1993
Executive Research Project
RS8

Realizing the Peace Dividend: A Systems Perspective on Defense Conversion

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Unclassified
SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION Unclassified	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY N/A	3. DISTRIBUTION / AVAILABILITY OF REPORT Distribution Statement A: Approved for public release; distribution is unlimited.
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE N/A	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) NDU-ICAF-93-R88	5. MONITORING ORGANIZATION REPORT NUMBER(S) Same
6a. NAME OF PERFORMING ORGANIZATION Industrial College of the Armed Forces 6b. OFFICE SYMBOL (If applicable) ICAF-FAP	7a. NAME OF MONITORING ORGANIZATION National Defense University
6c. ADDRESS (City, State, and ZIP Code) Fort Lesley J. McNair Washington, D.C. 20319-6000	7b. ADDRESS (City, State, and ZIP Code) Fort Lesley J. McNair Washington, D.C. 20319-6000
8a. NAME OF FUNDING / SPONSORING ORGANIZATION 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO.
11. TITLE (Include Security Classification) Realizing the Peace Dividend: A Systems Perspective on Defense Conversion	
12. PERSONAL AUTHOR(S) Robert M. Wallett	
13a. TYPE OF REPORT Research 13b. TIME COVERED FROM Aug 92 TO Apr 93	14. DATE OF REPORT (Year, Month, Day) April 1993 15. PAGE COUNT 57
16. SUPPLEMENTARY NOTATION	

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

SEE ATTACHED

20. DISTRIBUTION / AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT. ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION Unclassified
22a. NAME OF RESPONSIBLE INDIVIDUAL Judy Clark	22b. TELEPHONE (Include Area Code) (202) 475-1889 22c. OFFICE SYMBOL ICAF-FAP

DD FORM 1473, 84 MAR 83 APR edition may be used until exhausted. All other editions are obsolete.

SECURITY CLASSIFICATION OF THIS PAGE

UNCLASSIFIED

ABSTRACT

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The objectives of defense conversion must be to sustain needed defense capability, including a viable defense industrial base, and to use excess resources from defense to promote long-term economic growth. Clearly, defense conversion is not the panacea for curing the nation's economic ills; however, if done right, it can contribute to our long-term economic well-being. The only way to do this is through a systems perspective.

This study provides the conceptual foundation for applying systems concepts to defense conversion. It demonstrates how an integrated systems perspective can be used in developing and analyzing policy options to improve system performance; that is, achieving the defense conversion goals. This framework can serve as a useful conceptual guide for the public policy community which must develop and implement defense conversion policy.

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REALIZING THE PEACE DIVIDEND:

A SYSTEMS PERSPECTIVE ON DEFENSE CONVERSION

I. INTRODUCTION

THE ISSUE

For nearly five decades, the U.S. national defense strategy and defense budget focused on the threat imposed by the Soviet Union and its communist ideology. The U.S. built a large military force structure around the principal mission of deterring both a strategic nuclear war and a large-scale, fast-reaction conventional war in Central Europe that could rapidly escalate into a global conflict. To meet this threat, the U.S. maintained over 2.2 million active duty military, fielded relatively large numbers of modern weapon systems, and maintained a global network of bases/infrastructure. At the peak of the Reagan Administration buildup, the cost to maintain these forces was more than $340 billion annually--consuming 6.5 percent of the nation's gross domestic product (GDP), about 27 percent of the federal budget, and 82 percent of the federal government's discretionary spending.[1]

The dissolution of the Soviet Union and the breakup of the Warsaw Pact have ended the "Cold War"--dramatically changing strategic requirements and defense needs. Recognizing that future defense needs can be met with a smaller force, the U.S. embarked on wholesale reconfiguring of our armed forces for the post-Cold War era. The active military force is drawing down from 2.2 million persons in 1986 to about 1.4 million by 1997. Also, because the pressures for equipment modernization and replacement have greatly diminished, less equipment needs to be procured. As a result, U.S. defense budgets have been declining since 1986. In constant 1992 dollars, defense outlays are projected to decline from $340 billion in fiscal year 1987 to $237 billion in fiscal year 1997--a 30 percent reduction. Procurement outlays will be reduced 46 percent during this same period.[2]

These reductions in defense spending have had a ripple effect on the defense industrial base. Just as the military has downsized and restructured in response to a reduced threat, the defense industrial base is in the process of adjusting to sustained reductions in defense spending. Defense companies continue to downsize, streamline, and divest excess capacity through sale, merger, or plant shutdown. For example, Lockheed recently acquired the General Dynamics military aircraft division for $1.5 billion; last year Martin Marietta purchased the General Electric aerospace electronics division for $3 billion; Hughes Aircraft bought the General Dynamics missile business for $450 million; and Loral purchased LTV's missile business for $261 million.[3] This consolidation within the industry is being accomplished in conjunction with streamlining by other firms--a total of 960,000 defense industry jobs may be eliminated between 1987 and 1997.[4] Further changes are certain as the defense companies are now recognizing the sustained nature of the drawdown.

The downsizing of the military and the defense industrial base has released significant resources (manpower, plant, and equipment) to be absorbed by the commercial economy. This release of resources has occurred at a time when the economy is weak--slow recovery from recession, slow productivity growth, and weakened global competitiveness in manufacturing sectors.[5] The transition of excess defense resources to the civilian economy has been painful for many. Understandably, there has been a growing public demand for policies to facilitate this transition.

Many believe the notion of large-scale defense conversion--redirecting defense resources to critical civilian purposes--holds the promise of the peace dividend. The true "peace dividend" is not the amount of money saved in the Federal defense budget, but rather the real resources made available as defense spending declines.[6] The economy benefits to the extent that these resources are shifted into new, high value uses. Thus, defense conversion pulls together the political, economic, and technical processes needed to release skills, equipment, and other resources now being used for defense purposes and guides their transfer to alternative economic use.[7]

PURPOSE

In this paper I will discuss the need for a systems approach to defense conversion, then develop and analyze a conceptual framework of the defense conversion system. This conceptual framework consists of a rudimentary model of the defense conversion system and a resource allocation taxonomy. This analysis provides the background for the discussion of system performance and the implications for defense conversion policy.

Specifically, this study will:

Examine the utility of applying an integrated systems approach to defense conversion.

Develop a conceptual framework for analyzing the defense conversion systems.

Demonstrate how the framework can be used in developing and analyzing policy options to improve system performance.

The concepts presented can stimulate thought on the need for a rational, systemic approach to defense conversion. This should help avoid the trap of suboptimization within the system to the detriment of overall policy objectives.

The framework, which this study proposes, should serve as a useful conceptual guide for those who must grapple with the difficult issues of developing and implementing defense conversion policy. This study is not intended to provide a means of quantitative analysis, nor an all-inclusive means of objective evaluation of defense conversion policy.

WHAT IS DEFENSE CONVERSION?

Conversion--transforming defense-related resources to civilian-oriented purposes--means different things to different people. Differences in meaning usually arise from the hierarchy of economic activity being investigated. Basically, there are three levels of definition: the production level, the organizational level, and the systems level.

Production Conversion

At the plant or factory level, conversion usually means a well planned transition from the production of military goods to the production of commercial goods. In this scenario, people usually remain with the firm to the extent required for producing the new commercial product. They are employed using the same basic skills as before. It is the physical plant that is replaced or reconfigured to accommodate the new production process.

Organizational Conversion

At the firm or industry level, conversion takes on a broader meaning. At this level resources are fluid and variable. Conversion now implies the reaction by the firm to a decline in defense spending. These actions include restructuring or diversification. Restructuring can take the form of vertical integration of production functions, mergers with other firms, divestitures (selling off excess capacity or unprofitable segments), or plant closures. Diversification--entering or expanding commercial production--can be accomplished by acquiring or developing commercial production capability. Much of the current conversion literature deals with this industry/firm reaction to lower defense spending.

System Conversion

In its broadest sense, conversion is "the process by which people, skills, technology, equipment, and facilities in the defense sector are shifted into alternative economic applications."[8] In this sense conversion is the system or process of transitioning resources from defense use to civilian (commercial or public service) use. At this level, conversion becomes an economic adjustment issue for the nation. I will use this broad definition of conversion throughout this study.

II. THE NEED FOR A SYSTEMS APPROACH

Defense conversion was defined as the process by which people, skills, technology, equipment, and facilities in the defense sector (military and defense industrial base) are shifted into alternative economic applications. By this definition, conversion is a continual and natural part of change during defense downturns. The two, sometimes conflicting, objectives of the conversion process are: to shift resources out of defense into civilian pursuits efficiently and effectively, and to preserve the defense industrial base to meet conceivable future defense needs. That conversion takes place is a fact. The ease with which it is accomplished and the degree of success in meeting these objectives can be problematic.

