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REPORT
OF THE
DEFENSE SCIENCE BOARD
SUMMER STUDY
TASK FORCE
ON
DEFENSE MANUFACTURING
ENTERPRISE STRATEGY

SEPTEMBER 1993



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

September 30, 1993

DEFENSE SCIENCE
BOARD

MEMORANDUM FOR UNDERSECRETARY OF DEFENSE (ACQUISITION)

SUBJECT: Report of the Defense Science Board (DSB) Task Force on Defense Manufacturing Enterprise Strategy

I am pleased to forward the final report of the DSB Summer Study on Defense Manufacturing Enterprise Strategy, which was co-chaired by Mr. Ed Biggers and Mr. Gordon England. The study concentrated on the identification of acquisition and manufacturing processes which, if adopted, could lead both the DoD and industry to a new enterprise approach.

In developing its conclusions and recommendations, the Task Force reviewed numerous past studies which produced well-documented recommendations, few of which were ever implemented. The Task Force strongly believes that only a *revolutionary* enterprise process approach, where the focus is shifted to improving the efficiency and effectiveness of the total acquisition system, can provide the DoD leadership with the leverage to exact change. In essence, the report provides guidance on how to insert a continuous improvement, process-oriented culture into the Pentagon and its industrial suppliers.

The report defines the Lean Manufacturing Process and the characteristics of that process, by which the management of a large number of organizations has successfully transitioned to continuous improvement. It also identifies how the DoD is, by its nature, structurally different from most of these organizations, but notes that, in spite of these differences, it can apply enterprise process management, and in many cases, is already doing so.

The report documents the real crisis present in DoD acquisition, resulting from a severely reduced procurement budget and the existence of high fixed overhead, administrative, and support costs. This crisis, and the attendant potential for degraded readiness, can be overcome if DoD adopts the enterprise process approach. A strawman vision is provided for the DoD leadership; however, the Task Force cautions that the leadership needs to develop its own vision to guide the development of a focused strategy.

"How to" recommendations include, as a basis, the use of a DoD Acquisition Policy and Industrial Base Team to be the change agent for incorporating lean manufacturing and enterprise principles within the department itself and as an interface with the Industrial Base. The report also provides suggestions for near-term implementation of process change in several on-going programs. Of note, the Task Force strongly believes that, along with the benefits of process change, the important issue of public trust and accountability can be maintained.

The adoption of a revolutionary philosophy for DoD to focus on process improvement through enterprise management is the pillar of this report. I concur with the findings of the Task Force, and recommend that you forward the report to the Secretary of Defense.

Paul A. Kaminski

Paul G. Kaminski
Chairman



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

DEFENSE SCIENCE
BOARD

September 29, 1993

MEMORANDUM FOR CHAIRMAN, DEFENSE SCIENCE BOARD

SUBJECT: Report of the Defense Science Board (DSB) Task Force on Defense Manufacturing Enterprise Strategy

Attached is the final report of the DSB Summer Study on Defense Manufacturing Enterprise Strategy. The Terms of Reference asked us to identify those lean acquisition and manufacturing processes which both DoD and industry should adopt to become world class. The Task Force chose what can be regarded as a revolutionary approach to this challenge, i.e., only the option of the enterprise process concept—where the focus is on improving the efficiency and effectiveness of the total acquisition system and its components—can provide the leverage to enact the changes required to maintain national defense capabilities and readiness. Our impetus for this was a review of previous studies, stretching back for decades—all of which had valid recommendations for improving acquisition—but few of which were ever implemented.

The Task Force reviewed lean manufacturing practices and enterprise processes that have proven singularly successful in many organizations in both government and industry. It is these practices and process focus that lead to continuous improvement, and which, in the view of the Task Force, should be promoted throughout the DoD acquisition community. The recommended approach includes:

- Focusing on process improvement.
- Eliminating non-value-added activities.
- Developing long-term and real partnerships.
- Empowering teams.
- Integrating product and process development.


