness and is demonstrated in Figure I-1. The overall problem, one of short-term planning, manifests itself in emphasizing:

- Products over productivity
- Short-term profits over long-term competitiveness; and
- Return on investment over market share.

The effect of combining the short-term planning philosophy with America's uncoordinated policy-making mechanisms is best stated in the Data Resources Report on U.S. Manufacturing Industries:

"The decline of position of manufacturing is a major industrial development for this country. . . . There are so few exceptions to the decline of the international positions of U.S. manufacturing industries that one must seek . . . general causes that act on the entire economy."

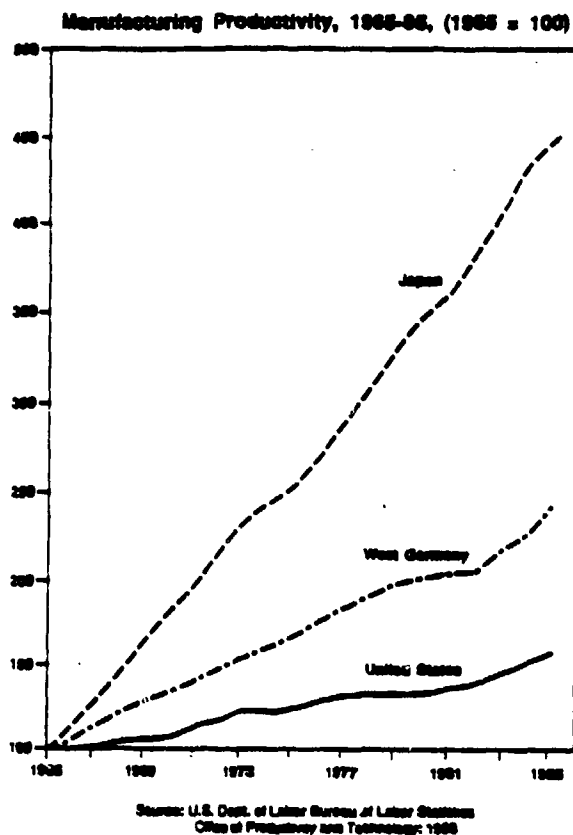


Figure I-1

Capital markets view the acquisition environment with skepticism due to instability of budgets and policies.

The defense industrial and technology base, because of its defined and regulated budgets and products, is the most easily understood example of these problems.

The DSB found that a most dispassionate observer of the acquisition environment is the capital market. Many factors affect investors' and analysts' views of the industry. Economic, fiscal, and regulatory actions by the government, either accomplished or projected, have a tremendous psychological effect on investors and on management decisions. The instability and unpredictability of defense spending drives away investors seeking growth.

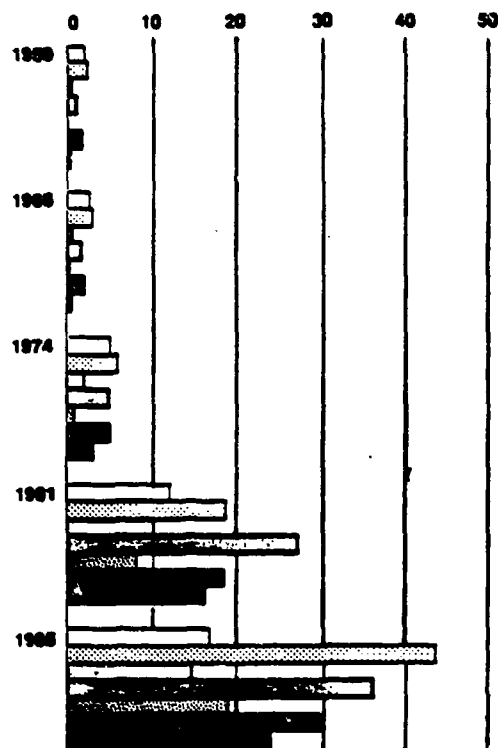
Investors' skepticism has caused a virtual closure of the equity and debt markets to all but a few major contractors. Almost none can obtain new funds in the equity markets at any price and only the largest can do so in the debt market. Low equity prices also invite foreign ownership which, as reflected in Figure I-2, has increased dramatically over the last several years.

The result is the short-term planning which now dominates industry investment decisions. With short-term planning, the DoD cannot be assured of the advancement of technology on which our deterrence depends. There is danger in the contrast with our adversaries whose stable, long-term planning may permit them to overcome technological advantages. The loss of this advantage is the loss of the industrial element of our deterrent.

Foreign Direct Investment Holdings^a in the United States, by Country, 1959-85

Billions US \$

- Canada
- ▨ United Kingdom
- ▤ West Germany
- ▥ Netherlands
- ▧ Japan
- Other Developed Countries
- LDCs



^aForeign direct investment holdings, together with foreign portfolio investment holdings, U.S. liabilities to foreigners, and foreign official assets, equal total foreign assets in the United States.

Figure I-2

II.

Differing Approaches to Long-Term Planning: U.S., Allies, and the Soviet Union

Many of our allies and adversaries recognize the link between long-term planning and the ability of the defense industrial and technology base to support national security objectives. We seem not to.

U.S. planning is decentralized.

The United States defense planning is decentralized, especially in the area of acquisition, where the individual military services acquire, support, and maintain weapon systems through their R&D and logistics commands. Substantial differences exist in approach among the services regarding acquisition policies and practices.

Allies tie industrial policy to national security goals.

Our allies make a concentrated effort to tie directly their nations' industrial policy to national security goals. Many of these goals are related to a policy of direct aid to defense industries, while others are by-products of economic policies only indirectly related to defense planning. Two reasons account for this: 1) the increasing technical advancement of armaments, and 2) national attitudes which emphasize a strong industrial base for both defense and non-defense purposes, resulting in a direct link between the defense base, the non-defense base, and security needs.

In the next pages, we examine the policies of several nations.

Japan

In Japan, the government supports industry.

The strength of Japan's defense-related industry is a function of many aspects of governmental support. The Ministry of International Trade and Industry, MITI, which has no U.S. equivalent, engages in effective, long-range planning for development of both the defense and civil sectors. This broad industrial planning effectively transfers technologies and products originally developed for civilian goods to the defense sector or vice versa. The Japanese government supports the defense industrial base through direct subsidies and tax provisions leading to low capital costs as well as government-sponsored R&D. A comparison of R&D versus GNP for major industrial nations is shown in Figure II-1 and reflects the high Japanese investment. Japanese costs of capital are one-quarter those of the U.S.

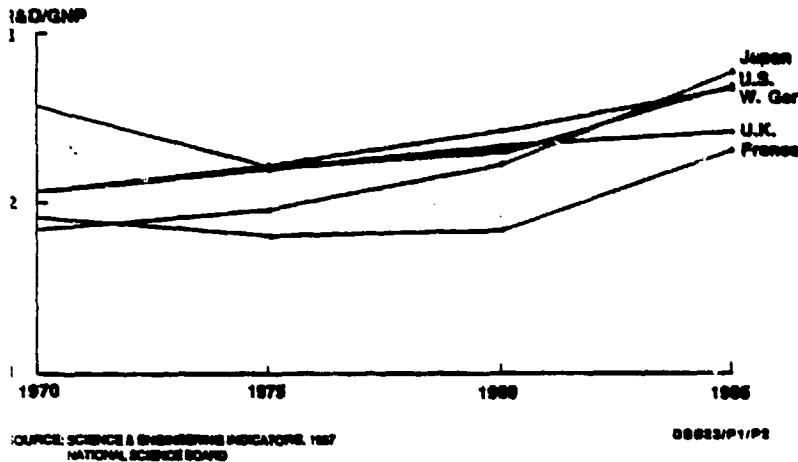


Figure II-1

In most cases, activities are coordinated or even formally directed by the Japanese Defense Agency, or the Ministry of Trade and Industry.

Under government sponsorship, Japanese companies frequently engage in joint research, product development, testing, and coordination of market shares. In most cases, these activities are coordinated or even formally directed by the Japanese Defense Agency, or the Ministry of Trade and Industry.

Companies engage in significantly less competition for defense business with each other than firms in the U.S. Japan has no antitrust laws to prevent joint commercial efforts.

Another factor enabling companies to engage in defense production is that defense-related business accounts for a relatively small percentage of a company's business.

Japan conducts little direct defense R&D. However, Japan ranks third, behind the U.S. and USSR, in total investments in science and technology. The overwhelming emphasis of Japanese research is on applied R&D or production technology, much of which is applicable to defense products. Moreover, the relatively small amount spent on basic research allows Japan to target a substantial percentage of its R&D to the direct development of products.

Japan deliberately targets its R&D, with defense R&D being secondary to commercial R&D.

Although much of what Japan does provides strong support for its defense-supporting industry, it has a much smaller defense industry than the U.S. Also, Japanese defense policy is limited to a direct defense of its homeland and sea lanes to a distance of 1,000 miles.

(For further confirmation, refer to: Asia-Pacific Community Journal, "The Rise of Japan's Military Industrial Base," by Kent E. Calder, Summer 1982; and Arms Production in Japan: The Military Applications of Civilian Technology, by Reinhard Drifte, Westview Press, Boulder, CO, 1986.)

Western Europe

The defense industries of the following Western European nations all depend heavily on export markets. As a result, defense production planning is significantly affected by the quantity and delivery schedules requested by foreign customers. Short-notice orders often perturb industrial planning on a year-by-year basis.

France

French defense acquisition is accomplished through a highly centralized procurement system with very little legislative oversight.

As a large-scale developer and producer of modern weapon systems, France's predominantly nationalized defense industry is the third largest in the world. Defense acquisition is accomplished through a highly centralized procurement system with very little legislative oversight. France has a

national industrial strategy which, through long-range planning, integrates defense with civil development and production planning. There is a national emphasis on exports and multinational collaboration.

France emphasizes comprehensive, long-term planning.

France emphasizes comprehensive, long-term planning and policy making. Its system features a special, high-ranking procurement planning committee, chaired by the Minister of Defense, which establishes the direction of future procurement for a 10-year period. Programming is accomplished for 5-year periods, and budgeting is annual. Their system has been quite successful in minimizing delays or cancellations of major programs. Additional information is contained in Organization of Defense Procedures and Production in France, 1980, by David Greenwood.

United Kingdom

The United Kingdom defense acquisition process is centralized and administered by civilians.