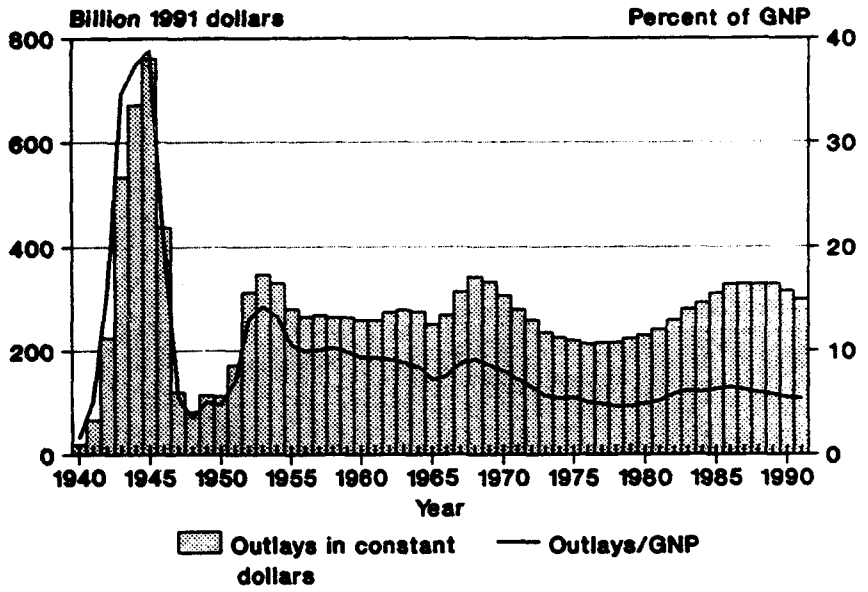
The need for a systems approach to the conversion process will be discussed from a historical perspective and on the basis of current realities.

HISTORICAL PERSPECTIVE

From the end of World War II to the end of the Cold War, U.S. defense spending has experienced several ups and downs (Figure 1).[9] To provide a historical perspective on conversion we will discuss the post-WWII conversion experience, the Cold War conversion legacy, and will conclude with a summary of factors which facilitate the conversion process.

The Conversion Lessons of World War II

The WWII "conversion" experience was highly successful. By 1948, defense spending fell from a wartime peak of 38.7 percent of GNP to 3.2 percent, 12.4 million people left employment in defense industries, 10.6 million were discharged from the armed services, and 1.8 million left civilian defense jobs.[10] Yet, the WWII demobilization model offers few relevant applications for today's defense conversion environment.



SOURCE: Steven Alexis Cain, *Analysis of the FY 1992-93 Defense Budget Request, With Historical Budget Tables* (Washington, DC: Defense Budget Project, February 1991).

Figure 1. Defense Spending, 1940-91

<u>"Reconversion," Not Conversion.</u> Post-WWII conversion was actually "reconversion." During the mobilization period and throughout the war, established commercial industries bore the brunt of wartime production. This was possible because of the compatibility of military and civil technologies and production processes. Also, the whole economy mobilized to support the war effort--commercial production was severely constrained. Assembly lines and equipment for production of commercial goods were put in storage and scientific/ engineering talent focused on the war effort. After the war, industries--such as automobile, rubber, and steel, which had originally converted from civilian markets--experienced little difficulty in returning to their traditional lines of business.[11] Many companies--as high as 80 percent--did not even need to retool for the first wave of postwar production.[12]

Supportive Government Policy. Some credit for easing the adjustment is due to government foresight in planning for the transition, which began as early as 1943. "Conversion" efforts focused on prompt termination of government contracts, disposal of surplus property, veteran transition benefits, and the rapid movement of war materials out of facilities to speed up the return to civilian production. The rapidity of demobilization, coupled with a backlog of pent-up demand for commercial products and accumulated wartime savings, and a supportive government tax policy created an ideal environment for the economic transition. The defense and commercial industrial bases remained highly integrated and the few specialized defense contractors were forced back to their specialized market.[13]

Taylorism and Fordism. There was one outgrowth of the WWII experience not often mentioned in defense conversion discussions, but many link it directly to today's economic problems constraining current conversion efforts. WWII indelibly ingrained the preeminence of Taylorism (hierarchical management) and Fordism (mass production) in the American industrial culture. During WWII and the years that followed, this American system of management and production conquered the world. This past success has been a significant barrier to change and, some suggest, has undermined our industrial competitiveness in the global economy.[14]

Conversion Legacy of the Cold War Period

The conversion experiences of the Cold War period (following the Korean and Vietnam Wars) created perceptions which bear on today's environment. These perceptions collectively create a paradigm which is now being shattered by current realities. The only perception which continues is the need to maintain technological superiority in our weapon systems.

Conversion is an industry problem. Throughout the Cold War, defense conversion was viewed predominantly at the organizational (firm/industry) level. Unlike the WWII experience, the Korean and Vietnam Wars were far less demanding on U.S. industry. Wartime production needs were achieved through

temporary expansion of the emerging, specialized defense industry. Conversion took place within a fundamentally sound economy--capable of absorbing excess defense resources during periods of reduced defense spending.[15] Further, the Soviet threat still drove defense needs and the capabilities required of the defense industrial base. Thus, the two objectives of conversion could be met with little or no government involvement--market forces could drive the transition of excess defense resources.

Conversion is temporary. Defense firms viewed declines in defense spending as temporary. Spending would eventually rise in response to emerging Soviet threats/capabilities. Defense industry attempted to use their capabilities to sell new commercial products or to enter commercial markets. However, these efforts were geared toward maintaining the size of their operations and using their excess capacity until the next upswing in defense spending. No defense firm made a concerted effort to move into a permanent commercial market.[16]

Conversion doesn't work. It is from this environment many studies have concluded that "conversion" doesn't work. In 1966 an Arms Control and Disarmament Agency (ACDA) report studied attempts at commercial diversification by U.S. defense firms. In 1990 they reexamined the same issue and came to the same conclusion: "Detailed research has not identified a successful product in our economy today which was developed through a military-to-civilian conversion approach.[17] In fact, at the systems level, conversion was very successful. What didn't work was particular firms' attempts to diversify.

Technology is more important than numbers. Throughout the Cold War we followed a policy of substituting technology for people. This led to a procurement strategy of quality versus quantity. It began in the Eisenhower Administration with the strategy of massive retaliation--a strategy to rationalize significantly reduced defense spending (following the Korean War) in face of an emerging Soviet threat. The strategy continued through subsequent administrations as it became apparent that the Soviets had

numerical superiority in weapon systems. Our strategy hinged on the advantages of U.S. technological superiority over Soviet numerical superiority.

A separate "defense economy" is OK. The effect of this strategy was a deep chasm between the commercial industrial base and the defense technology and industrial base. The highly integrated base of WWII was not feasible, nor even desirable, from the viewpoint of many policymakers. Security risk and the technological inferiority of commercial products were traditionally cited as reasons. [This is no longer true, as will be discussed later.] This divergence resulted in a unique defense industry culture, separate procurement practices, and a distinct "defense economy."

Factors Which Facilitate Conversion

History has shown there are several factors which affect the probability of success for defense conversion or the ease with which it is accomplished. From the above discussion, it is apparent that the following factors ease the defense conversion process:

- A healthy, growing economy capable of absorbing excess defense resources in a productive manner.
- A high degree of compatibility between defense and commercial technologies/skills.
- A high degree of integration between commercial and defense markets.
- A high degree of compatibility of management cultures between defense and commercial firms.
- Supportive government policy.[18]

CURRENT REALITIES

The Cold War legacy is an environment where traditional approaches to defense conversion won't work. A change in basic national security strategy, sustained reductions in defense spending, downsizing of the military and DoD civilian workforce, a declining defense technology and industrial base, a

stagnant economy, a segregated defense and commercial industrial base, and our declining competitiveness in the global economy have converged to make defense conversion a tough issue for policymakers.

To talk of defense conversion at the production or organizational levels does not make sense. In an era of global competition, conversion only makes sense if viewed from a systems perspective. Plant conversion is inefficient and only rarely effective. Organizational conversion (diversification) also has a poor history--largely due to the segregation of the defense and commercial industry sectors.

We must now view conversion in the context of the interaction of three sectors: the civil (non-defense) sector, the defense support sector (defense industrial base), and the military sector (DoD and the Services). We must avoid an issue-oriented, special interest approach.