Proven benefits in industry have been lower costs, higher quality, compressed cycle time, production flexibility, and better performance. Although we recognize that the DoD is different from industry, these differences are manageable. The need for process improvement is urgent because the DoD acquisition community is facing a real crisis, resulting from a severely reduced procurement budget and the existence of high fixed overhead, administrative, and support costs. This crisis, which can only result in reduced readiness, can be tempered if DoD adopts the enterprise process approach.

Our recommendations concentrate on the formation of an Acquisition Policy and Industrial Base Teams as the change agent to:

- State and communicate the vision of the enterprise.
- Adopt *process focus* within DoD and the supporting industrial base.
- Facilitate the process of change.
- Harmonize the change through the involvement of other stakeholders, e.g., the Congress.

We believe the adoption of an enterprise process approach to defense acquisition is absolutely necessary; we are convinced that public trust and accountability can be maintained while undergoing these needed changes.


Edwin L. Biggers
Co-Chairman
Attachment


Gordon R. England
Co-Chairman

FOREWORD

The 1993 Defense Science Board (DSB) Summer Study on Defense Manufacturing Strategy was initiated at the request of Undersecretary of Defense for Acquisition (USD(A)) to build on the 1992 DSB study, *Engineering in the Manufacturing Process*. That report focused on Science and Technology (S&T) programs. It recommended management approaches that included integrated product and process development (IPPD) and making best use of commercial products, practices, and capabilities. The study, by direction, did not address major issues associated with the acquisition process.

This year's study was chartered to create a defense manufacturing strategy that would encompass both a lean acquisition process and a lean manufacturing process. Concurrent with the early activities of this effort, a separate DSB task force was initiated on *Defense Acquisition Reform*. To ensure communication across the two efforts and to take advantage of that separate short-term effort (completed in July 1993), there were members common to both task forces.

This Task Force included many representatives from major firms that have implemented the "Lean Manufacturing Process" and have experienced benefits beyond their expectations. It also included DoD members who have had the same experience in their organizations. The concept is simple, straightforward, and implementable, although some recognition must be made of the unique barriers reflected in government legislative civil service constraints. The present crisis associated with the procurement budget squeeze calls for drastic action and a shift in direction. We believe that the process improvement approach of lean manufacturing can work across the DoD manufacturing enterprise, but it will be successful only if the new leadership in DoD provides the vision and example to lead in this new direction.

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EXECUTIVE SUMMARY

INTRODUCTION

Over the past decade, dozens of studies, reports, directives, and commissions have recommended specific changes in the approach the Department of Defense (DoD) uses to acquire products (primarily major weapon systems). This Defense Science Board (DSB) Summer Study Task Force reviewed these prior studies and concluded that, by and large, the recommendations are still valid and more important than ever. Unfortunately, few of these recommendations have been implemented. Rather than adding to the list of "what to do" recommendations, this Task Force concentrated on recommending "how-to-implement" change. This is a departure from the typical technical recommendations, but the Task Force believes this "how to" focus is urgently needed at this juncture.

The Task Force strongly recommends that the DoD adopt the lessons learned from lean manufacturing as the basic management philosophy for the Defense Manufacturing Enterprise (including both the public and private elements). Major industrial firms have taken this radical change in direction to become lean when faced with a crisis of survival. DoD can and should implement a similar "process improvement" lean manufacturing management philosophy. This will require:

- A recognition that the enterprise faces a real crisis
- The personal leadership of the Deputy Secretary of Defense and his top management team
- A training and education process to develop an understanding of the fundamental principles of lean manufacturing
- A long-term commitment and guidance from the Office of the Secretary of Defense (OSD) leadership team to institutionalize the process

It is clear that DoD and industry are quite different in a number of important areas such as personnel policies, customer identity, funding processes, and services; however, this Task Force believes that these differences should not prevent this new process-focused management philosophy from reaping significant benefits.