The United Kingdom, Western Europe's second leading weapon producing nation, has organized its defense acquisition as a centralized, civilian-administered procurement system. Like France, the U.K. is increasingly designing weapons to exploit export opportunities and emphasize multinational collaboration. Unlike France, the United Kingdom's system has strong legislative oversight, a commercial and competitive procurement approach, and significant private sector development/production processes.

The United Kingdom uses 10-year budget analyses and annual budgets. Under the doctrine of Collective Responsibility, British Parliament strongly shapes and executes both national policy and defense procurement policy. Like France, the United Kingdom has established a centralized, predominantly civilian agency which oversees the acquisition process.

The United Kingdom procurement system integrates overall defense needs and national concerns.

Current policy emphasizes a commercial orientation in the procurement process, virtually no competition at the prime contractor level, and enhanced competition at the subcontractor level. Relative to the U.S., there is less government oversight of industry.

The U.K. views its procurement system within the context of overall defense needs and overall national concerns; all new systems are examined for their economic and industrial implications. For further information, refer to Weapons Acquisition Process of Select Foreign Governments, GAO Report #GAO/NSIAD-86-51FS, February 1986; and Aberdeen Studies in Defense Economics, "Organization of Defense Procurement and Production in the United Kingdom," by Rae Angus, 1979.

West Germany

The West German procurement system is centralized under very strong legislative oversight and civilian control.

The West German weapons procurement system is centralized under very strong legislative oversight and civilian control. West Germany seeks multinational projects and exports a significant amount of weaponry and components.

West Germany utilizes a single planning document.

West Germany utilizes a single planning document to integrate all defense procurement, manpower, infrastructure, operations and R&D requirements. Weapon and equipment acquisition is specified for 15-year periods, with annual cost and scheduling updates, and annual budgets.

In Germany, oversight is concentrated on quality assurance and cost issues.

The centralized procurement system, under civilian control, has a somewhat rigid system of checks and balances, as well as division of labor, in the acquisitions process. There is very little competition for contracts and, once awarded, oversight generally is primarily concentrated on quality assurance and cost issues. Cost issues are particularly scrutinized due to a history of overruns, and suspicions of contractor "buy-ins."

The West German procurement system has been moderately successful, with some procedural and coordination problems arising due to its division of responsibility for the research, development, and testing functions. See The German Systems Acquisition Process and Comparative U.S. Aspects, by Hermann O. Pfrengle and Gerhard M. Brauer.

Soviet Union

In the 1984 edition of Soviet Military Power, DoD concluded that:

The Soviet Union has an integrated national strategy which is committed to a dedicated and militarily oriented industrial system.

"The Soviet priority attached to military power has required a national commitment to a dedicated and militarily oriented industrial system. During the past 35 years, there has been a tremendous growth in all sectors of Soviet military industries and the tightly integrated national strategy of military production, from mining of raw materials to the fabrication of finished weapons systems."

In contrast, American policy makers make judgments from the perspective of their more limited jurisdictions which our constitutional system of checks and balances has created to prevent the kind of totalitarian system which the Soviets have.

Defense industrial requirements receive the highest priority in economic planning.

Soviet defense industrial planning differs markedly from the processes used by the nations previously discussed. Because defense industrial requirements receive the highest priority in economic planning, the Soviet military follows a unified military technical policy which governs all aspects of defense preparedness. An extensive military-civilian industrial bureaucracy, responsible both to the Party and the Ministry of Defense, closely monitors every stage of weapons research, development and production. R&D activities, as well as weapons development programs are unconstrained by the usual 5-year planning cycle. Extensive, integrated long-term planning reviews are conducted periodically,

assuring availability of raw materials and timely completion of large-scale capital construction projects.

Soviet defense planning is based upon a strong, coordinated industrial premobilization structure.

Soviet defense planning, marked by highly compartmented, hierarchically layered acquisition process, is based upon a strong, coordinated industrial premobilization structure. This structure features prioritized contingency plans for industrial plants, strategic production reserves, and extensive contingencies for wartime relocation, dispersion and ensured national survival. For further information, see Signal (Journal), "Weapons System Acquisition in the Soviet Union," by Timothy D. Desmond, November 1987.

III.

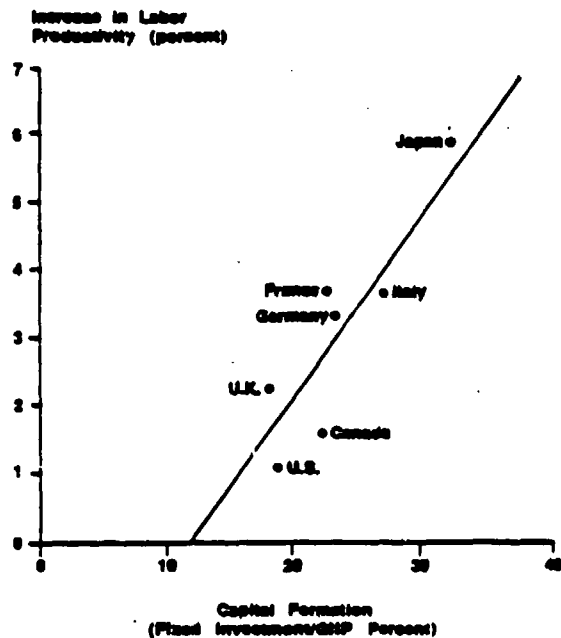
Capital Formation, Incentives, and Competition: Why Industry Plans for the Short Term

The trend toward short-term planning dominates industry. U.S. productivity growth, which directly reflects capital investment, is compared to its allies in Figure III-1.

American industry is often criticized for a management philosophy which focuses on short-term profits rather than long-term productivity and growth. Because these criticisms are, in many cases, entirely accurate, industry and government must examine why the trend toward short-term planning dominates industry.

Capital Formation

Capital Formation, International Comparison, 1960-63



Nations that invest more also have greater productivity growth. The United States ranks poorly in both of these areas when compared to our major trading partners.

Source: U.S. Department of Labor, Bureau of Labor Statistics, 1964; Organization for Economic Co-operation and Development, 1964.

FIGURE III-1

To understand industry's focus on short-term results, one must examine demands placed on public companies. Companies' owners (i.e., share holders) are not tied to defense industry investments. Defense industry managers must compete for shareholders' investments in markets which offer many choices of lower risk and greater short-term profits.

Investors always desire to achieve the greatest return for the least risk in the shortest possible time. In recent years the power and influence of large institutional investors (pension funds, mutual funds, brokerage firms, and others) has increased markedly. In terms of dollar value, pension funds now own 25% of all corporate shares traded in the

United States. More importantly, because their holdings are concentrated in major companies, pension funds own 50% of the shares traded on the New York Stock Exchange and 65% of the largest defense contractors found in the Standard & Poor's 500. The motivation of these owners largely determines companies' ability to obtain capital for investment.

Trustees of pension funds have a legal duty to maximize returns.

Trustees of pension funds have a fiduciary obligation to the beneficiaries of the pension plans. This obligation can be roughly translated into a legal duty to maximize returns. The legal requirements faced by other institutional investors may not be as strict, but their desire for higher returns each and every quarter is just as great. If a company or an industry demonstrates performance below that of other companies or industries, investor support evaporates. Should a corporate raider propose a takeover, or a proxy fight commence, large institutions are almost certain to support whomever promises them the higher short-term returns.

Procurement and tax policies have increased risk while simultaneously increasing the need for external financing.

In this environment, defense contractors face a serious dilemma. Although their business is inherently long term in nature, Wall Street expects excellent short-term results. In recent years, frequent changes in acquisition and tax policies (such as reduced progress payments, cost sharing, fixed priced development contracts, contractor-funded special tooling and test equipment, and virtual elimination of the completed contract method of tax accounting) have combined to increase risk at the same time that profits and cash flow are significantly reduced. As the Harvard-based MAC group study entitled "The Impact on Defense Industrial Capability of Changes in Procurement and Tax Policy" noted, these policies have increased risk and at the same time vastly increased the need for external financing.

Investors are skeptical about investment in defense stocks.

Companies are responding to investor skepticism by decreasing corporate participation in defense contracting.

Subtier firms are particularly vulnerable to recent tax policy and acquisition policy changes.

Uncertainty about defense budgets, missions, and policies have combined to create great investor skepticism about investment in defense stocks. Companies favored by the markets characteristically either have low risk and relatively modest returns or have high risk short-term investments with great potential for higher returns. The defense industries, however, are viewed as long term and high risk with potentially lower returns. As a result, debt and equity capital is hard to obtain from investors. Therefore, companies are discouraged to pursue the long term and high risk investments in research and development, modernization, and productivity. Companies struggle to raise their profitability in the short-term at a time when price-earning ratios in many defense sectors are the lowest in at least 25 years.

Companies have made two basic responses to this situation: first, to decrease corporate exposure to defense contracting; or second, if this exposure cannot be reduced, to limit discretionary spending such as capital expenditures.

The first response includes the most dramatic type of corporate action: divestiture. Companies such as Eaton, Sperry, IC Industries, Goodyear, Gould, United Technologies, Lockheed, and Honeywell have all sold, or are in the process of selling, certain defense operations. For some, this has meant a complete withdrawal from defense contracting.

Divestiture or exit from the defense markets is not limited to large firms. Several consultants and analysts have identified many subcontractors who wish to sell their businesses or find merger partners due to a lack of financial resources. Subtier firms appear particularly vulnerable to the recent changes in acquisition and tax policy because their access to capital is limited in the best of times.

A less extreme form of deemphasizing defense business has been the decision to not expand existing defense operations. Allied Signal, IBM, and Motorola have all publicly stated that they would not expand their defense businesses. The Wall Street response to the Allied Signal announcement in November 1987 was a 5% increase in the value of the stock.

Perhaps the most widespread means of attempting to limit this negative exposure is selective bidding. In some instances, this could mean that a company would decide to not seek work on particular programs. Martin Marietta, United Technologies, Grumman, Lockheed, Northrop, and GM-Hughes have all stated publicly they are being more selective, have lost programs because of changes in their bidding strategies, or have not bid altogether.

"Second source" opportunities are viewed as a method to reduce investment risk.