The objectives of defense conversion must be to sustain defense capability, including the viability of the defense industrial base, while utilizing excess resources from defense to promote economic growth and competitiveness. Clearly, defense conversion is not the panacea for curing the nation's economic ills; however, if done right, it can contribute to our long-term economic well-being. The only way to do this is to adopt a systems perspective.

III. DEVELOPING THE CONCEPTUAL FRAMEWORK

The need for and application of an integrated systems approach to defense conversion is intuitively clear. A systems approach defines the elements of a system/process and describes how these elements interact to produce an output. Understanding these interactions and interrelations should lead to better policy decisions. It should avoid suboptimization (optimizing the output or efficiency of one element of the system to the possible detriment of the system as a whole). Also, it should avoid the random application of resources in response to specific events without understanding

the impact throughout the system.

A model of a basic system is shown below (Figure 2). I've included a more complete description of system's terminology in the appendix.

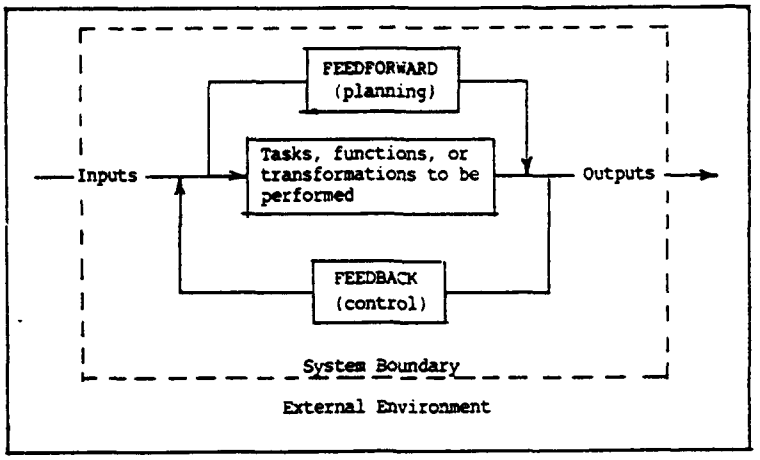


Figure 2. Basic System Model.

How can a systems approach be applied to the defense conversion process? First, we must build a conceptual framework of the defense conversion system. A conceptual framework will increase our understanding of defense conversion and will serve as a guide to improving system effectiveness. This conceptual framework consists of a rudimentary model, a description of the model, and an analysis of the model.

THE NATIONAL ECONOMY MODEL

Defense conversion is a process operating within the national economic system. How does the economy work? A basic model is shown in Figure 3 below.[19]

The nation's economy takes fundamental natural elements (such as raw materials, people, and geographic, hydrographic, topographic factors) and the existing infrastructure base and transforms them into output, referred to as gross national product or gross domestic product.[20] The transformation

processes are typically divided into two major divisions: the public sector (activities controlled through federal, state, and local governments/agencies) and the private sector. For our discussion, we have divided the private sector into defense-related activities and non-defense activities.

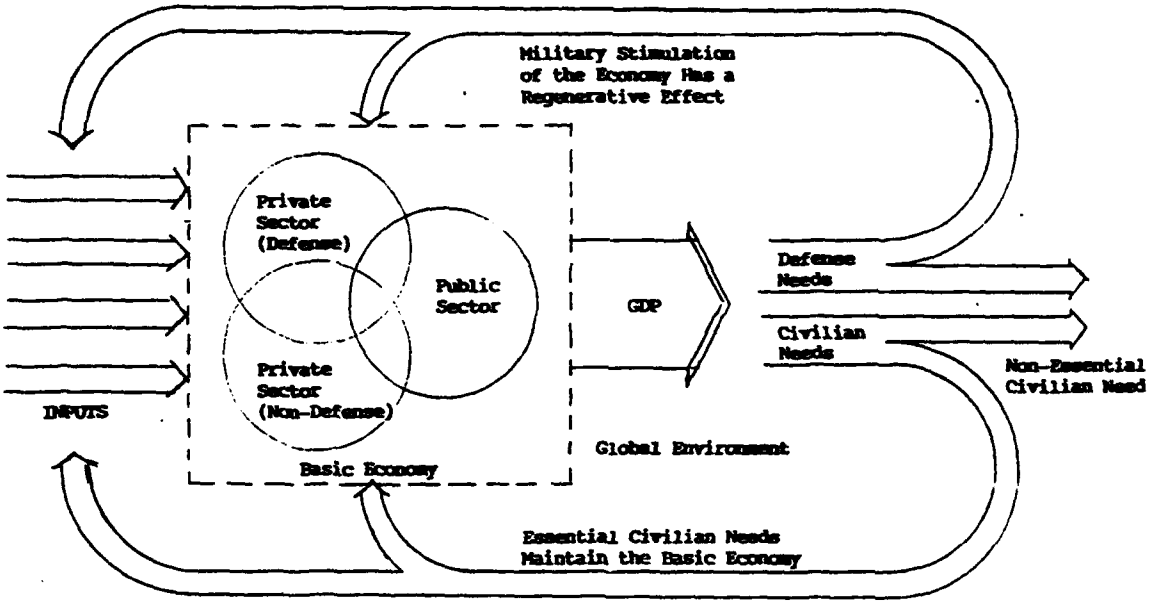


Figure 3. Basic Model of National Economy

The gross domestic product is distributed among defense needs and civilian needs. As can be seen from the various arrows, that portion of GDP used for defense needs has two elements: outputs which are basically consumed (or not available for other purposes) and output which is regenerative. Regenerative output results in further economic activity which serves to maintain or stimulate the basic national economy. Examples of regenerative defense activity include procurement and employee salaries which are spent in the economy for other goods/services. Another less direct example would be defense research which has commercial applications.

Similarly, civilian needs can be divided into non-essential and essential. Essential needs are those required to maintain the basic economy.

This would include public investment in education/training, public infrastructure systems, capital investment/savings, research and development, and some forms of social welfare spending. Non-essential civilian needs have no regenerative effect--many types of consumption. This non-essential civilian capacity is normally diverted to military needs during surge/mobilization. The result is a temporary reduction in the standard of living.[21]

DEFENSE CONVERSION GOALS

The basic national economy model is useful in helping us understand the defense conversion system. The first step in describing a system is to establish the mission and objectives of the system. For the national economy, the objective is to sustain long-term economic growth as measured by the system output, GDP. For defense conversion, many people have different ideas of what conversion should accomplish. The Defense Conversion Commission identified four significant goals for government to pursue in fostering defense conversion. These goals are: to encourage economic growth over the long run; to preserve defense capability; to ease the immediate impact on workers, communities, and companies; and to improve government programs.[22]

The last two goals are more related to internal system efficiencies and the policy environment than they are to the direct output of the defense conversion system. For this reason, we can limit the objectives of the defense conversion system to the following:

- Preserve defense capability to meet projected threats to our national security interests using less resources.
- Redirect the resources released from defense into alternative economic applications in a manner which promotes long-term economic growth.

These goals are not always complementary. We don't want defense conversion to threaten our ability to defend ourselves. For this reason, the primary system objective is to maintain sufficient defense capability. Beyond

that, excess resources should be applied toward maximizing long-term economic growth.

DEFENSE CONVERSION SYSTEM

We can describe the defense conversion system using a rudimentary model based on our national economy model. As described above, the goals of defense conversion are to preserve defense capability and to promote long-term economic growth. Thus, the system must efficiently transform minimum inputs into maximum output (defense capability). This output must be sufficient to meet projected threats to our national security interests. The basic model is shown in Figure 4.

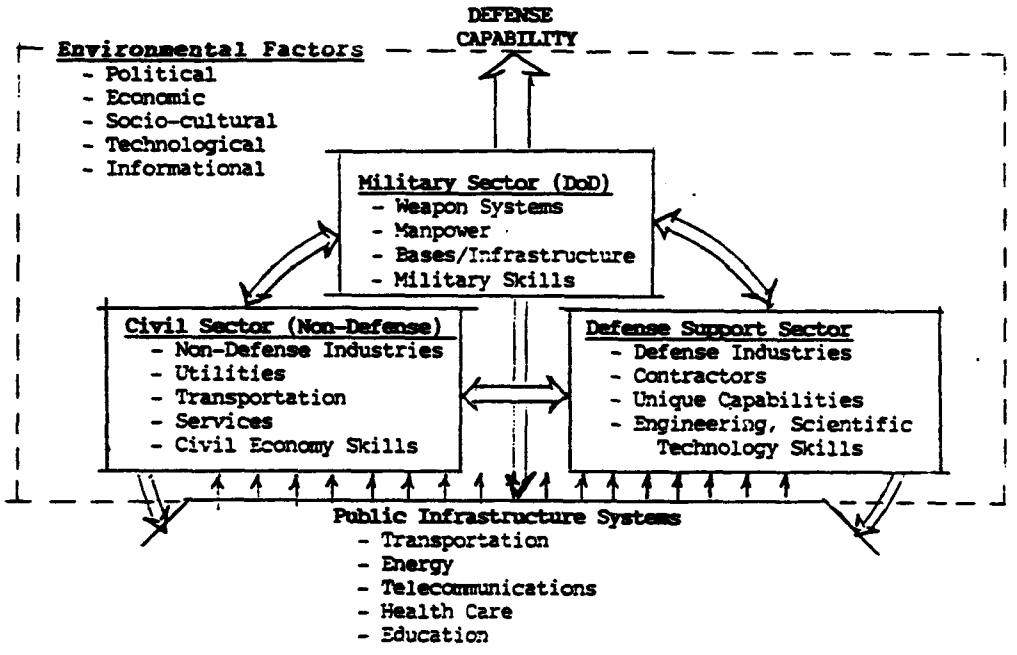


Figure 4. Defense Conversion System

As the model shows, defense capability is the direct output of the military sector. The inputs to the military sector are outputs from the national economy, both the public and private sectors. The military sector must define the defense capability required to meet the threat (defined by the operating environment) and must control the inputs (from the defense

support and civil sectors) needed to produce the desired capability. Clearly, not all inputs to the military sector are transformed into defense capability. Some inputs become retrograde outputs which are either reutilized in other sectors or released to the environment as waste.

One of the most difficult tasks is to define required defense capability. This requires a comprehensive review of U.S. national security strategy, including a reexamination of the size and structure of U.S. military forces and their supporting industry. Traditionally, the military force structure is the result of decisions based on judgments about the size and character of the threat and the resources available to develop and maintain the forces. Some now suggest we should pursue a capability-based force structure--one based on desired military capabilities/characteristics, since we no longer have a prevailing threat (such as the Soviet Union once posed). In any case, the amount spent on defense should be based on the objectives the nation pursues in the international security arena and the level of risk--economic, political, and military--that the nation is willing to tolerate in pursuing these objectives.[23]

This model shows how the various sectors must interact to produce defense capability. Later we will discuss system performance to determine how we can meet the first objective of defense conversion: to preserve defense capability in light of cuts in defense spending (less resources). The other goal of defense conversion is to redirect the resources no longer needed for defense in a manner which promotes long-term economic growth. In the basic defense economy model this is represented by the flow of resources out of the military and defense support sectors into the civil sector, the public sector, and the environment. However, the basic model does not clearly show how this occurs.

REDIRECTING RESOURCES

To help us understand the process of redirecting resources toward economic growth we can refer back to our basic national economy model

(Figure 3). It is apparent that long-term economic growth can only be stimulated through regenerative activities. Allocating defense cuts to regenerative activities such as reducing the budget deficit (which increases national savings); new, more efficient plant/machinery; and public investment in education and training (human capital development) or infrastructure is more likely to promote long-term economic growth than allocating to consumption programs. However, consumption can be regenerative if additional long-term demand is generated and met by increasing domestic capacity, rather than through additional imports.

The process of redirecting resources is shown in Figure 5.[24]

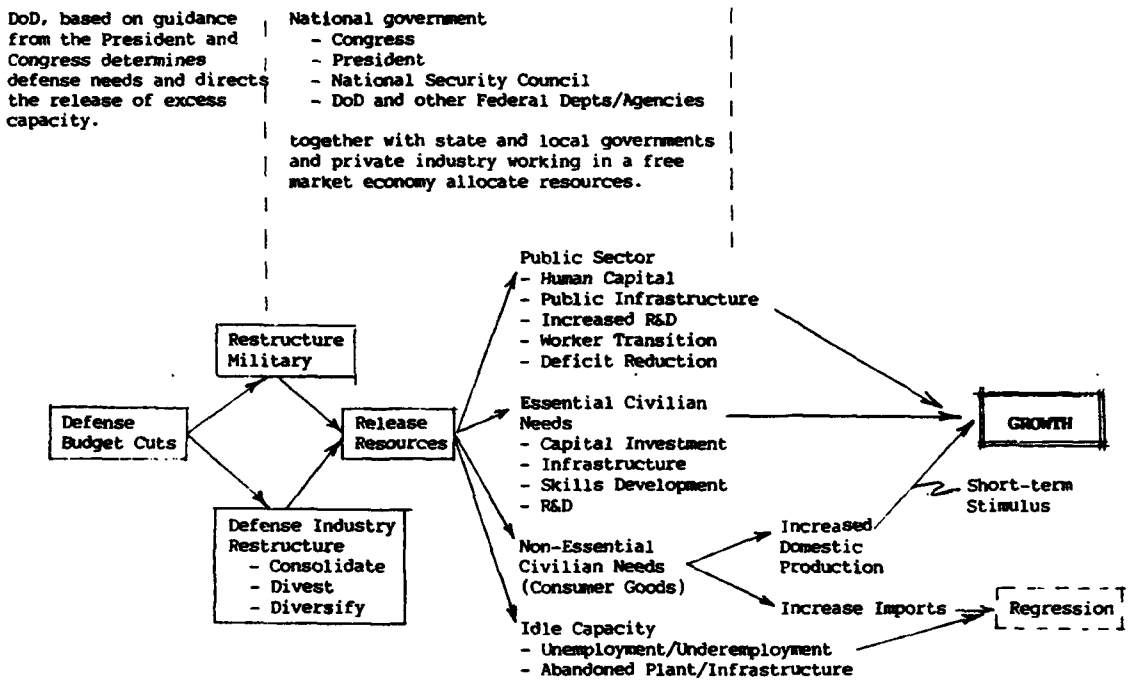


Figure 5. Resource Allocation Taxonomy

Defense cuts result in the release of resources from the military sector. Further, the reduction in defense procurement spending leads to a restructuring of the defense support sector (defense industry). This restructuring also results in the release of resources for non-defense use. The released resources can be absorbed by the public sector or the private sector and can be used for regenerative activities or for activities that detract from growth (regresssion). The allocation of resources to these various purposes takes place within the free market economy as controlled by the existing political system.

IV. SYSTEM PERFORMANCE

The defense conversion system model (Figure 4) and the resource allocation taxonomy (Figure 5) serve as the basis for discussion of system performance. Specifically, we will address three important aspects of system performance: the integration at the three sector interfaces, internal sector efficiencies, and the implications of the system's operating environment--the political economy of conversion.

INTEGRATION

Integration of activities at the three sector interfaces is the key to system effectiveness. Any barriers to the flow of resources among the various sectors results in the loss of capability. This is shown in Figure 6.

The system interfaces form the core capability of the system, which varies according to the degree of integration. To improve integration, we must understand the current nature of the interfaces and endeavor to remove barriers to the flow of resources at the interfaces.

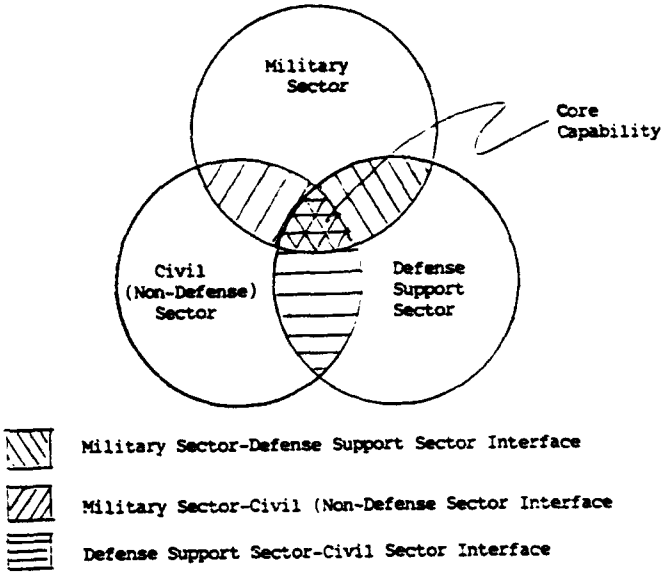


Figure 6. System Integration

Civil (Non-Defense) Sector-Defense Support Sector Interface

Our resource allocation taxonomy (Figure 5) shows, as threats recede and defense spending declines, resources are reallocated from defense to the civil sector. In reaction to reduced defense spending, the defense industrial base is shrinking and consolidating. Current production capacity at the prime contractor level exceeds both peacetime production requirements and most expected surge requirements.[25] Diversified companies are seeking to leave the defense business. Defense-dependent companies seek to consolidate their position through vertical integration and merger to sustain a "critical mass" within their sector. As a result, second-tier subcontractors and third-tier suppliers are vanishing from defense business.