The second basic response, to seek improved profitability through declining expenditures, is well demonstrated. As noted in the MAC Group study, contractor expenditures for IR&D have actually declined in both actual dollars and as a percentage of DoD-related sales between 1984 and 1985. Reducing IR&D expenditures minimizes contractor risk and increases short-term profit, but also limits innovation. Some companies have indicated that "pushing technology" is now an unwarranted risk given the chances of failure and already reduced profit margins.

Companies which are subjected to later competition on items they designed are motivated to avoid expenditures in research and development. Some are now seeking opportunities to be the "second source" while letting others take the risks incurred in initial investments.

Incentives

Through a variety of contract terms, the government seeks to create incentives for its contractors to invest in technology,

Determining whether incentives are achieving their goals has become difficult.

Government-sponsored incentives to foster contractor advancements in technology, modernization, or productivity change frequently.

Conflicts among the policies may prevent the incentive systems from reaching their goals.

Program stability is needed. Multi-year funding is required for system procurements.

productivity, and personnel. It also seeks to encourage them to undertake tasks which can only be performed at high technical risk. Determining whether these incentives are achieving their goals has become increasingly difficult.

The debates between Congress, DoD, industry, and the media have usually focused simply on what levels of "profitability" the industry achieved. The question of whether the incentives were working to create advanced technology, modernization, or productivity has not been addressed.

The system of incentives has been modified frequently over the past few years. Both Congress and the Defense Department have, on more than one occasion, made major changes to contract financing policies such as the tax laws, cost recovery, profits, progress payments, and a wide variety of other policies, each of which has a direct effect on companies' capital resources.

Some policies seek to create incentives for technical risk yet fail to reward the most risk-laden investments. Other policies direct investments in contract unique plant and equipment. Still others create taxable events before profits can be measured. The combined effect of these many changes is a conflict among the policies which may prevent the incentive systems from achieving their stated goals. Put simply, to the extent that profits are reduced or capital investments are specifically directed, they are not available for long-term investments in research, modernization, and productivity.

Program stability is needed. Existing government policies and annual budgeting reviews result in program funding levels that vary greatly from year to year. This is compounded by the fact that such budget actions result in one-year money even though procurement actions for many

major systems are multi-year in nature. This instability translates into high risk programs and discourages industry from making long-term investment commitments.

A commitment to develop should be a commitment to produce.

What is needed is a stronger tie between the commitment to develop a system and a follow-on commitment to produce an approved system. Existing contract policies such as dual-sourcing or leader-follower may in fact be viewed as a disincentive by the system developer. This can result in additional program instability and higher cost systems.

Longer term investment is tied to longer term procurement planning.

Industry's commitment to longer term investment is directly tied to government commitment to a longer term procurement plan. This has the added advantage of increasing contractor flexibility in meeting multi-year requirements.

Conflict inherent in the various contract financing policies increases pressure for short-term investment.

Companies seeking to meet burgeoning demands for working capital must satisfy shareholders and lenders by raising short-term returns. The conflicts inherent in the various contract financing policies thus increase pressure on corporate management for short-term investments to increase cash flow and short-term profits.

The resolution of present inconsistencies could be the basis for a revised incentive system which focuses on long-term investments.

The resolution of these inconsistencies could be the basis for a revised incentive system which focuses on long-term investments. DoD should examine the incentives which are used currently in, for example, several Navy and Air Force programs. These incentives are primarily performance based and are designed to provide DoD with greater value in more capable and longer lasting assets. The theory of these incentives could be applied broadly. They could even be applied in cases of simpler manufactured goods and simple or complex services by accounting for contractors' past performance as an incentive in evaluating proposals in competition for future work.

Competition

Both industry and DoD believe that competition has forced more discipline into the acquisition process.

Competition has proven to be both an effective incentive to contractor efficiency and a management tool for the services to obtain greater value for their program dollar. Since enactment of the Competition in Contracting Act (CICA), the number of competitive contract awards has grown significantly.

Both industry and DoD believe that competition has forced more discipline into the acquisition process. With competition, requirements must be more precisely defined and contractual statements of work are sharpened. The pressure of competition has also forced many contractors to become more responsive and efficient.

Competition has reached a quantitative peak.

Competition is often sought for competition's sake. Statistics indicate that competition may have quantitatively reached the highest level achievable and can be expected to remain at that level. In 1987, for example, more than 89% of Army, Navy, and Air Force procurement actions were awarded competitively.

As the Senate Armed Services Committee said in its report on the FY89 defense authorization bill:

The message that "competition is not for competition's sake" may not have reached the field.

"CICA has had a beneficial effect on the acquisition process. However, the purpose of the act was not to establish competition for competition's sake. The law recognizes that price is not the only determination, quality is important and should be stressed in competition. Although this seems to be well understood at headquarters level, it is not clear that this message has reached the field."

DoD should focus competition initiatives on qualitative, rather than quantitative, improvements.

DoD should not reduce its emphasis on competition but instead should focus competition initiatives on qualitative, rather than quantitative improvements. To do so, it should establish total product quality as a major criterion in choosing the best acquisition strategies

Total product quality means value.

for the government. Total product quality means more than the traditional elements of quality; it means value. It also means maintainability, operability, affordability, and more. It includes a measure of the contractor's past performance.

Total product quality should be used to evaluate proposals in several different ways. First, and most importantly, the soundness of a product's design, its producibility, reliability, and maintainability, must all be included. Finally, in determining total product quality, DoD should find some means of accounting for a company's past performance on the same or similar work.

A balanced approach to incentives and competition could provide a basis for longer term planning.

Source selection criteria should reflect rewards for superior past performance and penalties for past failures, similar to the Contractor Performance Assessment Review system now being used by the Air Force. A balanced approach to incentives and competition could provide a basis for longer term planning by both DoD and industry.

IV.

Cooperation in the Policymaking Process

As the Packard Commission explained, national security planning and budgeting policies are created in a number of agencies and congressional committees, most of which view it as their own obligation to approach the problem independently.

Although our independence of policy makers must be maintained, a greater level of cooperation is necessary to ensure national security.

In the Executive Branch national security policy is made by the President with the assistance of the Secretaries of State and Defense, the National Security Advisor, and others. Trade policies evolve through the Commerce and State Departments and tax policies from the Treasury Department. Similarly, Congress has divided its policy making responsibilities among a growing number of independent committees. Our Constitution requires this separation of powers. Nevertheless, because the lack of coordination has led to the current decline of the industrial and technology base, a greater level of cooperation and discussion among policy makers is essential to national security.

Major policy changes are made without regard to effects on our industrial and technology base.

The defense industrial and technology base is comprised of millions of people and thousands of companies, government laboratories, universities, and other facilities across the nation. But there is also no military economy or industrial base that is predominantly separate from the civilian economy of the nation.

America's defense companies compete with their civilian counterparts and are integrated with them in the sharing of financial, personnel, and natural resources. Recently, the industrial base has become even broader through inclusion of essential foreign manufacturing companies. Because of its breadth and depth, the industrial and technology base

is directly affected, sometimes significantly, by most of the major economic, environmental, and trade policies which our government undertakes.

Policy makers create changes without reference to their effect on national security.

Unfortunately, Congressional and Executive Branch policy makers frequently create major changes to these policies without reference to their effect on the capability of the industrial and technology base to perform the tasks which our national security strategy expects of it. The planning, budgeting, and organization processes are intertwined; this process, and improvements to it, will fail unless Congressional and Executive Branch leaders endorse the need for cooperation. Too often, the interests of constituents are not in the national interest.

Lack of cooperation and coordination of national strategies makes those strategies far less likely to succeed.

The effects of changes in national policy on the defense industrial and technology base should become obvious in the process of creating national security strategies and plans. However, even here the current policy making mechanisms do not undertake to match the capabilities of the industrial and technology base with the tasks they are assumed to perform in peace, national emergency, or war. This lack of cooperation and coordination of national strategies makes those strategies far less likely to succeed.

DoD policy makers do not have an adequate means of determining whether the defense industrial and technology base will be able to accomplish the tasks which underlie their plans.

Current national strategies are generated for presidential approval by the Secretary of Defense with the support of the Joint Chiefs of Staff and the Service Secretaries. In drafting these plans, however, DoD policy makers do not have an adequate means of determining whether the defense industrial and technology base will be able to accomplish the tasks which underlie their plans. In fact, recognizing this problem, the Joint Chiefs have begun their "Joint Industrial Mobilization Planning Program" by which some measurement could be made of industries' resources. Much more needs to be done.

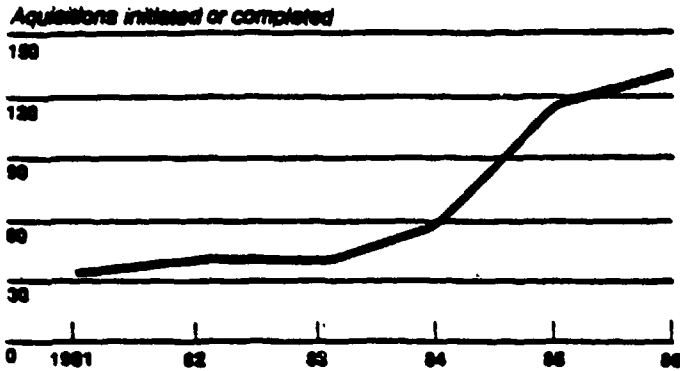
Other changes on economic, tax, trade, and defense policies must not detract from the ability of the industrial and technology base to support national security.

As President Eisenhower said, "Democracy, in one word . . . is . . . cooperation." National policy makers should be asked to cooperate, in their own actions, with DoD's plans for reliance on the defense industrial and technology base. Authorizers, appropriators, tax writers and all the federal agencies should be advised by DoD, at least in general terms, of the tasks which industry must perform. DoD should analyze new policy initiatives in depth and seek the cooperation of those policy makers to ensure that any major changes in economic, tax, trade, and defense policies assist in, or at least do not detract from, the ability of the industrial and technology base to perform as expected.

V.

Managing the Defense Technology Base

Foreign Acquisitions of U.S. High-Technology* Firms, 1981-86



*Includes electrical equipment, telecommunications equipment, and electronic components; computers, peripheral equipment, software, and services; R&D laboratories; precision instruments and scientific/medical equipment; specialized machinery, machine tools, and robotics; chemicals, pharmaceuticals, and biotechnology; and aerospace.