Congress' Office of Technology Assessment lists the following trends in the current defense industrial base:[26]

- Extensive but declining R&D capability
- Continuing surplus production capacity at the prime contractor level
- Declining number of subtier suppliers
- Limited access to civilian technology
- Increasing costs of production

- Consolidating maintenance and repair capability
- Increasing globalization in all three tiers of the base.

Also,the defense support sector is highly segregated from the civil/commercial sector. This segregation has resulted in two discrete economies: a defense economy and a non-defense economy. Evidence of this segregation includes:

- Defense products are designed, developed, produced, and supported separately in isolated plants or independent divisions of diversified companies. Other companies simply rely on defense business.
- Many companies either maintain separate research facilities for defense and commercial research and development or refuse to accept DoD contracts.
- Most firms create separate engineering and production facilities for military work--a process that duplicates billions of dollars in capital and labor investments in the commercial sector.[27]

As a consequence of these trends and segregation, some experts question the ability of the current defense support sector to meet the nation's fundamental security needs. A small production base limits surge capability and increases reliance on foreign sources. Limited access to civilian technology means lack of access to state-of-the-art product and process technologies--increasingly developed by the commercial sector. High production cost means fewer systems procured. Finally, segregation of the industrial bases limits economic strength and growth by splitting the nation's pool of human talent and capital resources.[28]

Integration of the sectors offers many advantages. Many industries could employ the same technologies, personnel, administrative procedures, research and production facilities for both commercial and military customers. Integration would expand the industrial base available for defense production while removing dependence on DoD for survival. It could lead to greater economies of scale and scope; thereby lowering costs while improving the quality of defense products.[29]

However, there are significant barriers to integration which must be dealt with, both for firms trying to enter the defense market and for firms trying to diversify out of the defense market. Entrance barriers include: a unique environment; high capital investments; "brand loyalty" by the Services; the need for high levels of engineering and scientific capability; the need for large cash reserves; specialized report writing requirements (accounting, management reports, inspection, etc.); required knowledge of detailed federal regulations; security clearances; and political considerations. Exit barriers include: government sponsorship of R&D; the large overhead required for defense work; the specialized nature of the capital equipment; the government's tendency to accept "low bids" (allowing a firm to stay in business even when it is not truly competitive); specialization of labor; specialized nature of the marketing force which is incompatible with the commercial marketplace; unique corporate culture.[30]

Clearly, to enhance integration and allow market forces to operate more effectively, these barriers to entry and exit must be greatly reduced. Most of these barriers are cultural in nature and will require long-term attention to eliminate. Other barriers can be eliminated through changes in government regulations, specifications, and laws. The promotion of dual-use technologies could help relieve some of the barriers to diversification.

Defense Support Sector-Military Sector Interface

The interface of the defense support sector and the military sector is largely the realm of defense acquisition. The key concern for this interface is how to acquire needed defense capability with a shrinking budget. This includes quantities of affordable equipment, access to and rapid fielding of cutting-edge technologies, and the ability to expand selected production significantly when crisis conditions warrant.

Defense acquisition is an enormously complex process driven as much by politics as by rational procedure. Players in the process include Congress (appropriations and acquisition laws), DoD (requirements and acquisition

management), and industry (producer)--sometimes referred to as the "iron triangle." There are three major decisionmaking systems supporting the acquisition process. These are the requirements generating system, the acquisition management system, and the planning, programming, and budgeting system (PPBS). The integrated management framework includes the complex relationships among these three systems. All three systems operate in a highly politicized environment.[31]

There are scores of studies and reports pointing out the ills in defense acquisition with at least some consistency in suggested remedies.[32] Efforts to reform weapons acquisition, with their focus on making the system more rational, have largely overlooked the political system in which the process is embedded. Appropriations for defense represent the largest discretionary item in the federal budget--they can be continuously tampered with by Congress.[33] Defense procurement represents 44 percent of the defense budget. In addition a significant amount of operations and maintenance funding (30% of total budget) goes toward the purchase of consumables.[34] Defense spending has a big impact on regional economies and defense communities. As a result, most people in Congress have a vested interest in seeing at least a portion of the defense budget appropriated.

In addition to "pork barrel politics," the defense acquisition system has been plagued by scandal, particularly during the years of the Reagan buildup. Many of the allegations of misconduct (on the part of both DoD and industry) were unfounded; some were legitimate. In any case, they have resulted in the proliferation of laws and regulations, oversight mechanisms, excessive hearings, audits, and cost accounting procedures. Pentagon statistics show there are over 22,000 auditors, inspectors, and investigators working for various government agencies that monitor the defense industry.[35] Defense acquisition has become heavily encumbered by unproductive layers of bureaucracy.

Not surprisingly, a Center for Strategic and International Studies (CSIS) report lists the following barriers to improved acquisition:

- Unique government accounting requirements.
- Unique contract requirements which force companies to comply with hundreds of unique clauses affecting decisions on subcontractors, employment practices, etc. This results in firms developing separate administrative structures to handle government contracts.
- Military specifications and standards prevent DoD from having access to many commercial products or advanced technologies.
- Technical data rights are considered by DoD as essential to operating, repairing, and maintaining military equipment. Yet, DoD's emphasis on unlimited rights in technical data makes many companies reluctant to incorporate any commercial technologies into defense items.[36]

To improve the overall acquisition process we must improve long-term strategy and resource planning (PPBS), improve the identification of weapon system needs (requirements generation), and improve the means of controlling acquisition (acquisition management). Aldeman and Augustine offer the following suggestions:[37]

- Turbulence in the defense acquisition management process must be eliminated. This requires budget stability (long-term budget agreement), program stability (don't terminate existing programs with known problems to initiate new programs with unknown problems), and management stability (don't continually reassign managers).
- Follow the dictum that justice consists of everyone doing one's own job--regulations are no substitute.
- The notion that programs can be managed by audit needs to be discarded.
- Realistic contingency planning must be introduced into the management of acquisition--technical problems requiring additional funding are

bound to arise.

- Add new incentives to the process--the monopsony buyer-seller relationship erodes normal marketplace incentives. Consider contract type (cost-reimbursable vs fixed price) and tie opportunity for future business to past performance, not just lowest price.

The objective of acquisition reform must be to foster a productive, long-term producer-client relationship built on teamwork and personal responsibility, not mistrust and command-and-control bureaucracy.

Military Sector-Civil (Non-Defense) Sector Interface

The interface of the military and civil sectors for defense conversion is concerned with the transfer of excess DoD resources into the civil sector. Thus, concerns at this interface include worker transition and reutilization of defense assets such as bases, plant, equipment, and technology. Also, there is a flow of resources from the civil sector to the military sector. This flow into defense includes recruits, newly commissioned officers through civilian universities, hiring of DoD civilians, and the acquisition of standard, commercial products.

There are two important performance aspects to this interface: worker/community transition and technology transfer from federal laboratories. DoD plans to reduce active duty end strength from 2.1 million in 1987 to 1.6 million in 1997. The Clinton Administration is now proposing a further cut to 1.4 million by 1997. Selected Reserve will be reduced from 1.2 million in 1987 to 0.9 million in 1997. DoD civilian employment will be reduced from about 1.1 million in 1987 to about 0.9 million in 1997. Further, the Defense Conversion Commission estimated as many as 960,000 defense support sector jobs could be lost between 1991 and 1997 as a result of the defense drawdowns.[36]

In studying the issue of worker transition, the Defense Conversion Commission found that government assistance programs for military personnel and DoD civilian employees was generally adequate. However, assistance programs for dislocated defense support sector workers needs to be

strengthened considerably. Many current government programs for dislocated workers, such as unemployment insurance are oriented toward assistance for those temporarily laid off rather than for those faced with permanent employment changes.[39]

DoD has been very successful in fostering integrated community planning as part of the process of closing and realigning military bases. The Office of Economic Adjustment has earned a respected reputation for helping communities affected by base closures to develop integrated plans. The Department of Commerce's Economic Development Administration (EDA) appears to be in an ideal situation to assume a more dominant role in promoting and supporting integrated planning for communities affected by economic dislocation caused by defense cuts but not related to base closure activities.[40]

Beyond worker and community transition, government should foster the transfer of promising technologies out of the federal laboratories into the commercial sector. Providing universal access for commercial enterprises to this information could help expedite the commercialization of technologies and manufacturing processes. Another idea gaining momentum is the establishment of manufacturing extension centers (similar to USDA extension services) to promote commercialization of technologies/processes.

Integration Summary

Improving integration at the sector interfaces will help achieve the defense conversion goals of preserving defense capability and promoting long-term economic growth. There are many barriers to integration that need to be addresses. The following table summarizes appropriate actions at each interface:

Interface	Action
Military-Defense Support	Acquisition reform (PPBS, Requirements Generation, Acquisition Management)
Defense Support-Civil	Reduce government regulation Promote dual-use technologies Flexible manufacturing processes Worker transition
Military-Civil	Worker/Community Transition Technology transfer

INTERNAL EFFECTIVENESS

Another way to improve system performance is to improve the internal effectiveness and efficiency of the various sectors. This may not impact the effectiveness of the system in maintaining a viable defense capability. However, it should result in the more efficent use of resources, thus releasing additional excess capacity for application in the civilian economy or providing surge capacity for crises.

To measure effectiveness and efficiency we must be able to measure the outputs of system elements in terms of their contribution to the system goals. Direct measurement is for the most part impractical, if not impossible. In these cases, effectiveness is often expressed as a performance parameter or characteristic which is representative of a system's ability to perform its intended function. Thus, another way to improve effectiveness is to describe desired characteristics which represent effective performance, then take actions to achieve these characteristics.

The Congress' Office of Technology Assessment in their publication Redesigning Defense has outlined desirable characteristics for the military sector and the defense industrial base. These desired characteristics are listed below:

Characteristics of Future U.S. Forces[41]

- Smaller active and ready reserve forces.
- Less forward basing, greater strategic mobility.
- Continuing weapons performance advantage.
- Substantial nuclear capability.
- Chemical and biological defense capabilities.
- Greater dependence on mobilization.

Characteristics of the Defense Industrial Base[42]

- Advanced research and development capability.
- Ready access to civilian technology.
- Continuous design and prototyping capability.
- Limited, efficient peacetime engineering and production capabilities in key defense sectors.
- Responsive production of ammunition, spares and consumables for theater conflict.
- Robust maintenance and overhaul capability.
- Good, integrated management.

Characteristics of the Civil (Non-Defense) Sector

Improvising from our previous discussions on factors that facilitate conversion, we can develop a similar list of desired characteristics for the civil (non-defense) sector:

- Robust economic growth.
- Healthy, mobilizable civilian production capability.
- Skilled workforce (compatible with defense production needs).
- An integrated industrial base (flexible manufacturing systems).
- Technological capatibility with the defense industrial base.

To improve system performance, government should foster actions that contribute to achieving these desired characteristics for each of the sectors involved in defense conversion.

OPERATING ENVIRONMENT--THE POLITICAL ECONOMY OF DEFENSE CONVERSION

Defense conversion is a resource allocation process. Figure 5 outlines the choices for resource allocation decisions. The objective of these decisions should be to distribute resources in a manner which will promote economic growth. These decisions are influenced by the political and economic dimensions of the operating environment. We will briefly discuss the political economy of defense conversion by looking at the economic impacts of defense spending, the distribution of defense work, and the decisionmaking process.

Economic Impact

From a macroeconomic perspective, the present defense reduction is the smallest and most gradual of the past half-century (Table 1).

Defense Spending as a Percent of Gross Domestic Product

Era	Peak		Low Point		Difference		Average Change Per Year (Percentage)
	Year	GDP %	Year	GDP %	Years	GDP %	
WW II	1944	39.3	1948	3.7	4	35.6	8.90
Korea	1953	14.5	1956	10.2	3	4.3	1.43
Vietnam	1968	9.6	1978	4.8	10	4.8	0.48
Current	1986	6.5	1997	3.6	11	2.9	0.26

Table 1. Comparison of Previous and Current Defense Drawdowns[43]

However, the effects of the drawdown are more pronounced in certain regions, states, and localities.

Distribution of Defense Work

The effects of reduced defense purchases will be concentrated in certain states. The Defense Conversion Commission estimated that ten states will account for about 60 percent of the estimated 960,000 defense-related jobs lost from 1991 to 1997 as a result of reduced defense spending.[44] The top ten

states for jobs lost in descending order are California, New York, Texas, Virginia, Massachusetts, Pennsylvania, Ohio, Florida, Connecticut, and New Jersey.[45]

If you rank states by the largest percentage of total jobs lost due to defense spending cuts, the results are somewhat different. The top ten states in descending order is Connecticut, Virginia, Massachusetts, Mississippi, California, Maine, New Hampshire, Arizona, Washington, and Maryland.[46] The exact figures for each of the states for both number of jobs lost and percentage of jobs lost are included in the tables of Appendix 2.

As a whole, defense dependence has steadily declined even in states that are most involved with defense industries and military bases. As an example, defense spending in California dropped from 15.6% of gross State product in 1964 to 7.8% in 1990.[47] These statewide averages of defense dependence can obscure local vulnerabilities.

Decisionmaking Process

The point is that the choice of policy options will inevitably be influenced by politics. Congressmen will welcome interventionists policies which offer prospects of large discretionary budgets. Powerful industry lobbies will provide economic justification for federal support to protect jobs and maintain viable teams of scientists, engineers, and highly skilled technicians--needed to "maintain a viable defense industrial base."

Decisionmaking in this environment will be governed as much by politics as by national security needs. This political environment is shown in Figure 7 below. Clearly, defense conversion will involve winners and losers. The winners are likely to be widely dispersed throughout the nation, whereas losers will be concentrated in specific industries, firms, and localities. The challenge for public policy will be to minimize the short-term effects to potential losers through regionally-targeted worker transition programs, while maximizing the long-term economic benefit to be gained from the resources released from defense.

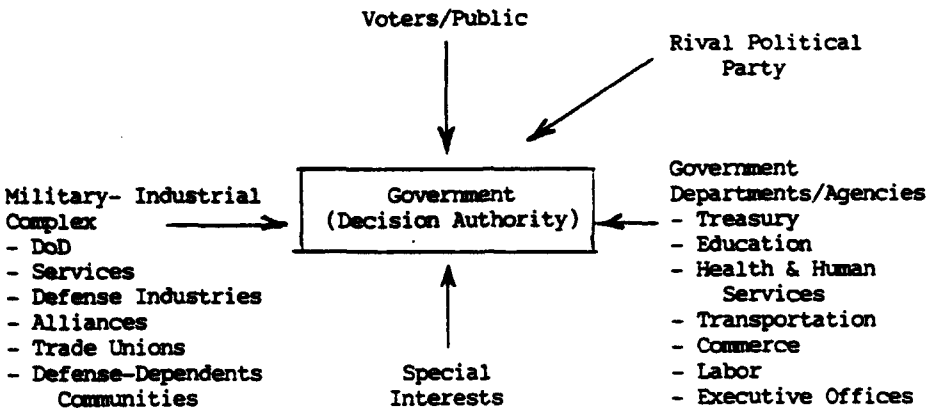


Figure 7. Decisionmaking Process[46]

PERFORMANCE SUMMARY

The success of the defense conversion process will be measured by how well we meet the dual goals of maintaining a viable defense capability (with drastically reduced budgets) and promoting long-term economic growth with the resources released from defense purposes. The defense conversion system involves three sectors: the civil (non-defense) sector, the defense support sector, and the military sector. Improving integration at the sector interfaces--by removing barriers to integration--will help achieve conversion goals. In addition, we can improve system effectiveness and efficiency by striving to achieve desired characteristics within each of the sectors. Finally, we must recognize the political nature of the operating environment and take appropriate actions to minimize adverse impacts of the political economy of conversion on performance.

V. POLICY IMPLICATIONS

As previously mentioned, the defense conversion process involves the reallocation of resources from defense-related purposes to other economic activity. Most reallocation decisions involve the federal government in some way. This decisionmaking environment is highly politicized. The question becomes, what is the appropriate role for government in the defense conversion process?

LAISSEZ FAIRE OR CENTRAL CONTROL?

The two extremes in approach to the redistribution of resources are to let "market forces" determine the allocation (laissez faire) or to have the federal government centrally control the allocation (Soviet-style approach). Our discussion of system performance makes it clear that a totally hands-off approach is inappropriate. This approach would not address the many barriers to the free flow of resources among the various sectors and would not ensure a viable defense industrial base.

Realistically, laissez faire does not apply to defense conversion. The federal government determines the national security threat facing the nation, decides what forces are needed to counter the threat (or to maintain capabilities), determines the amount of money to be spent on defense, exercises monopsony power in a regulated defense economy, and controls arms exports. The government is involved and responsible for many resource allocation decisions. However, it is equally inappropriate for the federal government to centrally control the redistribution of all resources from defense to the commercial economy. In most situations, free-market allocations lead to the most efficient outcome for society. Government intervention is appropriate only when structural deficiencies lead to inefficient outcomes, or when the transition to market-determined outcomes would take too long. We must determine the appropriate middle ground.