Figure V-1

The importance of the national scientific and technology capability to national security cannot be overstated. The Department of Defense Technology Base program is intended to exploit dual-use technology and develop defense specific technologies for incorporation into the operational inventory of our forces. The objective is a substantially increased capability at the lowest possible cost. Conflicting objectives, however, make this challenge difficult; a problem heightened by foreign acquisition of U.S. high technology (see Figures V-1 and V-2).

Cumulative Acquisitions, 1981-86 By Industry

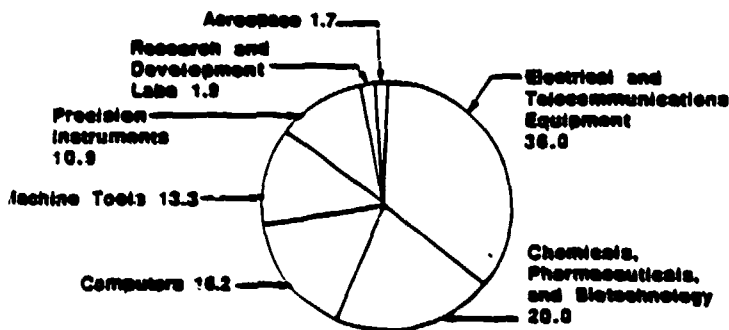


Figure V-2

In Figure V-3, technology base funding is compared to the total research in the U.S., federally supported research, and the GNP over the last three decades. The level of DoD technology base spending has not kept up with the levels of spending for other categories of research. Overall spending for U.S. basic and applied R&D has paralleled our growth in GNP.

TRENDS IN FUNDING FOR RESEARCH (BASIC AND APPLIED) COMPARED TO THAT FOR GNP, 1955-1987. Both curves and left-hand scale show GNP trend. Remaining curves and right-hand scale show trends for research funding: (1) total US (federal and private sources); (2) total federal; and (3) DoD.

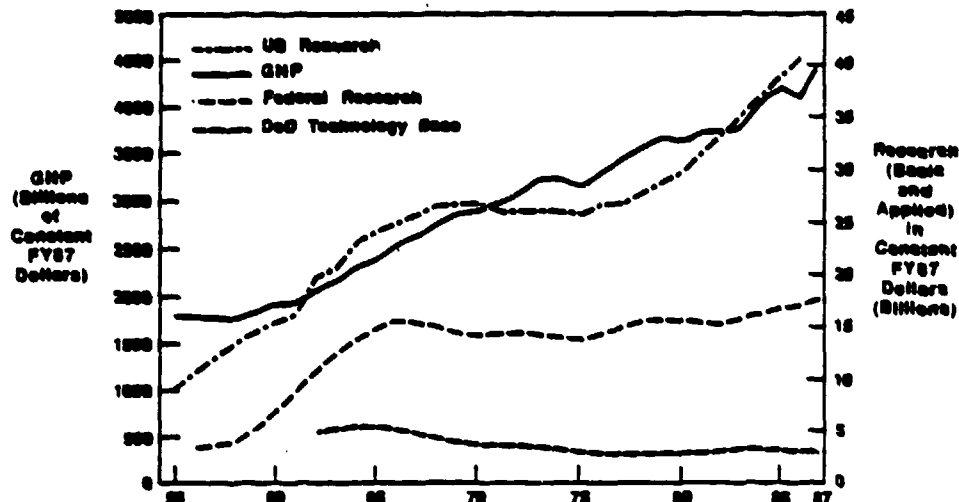


Figure V-3

As a further indicator of shortfalls in DoD technology base funding, Figure V-4 compares U.S. versus Soviet military RDT&E spending levels for almost 20 years.

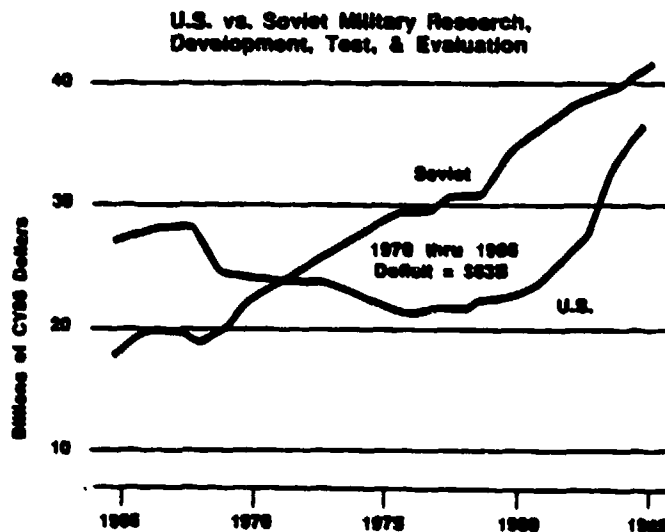


Figure V-4

This deficit can be tied to the relative trends in US/USSR standing in the 20 most important basic technology areas found in Figure V-5. While the U.S. is in the lead, the arrows indicate the relative technology level is changing in favor of the Soviets.

Relative U.S./U.S.S.R. Standing in the 20 Most Important Basic Technology Areas* (U)

Basic Technologies	U.S. Superior	U.S./U.S.S.R. Equal	U.S.S.R. Superior
1. Aerodynamics/Airframe Systems	X		
2. Computer & Software	X		
3. Conventional Warfare (Including all Chemical Substances)		X→	
4. Directed Energy		X→	
5. Electro-Optical Sensor (Including IR)	X→		
6. Guidance & Navigation	X		
7. Life Sciences (Human Factors, Bio-Technology)	X→		
8. Materials (L.I. Wt. High Strength, High Temperature)	X→		
9. Micro-Electronic Materials & Integrated Circuit Manufacturing	X		
10. Nuclear Warfare		X	
11. Optics		X→	
12. Power Sources (Mobile) (Includes Energy Storage)		X	
13. Production/Manufacturing (Includes Automated Control)	X→		
14. Propulsion (Aerospace and Ground Vehicles)	X→		
15. Radar Sensor	X→		
16. Robotics & Machine Intelligence	X		
17. Signal Processing	X		
18. Signature Reduction	X→		
19. Submarine Detection	X→		
20. Telecommunications (Includes Fiber Optics)	X		

- The list is limited to 20 technologies, which were compiled with the objective of providing a valid base for comparing overall U.S. and U.S.S.R. basic technology. The list is in descending order. These technologies are "on the shelf" and available for conversion. (The technologies are not intended to compare technology level in currently deployed military systems.)
- The technologies selected from the planning for equipment/technology needs capability in the next 10 to 20 years. The technologies are not those that are maturing or have the potential for significant improvement. New technologies may appear in future lists.
- The overall context and the relative technology level is changing significantly in the domains selected.
- Relative assessments of technology areas cannot detect overall strategic warning capabilities may be superior, equal or inferior in technologies of a given category.
- These overall assessments are not intended as a substitute for specific warnings when the individual components of a technology are considered.

As of: 17 November 1987

Figure V-5

Relative U.S./U.S.S.R. Technology Level in Deployed Military Systems*

Deployed System	U.S. Superior	U.S./U.S.S.R. Equal	U.S.S.R. Superior
Strategic			
ICBMs		X	
SSBMs	X		
SLBMs	X→		
Bombers	X→		
SABMs			X
Ballistic Missile Defense			X
Anti-Satellite			X
Cruise Missiles		X→	
Tactical			
Land Forces			
SABMs (Including Naval)		X→	
Tanks		X→	
Artillery		X	
Infantry Combat Vehicle		X	
Anti-Air Guided Missiles		X→	
Attack Helicopters	X→		
Chemical Warfare			X
Biological Warfare			X
Air Forces			
Fighters/Attack and Interceptor Aircraft	X→		
Air-to-Air Missiles	X→		
Air-to-Surface Missiles	X→		
Air/Aircraft	X→		
Naval Forces			
SSNs	X→		
Toposeals		X	
Sea Basing Aircraft	X		
Surface Combatants	X→		
Naval Cruise Missiles		X→	
Mines			X
CGI			
Counterspace		X	
Electronic Countermeasures/ECCM	X→		
Early Warning	X		
Surveillance and Reconnaissance	X→		
Training Simulators	X		

Figure V-6

The importance of technology as a factor in weapon systems deployment is shown in Figure V-6. The chart indicates the relative U.S./USSR standing in strategic and tactical forces. The arrows once again indicate significant changes in relative superiority of the U.S. versus the Soviet Union in key military systems.

IR&D is a very effective mechanism in developing and inserting technology into defense systems.

IR&D is a critical ingredient of the technology infrastructure (6.1, 6.2, 6.3A, and IR&D). Since IR&D is resident in the industry that uses it, the typical hurdles associated with technology transition (i.e., understanding, advocacy, "not invented here") are eliminated as demonstrated by the current status of stealth technology. Therefore, there is probably no other mechanism that is more effective in developing and inserting technology into defense systems than IR&D.

The goal of the science and technology infrastructure is to provide the best capability in defense systems at the lowest possible costs. Because the role and goals of the science and technology infrastructure are often misunderstood, they are restated here. Technology gives defense systems new capabilities. Therefore, the DoD uses the technology as a force multiplier. While this is a concept that is universally accepted, many people do not realize or understand that a second goal is to reduce costs.

The goal of the science and technology infrastructure is to provide the best capability to defense systems at the lowest possible costs.

Many programs in the science and technology infrastructure include among their objectives making an existing capability affordable. Example programs include: VHSIC, MIMIC, STARS/Ada, and many materials processing programs. Such programs are designed not only to reduce initial system cost, but to reduce life-cycle costs through increased reliability and lower maintenance. In addition, there are those who think that the only technologies designed to reduce manufacturing costs are the MANTECH programs. This is not accurate; for example, robotics is strongly funded outside MANTECH, as is automatic target recognition, which has considerable synergistic potential with robotics.

Therefore, we reassert that the goal of the science and technology infrastructure is to provide the best capability to defense systems at the lowest possible cost.

The key components of a strong technology base are people, resources, technology insertion, and management.

People are critical to manufacturing and technology leadership.

People - The quality of the scientists, engineers, and managers is critical to technology. Effective leadership in both program development and application is totally dependent on the qualifications, vision, and capability of personnel. Until "people" problems are adequately addressed and corrected, little hope can be held out for solving the other issues which are: 1) Resources in the form of budget stability and modern laboratory facilities; 2) technology insertion which assures that system development programs use the available technology; and 3) a management structure with authority, responsibility, and accountability.