DEFINING THE MIDDLE GROUND

Government's first responsibility is to ensure we retain a viable defense capability. The development of a new national defense strategy is an important step. Beyond this, the government must clearly articulate a rational, capability-based statement of defense needs. This will provide the planning, programming, and budgeting stability needed in today's environment. The other aspect of this objective is to maintain a viable defense industrial base capable of supporting the base force in peacetime; capable of supporting planned needs during contingencies; capable of providing production capacity to combat any emerging global threat; and be efficient and effective.[49]

Our discussion of system performance provides some directions for the appropriate role of government. It is government's role to create the proper fiscal, statutory, and regulatory environment to promote system integration. Deregulation must be a key element of reform. Government must recognize that there is no free defense market. Unlike a free market, the defense market is characterized by a monopsony buyer and regulation of the economy. It is characterized by unique suppliers of essential defense equipment, not the variety of suppliers typically found in a free market. This suggests that greater efficiency and effectiveness can be achieved by removing the barriers to integrating the defense and commercial industry sectors.

POLICY OPTIONS FOR A VIABLE DEFENSE CAPABILITY

Policy options include the fostering of dual-use technologies, encouraging flexible manufacturing techniques, which allow a company to produce efficiently at low volumes as well as high volumes. This would also allow firms to produce several similar products in the same plant, rather than dedicating a plant to a single product. Federal laboratories should be encouraged to transfer promising technologies to the commercial sector. Manufacturing extension centers can help promulgate leading-edge manufacturing processes. All these actions will improve integration and, in effect, expand the defense industrial base with low direct cost to the government and minimal

impact on defense spending.

Clearly, integration does not have universal applicability. There are some technologies or systems that have no commercial equivalent and must be maintained. Government must accept the fact that some major firms will go out of business and that further restructuring of the defense industrial base will occur. If there are some capabilities which must be maintained, such as stealth technology or nuclear submarine capability, and the private sector cannot sustain the capability without subsidy, we should seriously consider diverting the residual capability to a national laboratory/arsenal. At the same time, much of the R&D, production processes, materials, components, and even subsystems that make up these defense-unique products are not themselves unique to defense.

POLICY OPTIONS FOR PROMOTING LONG-TERM ECONOMIC GROWTH

Beyond maintaining defense capability, the government must determine its role in reallocating resources toward economic growth. Government policy to maintain economic growth and investment has five general instruments at its disposal:

(1) tax policy, especially general tax cuts and targeted tax incentives

(2) monetary policy, specifically, lower interest rates

(3) increased government purchases of non-defense items

(4) increased transfer payments and adjustment assistance to displaced workers and industry, and

(5) export promotion policies.[50]

Our discussion of resource allocation suggests that, to promote long-term economic growth, government policies should direct resources to regenerative activities. The free movement of capital and labor in response to new profit opportunities and wage differentials increases growth. Government allocation of investment that ignores market signals usually stunts growth by diverting labor and capital from more productive uses. This argument suggests that to foster economic growth, the primary focus of

government policy should be to strengthen the natural forces of the commercial economy by reducing the burdens and disincentives of government laws. We must increase the rate of capital formulation by raising the rate of saving. One way to do this effectively is to apply "defense savings" to the reduction of the federal deficit.

In general, reduction of the federal deficit is the best way to improve the nation's savings and investment rate. Large deficits are significantly harming our future growth prospects--they have been a major contributor to the fall in national saving and investment.[51] However, there are other options that have a regenerative effect on the economy. Four potential areas frequently cited for increased federal investment include: investment in physical infrastructure, education, civilian research and development, and health insurance for more than 30 million uninsured Americans.[52] All these actions would be appropriate to the extent the social benefits exceed the private benefits of these investments.

In addition, government has some social responsibility to ease the economic adjustment for workers and communities affected by structural changes in the civilian economy and by the declines in defense spending. Employment declines from the defense drawdown have created serious problems because of regional concentrations of job losses. These job losses are similar to the structural change occurring in the commercial economy in various regions/localities. Geographic immobility together with depressed local economies is the source of special distress associated with this economic adjustment.

Programs to ease adjustment should be designed to address both displaced defense workers and displaced commercial industry workers hit by permanent job loss. These programs should be targeted regionally. The fragmented, disjointed structure of current assistance programs needs to be eliminated. Integrating community assistance programs, increasing their flexibility, and enhancing local authority and accountability should lead to more timely and effective help for communities.

WHAT GOVERNMENT POLICY SHOULD NOT DO

Our systems analysis also points to some things government policy should not do. Beyond worker adjustment, there will be much political pressure to increase federal spending in areas with no regenerative effect on the economy. Government should not use conversion policy to halt the decline of basic industries (not deemed vital to national security) or to artificially support excess defense capacity. Neither military, nor economic security would be promoted by having an industry sector composed of many weak and inefficient firms. Industrial Darwinism should be allowed to evolve to the point where it does not impact critical defense capabilities. Protecting uncompetitive industry is a burden on the economy and a threat to long-term prosperity.

SUMMARY OF POLICY IMPLICATIONS

In summary, the government has many policy options available. To meet the goals of defense conversion, government should take actions designed to improve system integration and to increase investment and savings. Government also has a social responsibility to assist displaced workers and affected communities in a way that facilitates local initiative. Maintaining a viable defense industrial base and promoting economic growth is possible without increased federal spending to subsidize declining industries. Deregulation, incentives, and removal of significant barriers to system integration are important parts of this equation.

VI. CONCLUSIONS

Defense conversion can be viewed from three levels: production, organizational, or systems. The only view applicable in today's environment is the systems view. At the systems level conversion is defined as the process by which people, skills, technology, equipment, and facilities in defense- related activities are shifted into alternative economic

applications. In this regard, conversion involves the interactions and interrelations of three activities: the civil (non-defense) sector, the defense support sector (sometimes called the defense industrial base), and the military sector (DoD and the Services).

A systems framework is useful in analyzing the interactions of the three sectors involved in defense conversion. System performance (the success of conversion efforts) must be measured against two, sometimes conflicting goals. The first goal is to maintain needed defense capability, including the viability of the defense industrial base, with lower defense spending. The secondary goal is to utilize excess resources from defense in a manner that promotes long-term economic growth.

Systems analysis indicates that performance can be enhanced by improving the integration at the three sector interfaces. These interfaces form the core capability of the system which varies according to the degree of integration. To improve integration we must endeavor to remove barriers to the flow of resources at these interfaces. Another way to enhance performance is to describe desired characteristics for each of the sectors which is representative of effective performance, then take actions to develop these characteristics.

Defense conversion involves many resource allocation decisions which are highly politicized. Defense spending is highly concentrated in various regions and localities. The decisionmaking process is governed as much by politics as by national security needs. The challenge for public policy is to minimize the short-term effects to potential losers in the conversion process while maximizing the long-term benefit to be gained by all from the resources released from defense.

Public policy can take two extremes in approach to conversion: a laissez faire approach or central control by the federal government. Neither extreme serves the best interest of the public. The appropriate role for government is to create the proper fiscal, statutory, and regulatory environment to incentivize the integration at the three system interfaces. To enhance long-

term growth, policy should direct excess defense resources to regenerative activities, primarily investment and savings. Resources should be applied to deficit reduction, public infrastructure (such as physical infrastructure, education, civilian R&D, and health insurance), and worker/community transition assistance. Deficit reduction should receive priority.

Policy should not attempt to halt the decline of basic industries or to artificially support excess defense capacity. This would not promote economic growth and would only delay the necessary restructuring of these industries. Meeting the goals of defense conversion is possible without increased federal spending. The key is to facilitate the transfer of resources through appropriate incentives.

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19. The basic model of the national economy was developed on the basis of work done by Henry E. Eccles in his book, Logistics in the National Defense. Eccles developed the concept of "Logistics - The Bridge Between the Economic System and Combat Forces." His discussion of the economic system forms the basis for the national economy model included in this paper.

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Appendix 1

BASIC SYSTEM CONCEPTS [53]

SYSTEM MODEL

To assist in comprehending the definition and major features of systems, we can use a basic system model. A model normally found in the systems literature is shown in Figure 8.

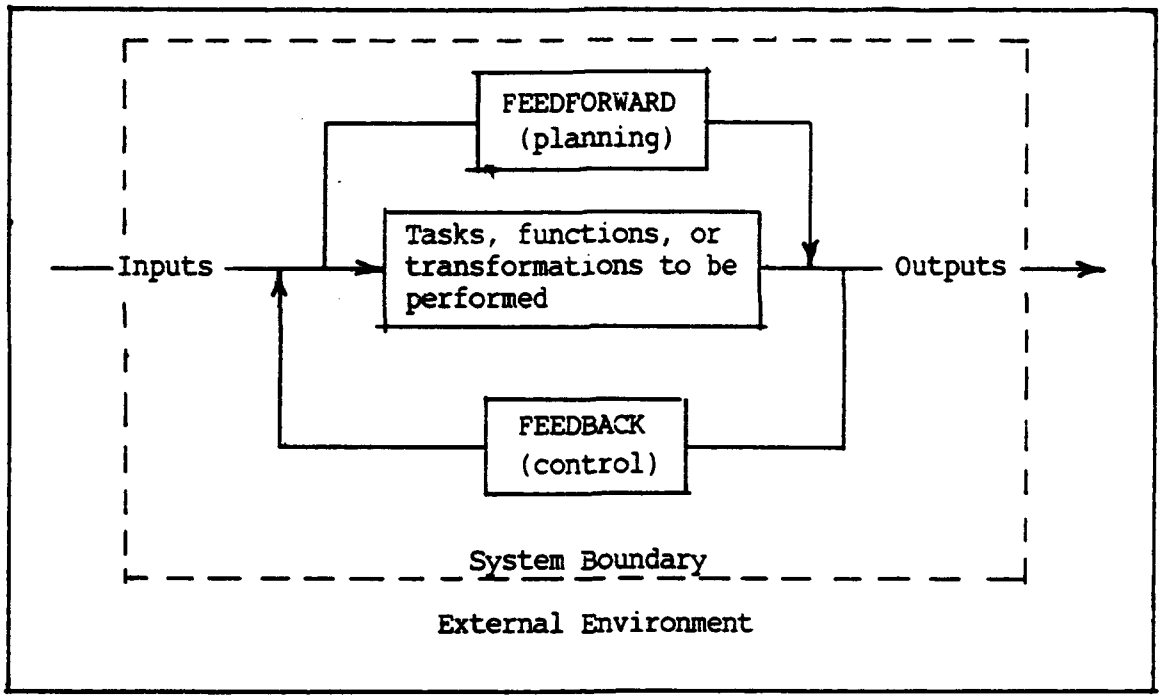

Figure 8. Basic System Model.

SYSTEM ELEMENTS

Using this model, we can describe each of the elements:

Inputs: Inputs to a system include such things as manpower, materiel, raw data, and energy. In general, an input is anything a system needs to transform or process to produce the desired output.

Process: The process accomplishes some functional transformation of the inputs to produce the desired output.

Outputs: The purpose of any system is to produce a desired output. Without generating outputs the system has no function. Unless the output is useful, the system is not useful.

Feedback/Control: If systems were perfect and all inputs were known and controllable, all processes known and intended, and no selection and distortion took place, then all outputs would be known and anticipated. However, no system is perfect; all systems need to look at their actual outputs and compare them with intended outputs. This comparison is accomplished through feedback loops.

Feedforward/Planning: All systems should look into the future to anticipate the output of adjustments in inputs or processes. Feedforward loops provide a mechanism for evaluating current policies and procedures in light of forecasts of future operating environments and current operations.

System Boundary: To limit the scope of a system we must specify its boundaries. This is normally done while specifying the mission or purpose of a system. Everything that remains outside the boundaries of the system is considered to be the environment. However, no system is completely isolated from its environment. Materiel, energy, and information must often pass through the boundary as input to the system. Similarly, the output of the system passes to the environment.

Environment: The environment is important to the system in two ways. First, it is the primary source of system requirements and constraints in satisfying those requirements. Second, it is the operating medium for the system.

SYSTEM PERFORMANCE

Now that we understand the elements of a system, we can discuss basic concepts of system performance: load, effectiveness, and efficiency.

Load

The load on a system is the sum of all outputs at a given time. The magnitude of load is a function of the operating level and system design. The operating level includes the rate of use, the environment of use, and the nature of use. Rate can be expressed in such terms as hours per day, miles per day, etc. The environment of use includes such things as climate and geography. Nature refers to the intensity of the operation such as peace or war. System design affects load in the sense that the system consumes resources in the process of transforming inputs to outputs. Thus, load also consists of resources consumed per unit of operation.

Effectiveness

To be effective a system must be capable of sustaining the load. To the extent that it will not sustain the load for any reason, we would say the system is ineffective. Thus, effectiveness is the ratio of system load to system capacity with an upper bound of one or 100%. If capacity equals load, the system is 100% effective. If load increases beyond capacity, the effectiveness decreases proportionately. If capacity is greater than the load, then the system is still only 100% effective.

Efficiency

The efficiency of a system is the output divided by the input (as long as they are expressed in common terms). To improve efficiency, we must improve processes internal to the system. In a system with extensive interaction with the operating environment inputs and outputs are dynamic. Thus, the efficiency of the system is dynamic. Therefore, efficiency should be specified over a period of time or under a given operational scenario; further, efficiency can be stated in terms of an average value or a point value for the worst case scenario. Thus, system efficiency (as well as effectiveness) is highly dependent on the operating environment, which may or may not be controllable.

This appendix has provided the ground work for those not familiar with basic system concepts. Understanding these concepts is critical to understanding the "conceptual framework" proposed in this study.

[53]Benjamin S. Blanchard and Walter J. Fabrycky. Systems Engineering and Analysis, Englewood Cliffs, NJ: Prentice-Hall, 1981.

Appendix 2

EFFECTS OF DEFENSE DRAWDOWN ON STATES

As stated in the text, defense-related work is concentrated in certain states. The Defense Conversion Commission estimated that 10 states will account for about 60 percent of the estimated 960,000 defense-related jobs to be lost from 1991 to 1997. This is summarized in Table 2. below.

States with the Largest Estimated Number of Private-Sector Job Losses Due to the Defense Drawdown, 1991 to 1997

State	Thousands of Jobs Lost	Jobs Lost as a Percentage of Total Jobs Lost Nationwide	Cumulative Percentage of Total
California	178	19	19
New York	62	6	25
Texas	56	6	31
Virginia	47	5	36
Massachusetts	46	5	41
Pennsylvania	38	4	45
Ohio	38	4	49
Florida	38	4	53
Connecticut	37	4	57
New Jersey	30	3	60
Total for Top 10	**570**	**60**	**60**
Total for Job Losses	**958**	**100**	**100**

Source: Logistics Management Institute. *Impacts of Defense Spending Cuts on Industry Sectors, Occupational Groups, and Localities.* January 1993.

Note: Job losses represent one-time dislocations and do not reflect the economy's ability to absorb dislocated workers.

Table 2. Top Ten States for Numbers of Jobs Lost[54]

The number of jobs lost may not be the best descriptor of impact on various states. Perhaps a better indicator of state impact would be the percentage of total jobs lost due to defense spending cuts. These figures are shown in Table 3 below.

States with the Largest Estimated Percentage of Private-Sector Job Losses Due to the Defense Drawdown, 1991 to 1997

	1991 Total Number of Nonfarm Private-Sector Jobs in State (thousands)	Number of Those Jobs Attributable to DoD Purchases (thousands)	Share of Those Jobs Attributable to DoD Purchases (percent)	Rank Among States	Estimated Job Losses Resulting from Reductions in Defense Purchases, 1991 to 1997 (thousands)	These Losses as a Share of 1991 Total Nonfarm Private-Sector Jobs in State (percent)	Rank Among States
Connecticut	1,349	113	8.3	1	37	2.8	1
Virginia	2,250	166	7.4	2	47	2.1	2
Massachusetts	2,433	159	6.5	3	46	1.9	3
Mississippi	733	38	5.2	6	13	1.8	4
California	10,418	585	5.6	4	178	1.7	5
Maine	417	16	3.9	16	6	1.5	6
New Hampshire	409	18	4.4	13	6	1.5	7
Arizona	1,226	58	4.8	9	17	1.4	8
Washington	1,759	79	4.5	11	24	1.4	9
Maryland	1,682	93	5.5	5	23	1.3	10
Missouri	1,924	94	4.9	8	26	1.3	11
Vermont	205	7	3.6	17	3	1.3	12

Source: Logistics Management Institute. *Impacts of Defense Spending Cuts on Industry Sectors, Occupational Groups, and Localities.* January 1993.

Note: Job losses represent one-time dislocations and do not reflect the economy's ability to absorb dislocated workers. Estimates of jobs and percentages have been rounded.

Table 3. Top States for Percentage of Jobs Lost[55]

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[54] DoD Defense Conversion Commission Report, p. 42.

[55] Ibid.