A cooperative effort should be initiated to focus national efforts on critical technologies.

In light of the critical importance of advanced technology to United States strength and capabilities, a cooperative national effort should be initiated to focus government, industry, and academic expertise on a set of critical technologies that should be accelerated and explicated during the 1990s.

The establishment of a national policy for the protection and development of those portions of our industrial and technological base that support national security has been an elusive goal since the demobilization that occurred after World War II. Development of such a coherent policy is made difficult by the vast and diverse nature of the national economy and by the conflicting needs to have an efficient peacetime defense base and at the same time one that has sufficient capacity to expand rapidly to a wartime footing.

Conflicting interests discourage an effective national policy.

The complexity of the problem is aggravated by often conflicting interests, e.g., executive support for a certain technology advance while DoD budgetary restrictions do not allow it or State

Department advocacy of certain technology sharing while DoD is protecting the same technology.

A presidential Executive Order or Directive can establish the framework for coordination of a coherent national industrial and technology policy.

Strong interagency cooperative efforts to establish broad policy and to resolve disputes are required to correct the problem. A presidential Executive Order or Directive is the most appropriate way to establish the framework needed to begin the process of establishing and implementing a coherent national industrial policy in support of our national security interests.

VI.

Realism in Surge Planning

Increased attention must be given to industrial planning, the defense mobilization base, and foreign-manufactured components.

The increasing possibility of intense or protracted conventional conflicts where high technology weapons suffer high attrition rates warrants increased attention to industrial planning and the defense mobilization base. Historically, industrial investment in our technological base has been a basic tenet in our strategy of deterrence. Current acquisition policies, however, frequently discourage industry investments, thus eroding our mobilization capabilities. Concurrently, the increasing reliance on foreign-manufactured weapon system components compounds the difficulty in maintaining a robust mobilization base.

Defense Guidance derived from National Security policies has heretofore not adequately linked force development and strategy with industrial base capability/capacity.

Defense Guidance derived from National Security policies focuses on short wars and has not adequately addressed these factors or the critical linkages between force development, military strategy and the industrial base capability. It is necessary to focus on these vulnerabilities and determine when such measures as stockpiling critical materials or mothballing equipment should be adopted.

The use of buffer stocks significantly reduces the risk of production delays, as shown in Figure VI-1. As depicted in the shaded area, the risk of production delays is significantly reduced from that of a "cold start" position when a buffer supply is available.

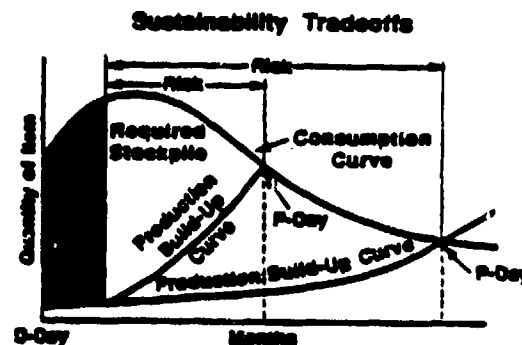


Figure VI-1

The costs associated with mobilization preparedness are unacceptable.

The Graduated Mobilization Response concept assures surge capabilities to attain predetermined levels or tiers of mobilization.

Our surge capability needs to be significantly strengthened.

Surge capability which could provide rapid production acceleration of critical consumables at the front end of a conflict is within the realm of affordability.

While mobilization planning is a necessary adjunct to preparedness, the costs associated with mobilization preparedness are unacceptable in a peacetime environment. Improvements in surge, and ultimately in mobilization capability in selected critical systems is vital. Coupled with the Graduated Mobilization Response (GMR) concept, utilizing surge capabilities to attain predetermined levels or tiers of mobilization, this strategy would be far more effective than current practice. The GMR is presently being implemented throughout the Federal Government by direction of the National Security Council.

The Graduated Mobilization Response concept also accounts for globalization of the defense industrial base, providing a framework for CINCs to identify and designate elements critical to operations. Within this framework, key vulnerabilities would be assessed and a "buffer" of selected stock would be matched to each vulnerability. Such a buffer is envisioned to be sufficient to last for the first 18 months of a conflict, permitting industry to surge production while simultaneously developing alternatives compensating for supply interruption and expanding overall production capacity to meet wartime demands. Care must be taken to ensure that in-process inventory buffers do not become technologically obsolete.

Effective deterrence of sustained conflict depends upon our surge ability, and our surge capability needs to be significantly strengthened in order to meet current national security objectives.

Surge capability which could provide rapid acceleration of production of critical consumables early in a conflict is affordable. Sufficient simulations and studies by JSD, JCS, and industry validated both the feasibility and cost of implementing surge capabilities into selected production processes.

Surge capability can be enhanced through cash flow changes.

Surge should be linked to early warning indicators.

Realistic and uniform definition of surge needs and capabilities is lacking.

DoD must assure that the industrial base can surge, particularly for consumables, as a peacetime deterrent to support low- and medium-intensity conflicts.

It should be recognized that surge capability can be dramatically enhanced at little additional cost of these items through changes in cash flow management, and affordability can be significantly improved by changes in acquisition strategies. Changes in surge planning could also encourage industry IR&D investments, thus strengthening our mobilization capabilities.

Industrial surge must be linked to early warning indicators. The DSB supports the finding in the 1988 National Security Strategy Report which states:

". . . the readiness of our industrial base would be progressively increased as intelligence suggested an increasing probability of hostile actions directed against U.S. interests."

Realistic and uniform definition of surge needs and capabilities is lacking, and this problem is exacerbated because there is no multi-service integration of surge priorities. DoD policy, including the Defense Guidance, must incorporate appropriate mechanisms and processes to link force development, operational planning, and industrial base capability/capacity.

Strategy depends in part upon the ability of the industrial base to supply the required quality and quantity of material. Using the POM and PDM processes to guide programming and budgeting decisions will not only demonstrate a commitment to surge, it will provide the necessary foundation for strategy and operation plan development and execution.

DoD must assure that the industrial base can surge, particularly production consumables, as a peacetime deterrent and to support low- and medium-intensity conflicts. Budget priorities should reflect this and the building and maintaining of these capabilities. Defense Guidance also must be supported

by budget and acquisition commitments to ensure industrial base capabilities required to implement strategy.

The ability to surge must be demonstrated.

The ability to surge must be demonstrated and exercised. To be fully effective, surge must begin before our forces are committed to a conflict. Further development and expansion of the JCS Joint Industrial Mobilization Planning Program (JIMPP) would provide the means for setting priorities for industrial base capabilities and developing criteria and "triggers" for commencing surge production.

An 18-month buffer of critical foreign-sourced components must be provided.

We should also identify, price, and specify purchase of an 18-month buffer stock of critical foreign-sourced components or materials essential to surge operations.

Where budget constraints prevent an adequate capability, operations plans should be altered to reflect the real capability.

Finally, budgetary realities can and must be reflected in planning for and demonstrating surge capabilities. Where budget constraints prevent an adequate industrial surge capability, operations plans should be altered to reflect the real capability.

VII.

Comments on the DoD Report on Bolstering U.S. Industrial Competitiveness (BIC)

The problem of strengthening the industrial base needs national attention.

For the DoD to be effective in strengthening the industrial base, it must extend its activities beyond the traditional policy remedies of procurement and R&D policy.

Priorities need to be assigned.

The Defense Science Board is in general agreement with the recommendations stated in the BIC report. One of our primary recommendations builds upon the finding of the BIC report that DoD must utilize all the policy tools available to ensure an adequate industrial base. These policy tools include a full range of public policy instruments available to the Executive and Legislative branches.

For DoD to be effective in strengthening the industrial base, it must extend its view and influence beyond its own acquisition policy to reach tax, trade, and other economic policies which affect the industrial base. DoD must take on the additional responsibility of dealing with this national problem with national resources. DoD and others need to recognize that the DoD cannot solve the industrial base problem by itself.

Although the BIC report describes the problem well, the report fails to recommend priorities for the 19 recommendations for DoD action. (The recommendations are summarized in Appendix C.) DoD, like any institution, has limited resources to meet its mission. Competition for them has always been strong and will get even stronger under the current prospects of declining budgets. While the report makes the case that significantly more resources need to be directed to dealing with the industrial base issue, the lack of specific priorities weakens that position. For example, one of the last recommendations of the report calls for strengthening the contribution of the educational system to manufacturing and industrial competitiveness.

Because priorities have not been assigned, we are unsure as to how many resources can or should be dedicated to particular issues.

Create an implementation plan.

Assignment of priorities to the recommendations should be followed by an implementation plan and schedule. The industrial base suffers from an overabundance of study and of inaction. The difficulty in taking action on that subject stems from the inability of government and industry to devise achievable solutions. For example, the report calls for a tax policy that will enhance the ability of the industrial base to compete in world markets. However, the report stops short of suggesting the means to accomplish this.

The recommendations made in this study are complementary to the recommendations of the BIC. An action plan to implement the recommendations of both studies will leave little doubt in the minds of government and industry policy makers that the health of our industrial base is an issue of the first order of importance.

A new and broader role for the DoD is required.

To accomplish the recommendations of both the DSB and the BIC report will require DoD to act in a new and unfamiliar role. DoD must strongly voice its concerns in the councils of the Executive and Legislative Branches on matters of national and international economic policies which affect the industrial base. This role is not one usually assigned to DoD; but DoD cannot meet its mission without a strong commercial base and it should recognize and accept this broader responsibility.

DoD should have strong analytical capability.

DoD must establish a strong analytical capability to understand the responses of the manufacturing base to the various economic factors which affect it. The policy issues facing the production base must be understood from a quantitative perspective and not from an anecdotal basis. To be persuasive in the councils of economic policy, DoD must be able to

present strong evidence of the need for action and data supporting the recommended solutions. DoD must have the ability to estimate the impact of alternative policy decisions to be confident that proposed action will provide the desired result.

Ensuring strong relations with industry requires concerted effort.

The BIC report raises the relationship between the DoD and industry as one of the fundamental determinants of success in efforts to strengthen the industrial base. The report cites several specific actions including the Defense Manufacturing Board, the Manufacturing Advisory Council and the National Academy of Sciences. "Forging the right relations with industry" will take concerted and consistent effort at all levels of government and industry.

Educational excellence is a long-term foundation of industrial success.

The improvement of the quality of the nation's educational system is necessary to assure future competitiveness of U.S. manufacturing industry. For this issue to be resolved, however, DoD will have to devote a substantial amount of resources and enlist the assistance of many others in government. While DoD does and should direct its own educational resources to assist in this area, the larger issue relates to university and secondary school involvement. DoD should exploit its potential as a catalyst to encourage appropriate government agencies and industry to address this issue. DoD can provide the leadership and guidance to assist in a national coalition between government and industry to achieve the educational goals necessary for national success.

To the extent that the BIC recommendations result in organizational realignments within the DoD acquisition offices, the DSB strongly recommends that experimental or prototype programs not be included in the new responsible office. Rather, the DSB recommends that the focus there be on programs and projects with direct operational application.

VIII.

Findings and Conclusions

FINDINGS

- * Globalization of U.S. defense markets has made our nation partially dependent upon foreign sources. Neither DoD nor industry has the means of measuring the scope of this dependence or of identifying the systems and components which are affected. Current acquisition policies and strategies do not give sufficient recognition to this problem.
- * Of greatest importance is the fact that the continued deterioration of the industrial and technology base diminishes the credibility of our deterrent. It is a national problem requiring a coordinated response by government and industry. If our nation is to ensure its security for the coming decade and beyond, it must adopt a strategy which links military strategy with a policy to ensure the availability of the industrial and technological resources on which operations plans rely.
- * A pattern of inadequate long-term investment by prime and subtier suppliers is a primary cause of the increasing deterioration of the defense industrial and technology base. This inadequate investment can be attributed to:
 - Pressure on defense industries to provide short-term returns equal to those available from lower risk investments;
 - Uncoordinated effects of national economic and defense acquisition policies which further reduce the resources available for investment;
 - Increasing uncertainties surrounding the defense budget and acquisition process; and
 - The capital markets' perception of an imbalance between the risks taken and the possible rewards in defense business.

- * The growing interdependence of national economic, defense, and foreign policies requires greater coordination of those policies in the Executive Branch and in Congress. The performance and capabilities of the defense industrial and technology base is directly affected by changes to tax, trade, environmental, and socioeconomic policies.

The policymakers must find the means of measuring and coordinating these effects before they act.

- * The maritime industries have deteriorated to the point where they cannot support national security objectives. Whether the war be a short Persian Gulf war or a long European war, or anything in between, maritime assets are required beyond the capability of American industry today.
- * There is a lack of central management of the DoD technology base programs. Until they are brought under a more active management, with sufficient accountability for efficient expenditure of resources, the program will not achieve the significant benefits it is capable of producing.

CONCLUSIONS

- * Significant differences exist between industry's capabilities and the tasks which national security planning assumes can be performed by industry.
 - A high level forum should be created to ensure that the industrial and technology base can support national security objectives.
- * Effective deterrence depends upon an ability to surge
 - Realistic and uniform definition of surge needs and capabilities is lacking. Surge planning must include and account for dependency on foreign sources.
 - Surge capability needs to be significantly strengthened in order to meet current national security objectives (e.g., consumables, assured transportation capacity).
 - Ability to surge must be demonstrated and exercised. Affordability can be significantly improved by changes in acquisition strategies.
- * DoD's technology base is threatened by an unstable budget and an inability to attract and retain high quality scientists and engineers in laboratories and R&D centers.

- * Present acquisition policies and strategies do not provide sufficient incentives to enable industry to make long-term investments in technology, modernization, and productivity.
- * Independent Research and Development (IR&D) has had a major influence on industry's ability to meet defense needs by providing a primary source of competitive approaches to many of the tactical and strategic problems which face DoD. The real advantages of IR&D must be emphasized and current challenges to the process resolved.
- * Competition within the acquisition process must be continued; however, the present emphasis on cost alone must be modified so that quality, past performance, innovation, and technology are given equal credit in the competitive environment.

IX.

Recommendations and Implementation Plan

Secretary Carlucci and Under Secretary for Acquisition Costello both, in their meetings with the Task Force, requested that we prepare a plan of action for implementing our recommendations.

Recommendation Number One: Establish a permanent Cabinet level mechanism to determine industrial and technology base capabilities, compare them with national security objectives, and develop national policy initiatives to reconcile the differences between industrial and technology based capabilities and national security objectives. Specific steps should be taken to ensure DoD an active role in the formation of national economic policies affecting national security capabilities:

Implementation of Recommendation Number One:

- The Secretary of Defense should:
 - Obtain presidential approval of an Executive Order or National Security Decision Directive establishing such a mechanism;
 - Request formal membership on the Economic Policy Council and the establishment of the Defense Working Group of that council.

Recommendation Number Two: Improve the planning mechanism affecting surge capabilities by integrating those capabilities into the acquisition process and selectively funding high priority surge items chosen by the Joint Chiefs of Staff or the services. Further, purchase an eighteen month buffer stock for work in process to cover critical foreign-sourced components. Finally define quantitative objectives and criteria for commencing industrial surge in time of national emergency.

Implementation of Recommendation Number Two:

- The Secretary of Defense should:
 - Issue defense guidance on planning, programming and budgeting, to use the Program Objective and Decision Memoranda processes to ensure service planning for surge. Further the functions of production based advocacy should be consolidated

with those of overseeing the defense industrial base in a new function such as a Deputy Under Secretary of Defense for Acquisition.

- The Under Secretary for Acquisition should
 - Incorporate decisions on surge capability in acquisition strategies at the defense acquisition board milestone reviews. Further, USD(A) should institute policies requiring all prime contractors to (1) account for critical components that cannot be acquired in the U.S.; (2) price a one-time investment in an eighteen-month stock of these components; and (3) seek alternatives that would protect against foreign dependency.
- The Joint Chiefs of Staff should:
 - Develop criteria which will trigger further procurement of foreign vulnerability buffer stocks and other industrial surge needs based on all-source warnings to enable DoD to order "surge on warning".

Recommendation Number Three: Because the DoD technology base is being weakened by its inability to attract and retain high quality management and technical people, DoD should urgently implement those policies and procedures necessary to adequately compensate and reward high quality technical talent and should propose an organizational structure for select facilities which could enable private sector operation under government control.

Implementation of Recommendation Number Three:

- The Secretary of Defense should:
 - Convene a high level peer group to establish and promulgate criteria for selecting and accomplishing the transition of research and development centers to private sector operation, such as FFRDC's. This high level peer group should consist of directors of some of the R&D centers, other DoD elements, and industry. Further, the Secretary should direct the services and DoD agencies to nominate R&D activities for transition to the private sector.
 - Where transition of a research and development activity to the private sector is not appropriate, the Secretary should structure special compensation packages for key science and engineering and

management positions to ensure the ability to obtain and maintain highly capable personnel.

Recommendation Number Four: The Under Secretary of Defense for Acquisition should develop and implement centralized and integrated policies to effect industrial base development, acquisition processes, and coordinated service implementation.

Implementation of Recommendation Number Four:

- The Under Secretary of Defense for Acquisition should:
 - Conduct a review of each of the services acquisition policies and their implementation of federal acquisition regulations with the objective of identifying inconsistencies in policy and implementation. As a result of this review, the USD(A) should establish a set of uniform procurement policies and procedures.
 - Assign policy leadership responsibility to the new Deputy Under Secretary of Defense for Acquisition and consolidate operations and administration of the manufacturing technology and industrial modernization programs under a single joint service office.

Recommendation Number Five: Uncertainty about acquisition policies and strategies contributes to the pressures on industry to plan for short-term investments and avoid long-term risks. This uncertainty is compounded by the strong belief that the varying acquisition policies used by the services reflect continued instability.

USD(A) should implement a set of consistent and integrated acquisition policies. USD(A) should review the services' acquisition policies to determine inconsistencies and variances with DoD policy. Direct actions should be taken to eliminate these differences and to impose specific objectives for industrial and technology base needs.

Implementation of Recommendation Number Five:

- The Under Secretary for Acquisition should:
 - Support the use of incentives in acquisition strategies and policies which would encourage long-term industry investment in technology, production processes, and modernized facilities.

- Establish within DoD the capability for conducting sophisticated financial analyses and modeling on both macro- and micro-economic theories.
- Within 180 days, issue instructions requiring the development of standardized financial impact assessments of existing and prospective regulations, policies, and acquisition strategies.
- Use these assessments to: (1) determine the effect of acquisition and other economic policy changes on capital formation in the industrial and technology bases; support acquisition policies that would foster long-term investments; and test new legislation affecting acquisition policies and the industrial and technology base. Reports should be provided to Congress at the earliest date and prior to enactment.

Recommendation Number Six: Because IR&D has profound influence on the ability of industry to satisfy DoD's evolving needs, the Secretary of Defense should:

- Reaffirm the importance of IR&D to DoD;
- Determine IR&D ceilings in the context of the long-term assessment of technology requirements, not in specific relation to budget levels; and
- Endorse the existing method of IR&D/B&P cost recovery.

Implementation of Recommendation Number Six:

- The Secretary of Defense should, in messages to Congress and each of the services, state that IR&D is essential to national security and to maintaining competition for major defense programs. Further, the Secretary should also review personally principle decisions of the Defense Resources Board and the services in establishing annual IR&D cost allocations ceilings.

Recommendation Number Seven: To ensure that competition provides DoD with the best value for each defense dollar, the Under Secretary of Defense for Acquisition should ensure that procurement policies and the competition advocacy process base competition principally on total product quality, good business practices, and not just competition for lowest costs.

Implementation of Recommendation Number Seven:

- The Under Secretary of Defense for Acquisition should:
 - Establish Total Quality Management (including Total Product Quality) as a major criterion in choosing the best acquisition strategies for the government;
 - Consider all real costs of competition in determining the net benefits to the government; and
 - Include competition at subtier levels in measuring the amount of competition for DoD contracts.

Recommendation Number Eight: DoD should undertake to reverse the deterioration of the maritime segment of the industrial base to ensure the credibility of our conventional deterrent.

Implementation of Recommendation Number Eight:

- The Secretary of Defense should:
 - Define, in the context of national security objectives, the capacity of the United States' and its allies' maritime transportation assets to meet the needs of current national security plans; and
 - Seek international commitments to ensure a balance between capacity and requirements.

Recommendation Number Nine: Further improvements should be made to the policies governing the use of best and final offers ("BAFOs"). The task force strongly supports DoD's recent efforts to reform these policies, but suggests that a greater effort should be made to reduce the use of BAFOs and eliminate second- and third-time BAFOs. Pricing data should be included with all RFPs to include those that now only call for technical work effort definition. To the greatest extent possible, responses to RFPs should become "BEST AND ONLY OFFERS."

Implementation of Recommendation Number Nine:

- The Under Secretary of Defense for Acquisition should:
 - Convene a high-level joint government-industry group to consider further modifications of regulations governing best and final offers. This group should be formed immediately and asked to report back within 90 days.

Recommendation Number Ten: Because current allegations of misconduct are diverting attention from efforts to implement improvements to the acquisition process, DoD should undertake specific actions to reduce the probability of similar future incidents.

Implementation of Recommendation Number Ten:

- The Secretary of Defense should:
 - Support current investigations and any resulting prosecutions to ensure fair, firm, and rapid resolution;
 - Institute policies which will ensure that all defense contractors, suppliers, and consultants adopt and adhere to suitable codes of ethics to govern their business operations; and
 - Ensure that government and industry managers have adequate knowledge of relationships among consultants, suppliers, and the government to avoid possible conflicts of interest.

APPENDIX A

DRAFT PRESIDENTIAL DIRECTIVE

THE NATIONAL INDUSTRIAL AND TECHNOLOGICAL BASE

Our national industrial base is critical to preserving the National Security of the United States. It must provide technologically superior defense material in quantities sufficient to meet our national security needs at reasonable cost, and do so in a timely manner.

A healthy, responsive, and technologically superior industrial base is an essential element in our national security strategy to deter war. It is also a prerequisite to sustaining our armed forces and ensuring that essential civilian needs are met during a national security emergency. Therefore, it is the policy of the United States to have an industrial capability that will ensure our continued prosperity and security.

A key part of our efforts to enhance national security is the maintenance and improvement of our national industrial base. American industry must have the capability to modernize and expand production to meet increased demands for weapon systems and supplies during times of national emergency if the United States is to confidently and rapidly face changing world conditions. Our policies must recognize the vital role that industry plays as we improve our capability to surge industrial production, and should foster improved relationships between the government and industry as partners in the support of our national defense.

The National Technology Base is the essential foundation of our national industrial base. The competitiveness of our national industrial base depends on a continuous creation and infusion of technology just as our national security relies on technology to give our military forces the capability to defeat adversaries who can muster numerically superior forces.

While all elements of our national technology base are important to national security, certain key elements of this base must be recognized as the cornerstone to our enduring national security strategy of deterrence. This national security technology base includes the technology base programs of the DoD, the government-sponsored independent research and development program conducted by industry, the technology base program of the DoE, the technology base program of NASA, and the National Science Foundation program.

This directive recognizes the need to properly fund the national security technology base, even in times of relatively austere funding of other portions of the federal budget. Technology base programs must have a high degree of stability so that long-term technology development programs typically not pursued in industry can be successfully integrated into weapon systems. Additionally, a rigorous, competitive, national security technology base program should be growing hand-in-hand with the commercial technology base in which it is embedded. Therefore, it will be the policy of this administration to fund the national security technology base program at a constant growth rate at least equal to the growth in our gross national product.

Even with this funding level, the success of this program will depend on its ability to successfully transfer technology to and from our own commercial technology base. The independent research and development program is the DoD's principal program which stimulates industry to develop innovative applications of technology to defense requirements. This program should be funded at a level commensurate with its importance to our national security.

New mechanisms within the government must be developed to ensure that these policies are implemented and integrated into our overall national security strategy.

This Directive provides for the creation of a national level forum to review and coordinate these critical policy issues which impact our national technological and industrial health. The National Security Council will coordinate the National Security aspects of this activity by oversight of an Industrial Policy Committee (IPC) that will be established under the authority of this Directive. The IPC will be chaired by the President's National Security Advisor and will be comprised of appropriate representatives from the Departments of State, Defense, Justice, Commerce, Transportation, Energy, OMB, CIA, FEMA, NASA, and the NSF, with the President's Science advisor as a principal member. The IPC will also serve as a subcommittee of the Economic Policy Council (EPC). The IPC will have the ability to draw support from the entire array of government agencies and departments that comprise the EPC.

Goals that should be preeminent in national industrial program development and in establishing a charter for the IPC include:

- Review of major Government policies and their impact on the domestic industrial and technology base.
- Review of Government policies as they relate to globalization of the industrial base.

- Development of a plan for periodic industry-wide assessment of the rate of technology advancement and production capabilities compared to national security objectives.
- Review of existing industrial policy objectives.
- Redevelopment of a "key technologies strategy" that identifies those technologies where the country should be a leader or competitive to assure national security and economic competitiveness.
- Review of the adequacy of resources dedicated to enhancing the national industrial and technological base including independent research and development prior to the President's approval of his annual budget.
- Review and revision of current executive orders such as 11490 and 10480 that assign national security emergency responsibilities.
- Development of industrial responses based on a graduated response to early warning.
- Development of policies throughout the government that foster industrial innovation, modernization, and productivity.

This Committee will meet at least quarterly and prepare a summary of their activities, findings, and recommendations for review of the broader NSC and EPC membership, the President, and Congress as appropriate. The Committee will provide an annual report to the President on the strengths and weaknesses of the defense and commercial industrial base as it relates to national security. The report will identify the long-range impact of existing and anticipated government policies, laws, and regulations on the industrial base. It will make recommendations on changes to government policy needed to assure a national industrial base capable of sustaining national security objectives.

APPENDIX B

COMPARISON OF REGULATION OF ELECTRIC SERVICE BY STATE AND FEDERAL UTILITY COMMISSIONS WITH REGULATION OF DEFENSE PROCUREMENT BY THE DEPARTMENT OF DEFENSE

	Defense Procurement	Electric Regulation	Comparison
Allowable profit	DoD guidelines for contract negotiation; some statutory provisions.	Percentage of rate base set by regulators.	Profit allowances in both cases are based on costs of capital investment. In neither case do regulators simply accept an offer price as generally happens in competitive circumstances.
Allowable costs	In general, costs must be reasonable to be allowable; however, recent statutes have specifically provided that certain costs - such as advertising costs - are not allowable.	Operating and maintenance, fuel, research and development, provided the costs are prudent.	The processes of determining what costs are reimbursable are similar because the regulators control profit through knowledge of costs; however, DoD legislation is very detailed.
Cost-plus contracts	Generally used for developmental items.	Common only in nuclear construction.	In both cases, regulators take into account lack of construction or manufacturing experience with a new technology.
Cost analysis	"Should-cost" analysis may be used on major projects.	Based on historical year.	In both cases regulators compare cost experience with current requests for compensation.
Auditing	Defense Contract Audit Agency, Inspector General, Services also have own audit staffs.	Regulatory staff and/or consultants.	Similar treatment.
Conflict of Interest (Revolving door)	Two-year wait before employment with contractor.	State laws forbid - or require time before - industry employment of regulators.	Similar treatment.
Sunk costs after cancellation	Reimbursement, but no profit on uncompleted portion of contract.	Varies according to State law.	Reimbursement for sunk costs (but not for expected profit) is common but not universal in electric regulation; thus, treatment is generally similar in the two industries.
Competitive proto-types	Generally required for major weapon systems in accordance with Packard Commission recommendations and implementing legislation.	Informal assessments of plant types are made but are not required of regulators.	Traditionally, electric regulators have not participated in decisions about what kind of equipment to build, whereas DoD has full responsibility for such decisions. (Congressional pressure is frequently brought to bear on DoD, however.

APPENDIX B (Cont'd)

COMPARISON OF REGULATION OF ELECTRIC SERVICE BY STATE AND FEDERAL UTILITY COMMISSIONS WITH REGULATION OF DEFENSE PROCUREMENT BY THE DEPARTMENT OF DEFENSE

	Defense Procurement	Electric Regulation	Comparison
Regulation type	Federal only. (Some State health and safety regulations may apply.)	Federal and State.	Federal policies relating to DoD procurement are generally paramount, whereas most regulatory decisions for utilities are made by States. Federal regulation of bulk power and interstate sales, as well as safety regulations and various socio-economic regulations apply to utilities.
Time until payment	Progress payments are made.	Payment begins in most States at plant completion; continues through 30-year depreciation period. Federal regulators allow some payment before completion.	State laws have traditionally not allowed any compensation until completion of an electric plant. In the last 10 years, compensation for a plant during construction has been allowed in about 1/3 of the States. Thus, DoD practice is more favorable to industry.
Reimbursement for public relations costs	Although the DoD appropriation acts prohibit reimbursement of advertising costs, the Armed Services Board of Contract Appeals has allowed public relations costs. The distinction has not been fully clarified.	Disallowed.	The allowability of public relations costs for DoD contractors has been upheld in at least one case; for public utilities, these costs are disallowed.
Number of companies	Many competitors for some items; however, sole source is frequent. (There are statutes and policies favoring competition.)	Stable, small number in each State under current practice; expansion is now proposed.	Assignment of service areas to companies by electricity regulators has kept the number of companies small. Deregulation would probably see the number grow.
Start-up capital	Occasionally made available for new technology and in other circumstances.	Companies use own capital plus long-term debt.	Electric companies are expected to find their own capital based on constant stream of revenue.
Regulation as part of product cost	Unknown.	Less than 1 percent.	No comparison can be made.

SOURCE: CONGRESSIONAL RESEARCH SERVICE

APPENDIX C
BIC RECOMMENDATIONS

1. **Improve Industry Relations**
 - Establish Defense Manufacturing Board Manufacturing Strategy Committee
2. **Industrial Strategic Plan**
 - Systematic Action Plan for industrial strength
3. **DUSD (Production Base and International Technology)**
 - Establish the production base advocate
4. **Develop Analytical Capability**
 - Establish ability to monitor and understand industry
5. **Greater Foreign Dependency Visibility**
 - Document degree of foreign buying at component level
6. **Improve Incentives for Investment**
 - Increase contractor motivation to invest in modern facilities
7. **Increase Program Stability**
 - Stabilize program commitments to encourage contractor efficiency
8. **Raise Priority of Life Cycle Costing**
 - Institute life cycle costing as a standard way of doing business
9. **Develop Quality First Program**
 - Effect culture change to do it right the first time
10. **Increase Greater Use of Commercial Products**
 - Reduce cost and lead times through more commercial item use
11. **Greater Emphasis on Process Technology**
 - Increase support for manufacturing technology and IMIP
12. **Encourage Technical Skill Base**
 - National program to assure skilled workforce
13. **Build University Manufacturing Expertise**
 - DoD act as catalyst to establish industry/university efforts
14. **Fund Factory Demonstration Centers**
 - Establish hands-on production center for best process technology
15. **Production Base Impact Assessment**
 - Determine effect of laws and regulations on manufacturing industries
16. **Tax Policy to Enhance Competitiveness**
 - DoD encourage concern for manufacturing in tax policy
17. **Trade and Domestic Policies to Enhance Competitiveness**
 - DoD encourage consistent national policies for national security
18. **Encourage Strengthened Educational System**
 - Broad national focus on stronger technical education
19. **Remove Barriers to Management Excellence**
 - Active effort to remove organizational/regulatory barriers

APPENDIX D

Task Force Membership

Mr. Robert A. Fuhrman,* Chairman
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Lockheed Corporation

Mr. William A. Anders,* Vice President
Senior Exec. V.P. - Operations
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Dr. Robert A. Krell, Executive Secretary
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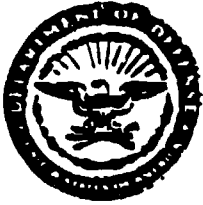
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APPENDIX D



THE UNDER SECRETARY OF DEFENSE

WASHINGTON, DC 20301

ACQUISITION

16 MAR 1988

MEMORANDUM FOR CHAIRMAN, DEFENSE SCIENCE BOARD

SUBJECT: Terms of Reference--Defense Science Board (DSB) Task Force on Defense Industrial and Technology Base

You are requested to form a Defense Science Board 1988 Summer Study on the Defense Industrial and Technology Base. The objective of this DSB task force is to recommend a strategy and specific actions for the Government and industry to adopt that will ensure the defense industry is capable of providing the support required to fulfill our National Security Objectives. The objectives require the defense industry to be capable of providing the technologies essential to our competitive strategies, as well as surge production requirements during times of crisis.

By meeting these objectives the Department of Defense (DoD) should be able to maintain an industrial strategic plan as an analog to our military strategic plans. Thus, a focus of this effort should be to recommend the linkages between military operations, research and development and industrial base planning and to suggest a balance between short and long term prioritization of industrial base issues. One area of particular concern is the subtler and overall infrastructure industries necessary to support DoD prime contractors.

The task force should review actions taken since the 1980 DSB Summer Study on Industrial Responsiveness, including:

- Changes resulting from the DoD industrial preparedness planning, policy, and procedural studies,
- Studies performed by the Office of Technology Assessment, the Center for Strategic and International Studies, and the Federal Government,
- National Security Council interagency mobilization planning studies, and
- Federal and Congressional actions that have helped or adversely affected acquisition lead times, productivity, incentive for capital investment, and technological innovations.

The actions of these organizations can be useful to help define the problems, and offer a baseline from which the DSB

task force efforts can begin. The task force can focus its attention on means by which DoD can deal with the problems.

The task force should recommend procedures for effective utilization of DoD resources to ensure a defense industry capable of providing the support required to fulfill our National Security Objectives. The task force should address:

- The DoD position in a global manufacturing economy and our increased dependency on foreign sources for essential components and raw or finished materials,
- Erosion of the second and third tier domestic support industry,
- Shifting priorities that influence industry's total investment in productivity improvements and technology,
- The role of Government-owned, company-operated research, development, and manufacturing facilities,
- Increased channeling of independent research and development investments away from innovation to an effort to reduce technical risk in ongoing weapons programs,
- Statutory and policy changes in DoD acquisition strategy including procurement methods, contract financing, competition, and cost sharing, and
- Improved estimates and prioritization of desired sectoral capability,
- Analysis of industrial capability that anticipates future weaknesses,
- Impact on national security of industrial trends,
- Support of allies/friendly nations to reach desired production capability,
- Prioritizing shortfalls, and
- Stimulating private sector initiative, DoD/industry cooperative opportunities.

The products of this task force will be a briefing to the Secretary of Defense summarizing results and recommendations of the study, as well as a report which will provide a foundation for the Secretary's guidance to the Department of Defense and industry to better support National Security Objectives. Particular attention should be given to modern concerns including the time delays inherent to a production system, both the delays of incorporating technological advances into weapons

and the delays of transitioning from peacetime to wartime production rates. The report should provide specific recommendations for the implementation of proposed DoD policy and procedures, and the execution of complementary business strategies.

Under Secretary of Defense for Acquisition, will sponsor the task force, and Mr. Robert A. Fuhrman will serve as Chairman. Dr. Robert A. Krell will be the Executive Secretary, and Lieutenant Colonel A. J. Beauregard, USAF, will be the DSB Secretariat Representative. It is not anticipated that your inquiry will need to go into any "particular matters" within the meaning of Section 208 of Title 12, U.S. Code.

A handwritten signature in dark ink, appearing to be 'R. A. Fuhrman', written in a cursive style.

APPENDIX E

GLOSSARY

Acquisition Activity - The organizational element of a Military Department that has contracting authority and responsibility and, therefore, the industrial preparedness planning responsibility.

Advanced Development (6.3A and B) - Programs which have begun development of hardware for test. Purpose of efforts in this category relate primarily to "proof of design" rather than development of hardware for use. All programs in the advanced technology development budget activity, and some programs in the strategic, tactical, intelligence and communications, and defense-wide mission support budget activities, are in the advanced development research category. Advanced development programs move from advanced technology development into the strategic, tactical, intelligence and communications or defense-wide mission support activity after they have been selected by the Defense Acquisition Board as programs which are to move from advanced development to engineering development, and eventually to production. This selection, known as a "Milestone I decision," takes place during advanced development.

Advanced Technology Development (6.3A) - Programs which explore "alternatives and concepts prior to development of specific weapons systems." Includes development of hardware and feasibility demonstrations for technologies which "are not formally identified to specific operational requirements." All advanced technology development programs are in the advanced development research category.

Applied Research - Research concerned with the practical application of knowledge, material, and/or techniques directed toward a solution to an existent or anticipated military requirement.

Basic Research - Research directed toward the increase of knowledge, the primary aim being a greater knowledge or understanding of the subject.

Bid and Proposal (B&P) Costs - Those costs incurred in preparing, submitting, and supporting proposals on potential contracts.

Competition - Government procurement actions and acquisition policy which intends for more than one contractor to bid for specific DoD proposals. It has become the prevalent strategy of the government in its efforts to reduce defense

procurement costs and, in too many cases, is based entirely on price without regard to quality.

Defense Guidance (DG) - The document containing the annual guidance from the Secretary of Defense to DoD components.

D-Day - The day on which an operation commences or is due to commence. This may be the commencement of hostilities or any other operation.

Engineering Development (6.4) - Programs which develop hardware for military use according to specifications established by the services. Excludes development of systems already approved for production. Programs move from advanced development to engineering development when they are selected in a "Milestone II decision" by the Defense Acquisition Board. Engineering development programs are found in the strategic, tactical, intelligence and communications, and defense-wide mission support budget activities.

Exploratory Development (6.2) - Efforts directed toward evaluating the feasibility of proposed solutions to specific military problems. Includes both applied research and the development of "bread-board hardware." All exploratory development programs are included in the technology base budget activity.

Incentives - Those initiatives and policies adopted by government which encourage industry investment to create and maintain a modernized, competitive, productive and responsive industrial and technology base.

Independent Research and Development (IR&D) - A contractors' cost that is not sponsored by, or required in performance of a contract and that consists of projects falling within the following areas: 1) basic research, 2) applied research, 3) development, and 4) system and concept formulation studies.

Investment Costs - Those program costs required beyond the development phase to introduce a new capability into operational use, to procure initial, additional, or replacement equipment for operational forces; or to provide for major modifications of an existing capability. They exclude research, development, test and evaluation, personnel, and operation and maintenance costs.

Management and Support (6.5) - "Includes research and development efforts directed toward support of installations or operations required for general research and development use. Included would be test ranges, military construction, maintenance support of laboratories, operations and maintenance of test aircraft and ships and studies and analyses

in support of the R&D program." All management and support programs are in the defense-wide mission support research activity.

Mobilization - The act of preparing for war utilizing the full authorities available under declared national emergencies.

Operational Systems Development - R&D on projects which are still in engineering development, but have already been approved for production by the Defense Acquisition Board in a "Milestone III decision." Operational systems development programs are found in the strategic, tactical, intelligence and communications, and defense-wide mission support budget activities. They are not included in Defense Department's R&D mission, but in the other missions (strategic, general purpose forces, airlift and sealift) as appropriate.

Procurement - The process of obtaining personnel, supplies, services, and equipment.

Production - The conversion of raw materials into products and/or components through a series of manufacturing processes. It includes functions of production engineering, controlling, quality assurance, and the determination of resources requirements.

Production Base - The total national industrial production capacity available for the manufacture of items to meet material requirements.

Program Decision Memoranda (PDM) - Convey the Secretary of Defense's decisions to the Services and Defense Agencies on issues raised during the programming and budgeting process. PDMs are the final major documents in the budget submission process.

Program Objective Memoranda (POM) - Provide total service programs and associated budget data necessary to support Defense Guidance objectives. The POMs detail manpower, material, and money for proposed programs as well as potential risk.

P-Day - The point in time at which the rate of production of an item available for military consumption equals the rate at which the item is required by the armed forces.

Research (6.1) - "Includes all effort of scientific study and experimentation directed toward increasing knowledge and understanding in those fields of the physical, engineering, environmental and life sciences related to long-term national security needs." All "research" programs are included in the technology base budget activity.

Surge - Rapid increase, upon short notice, of the availability of material at the point of conflict, with or without a declaration of war.

Technology Base - Programs whose primary purpose is to improve scientific knowledge which can be adapted to military purposes. The "research" and "exploratory development" research categories are included in technology base budget activity.