CRISIS FACING DOD

DoD's procurement budget has declined in constant FY94 dollars by 65% since 1985. Fixed costs and overhead have not dropped as rapidly. Modernization is caught in such a tight financial squeeze (Figure ES-1) that, even with a downsized force, business as usual would allow DoD to replace aircraft, tanks, ships, and other major systems at a rate of less than 2% per year (i.e., replacement once every 50 years). Since procurement budgets are not likely to increase, the Task Force believes that a major change in direction is needed. Otherwise, it is unlikely that DoD will be able to provide and maintain a modern, capable, and well-equipped force. Tough decisions must be faced to cut the infrastructure and administrative costs. New behavior patterns and new processes are crucial to allow a greater portion of the available funds to provide the needed modern products and to maintain readiness.

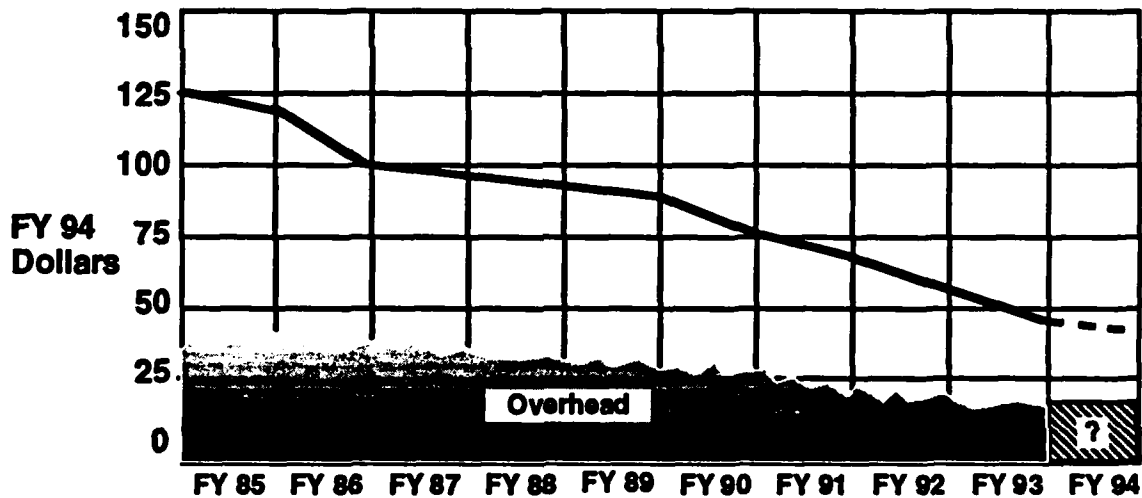


Figure ES-1: Defense Procurement Funding 1985-1994

LEAN DEFENSE MANUFACTURING ENTERPRISE

Lean manufacturing stresses a *focus on process improvement* that encompasses the entire enterprise (from executive suite to the factory floor) and the entire product life cycle (from customer requirements determination, through research and development, to product support and phaseout). Lean manufacturing is not new; it was first introduced in Japan and has been applied successfully in America. The process improvement focus and teaming structure of a lean enterprise has been proven to work. Substantial reductions in design man-hours and span times, assembly hours, job classifications, defects, inventory, and number of suppliers have been achieved.

Lean principles are applicable to the entire organization. In fact, unless the entire organization is involved—from the board room to the shop floor and from the operating commands to the Secretary of Defense—these principles will be ineffective in improving the organization's performance. To emphasize this point, the study team coined the term "Defense Manufacturing Enterprise" to reflect the fact that, for DoD, "board room to shop floor" includes all activities (public and private) required for force modernization, materiel readiness, and support.

The lean manufacturing enterprise employs a dynamic management system characterized by a focus on continuous process improvement (see Figure ES-2). The leadership team establishes a vision and the process team sets stretch goals, measures progress, and benchmarks its processes and performance towards world-class status.

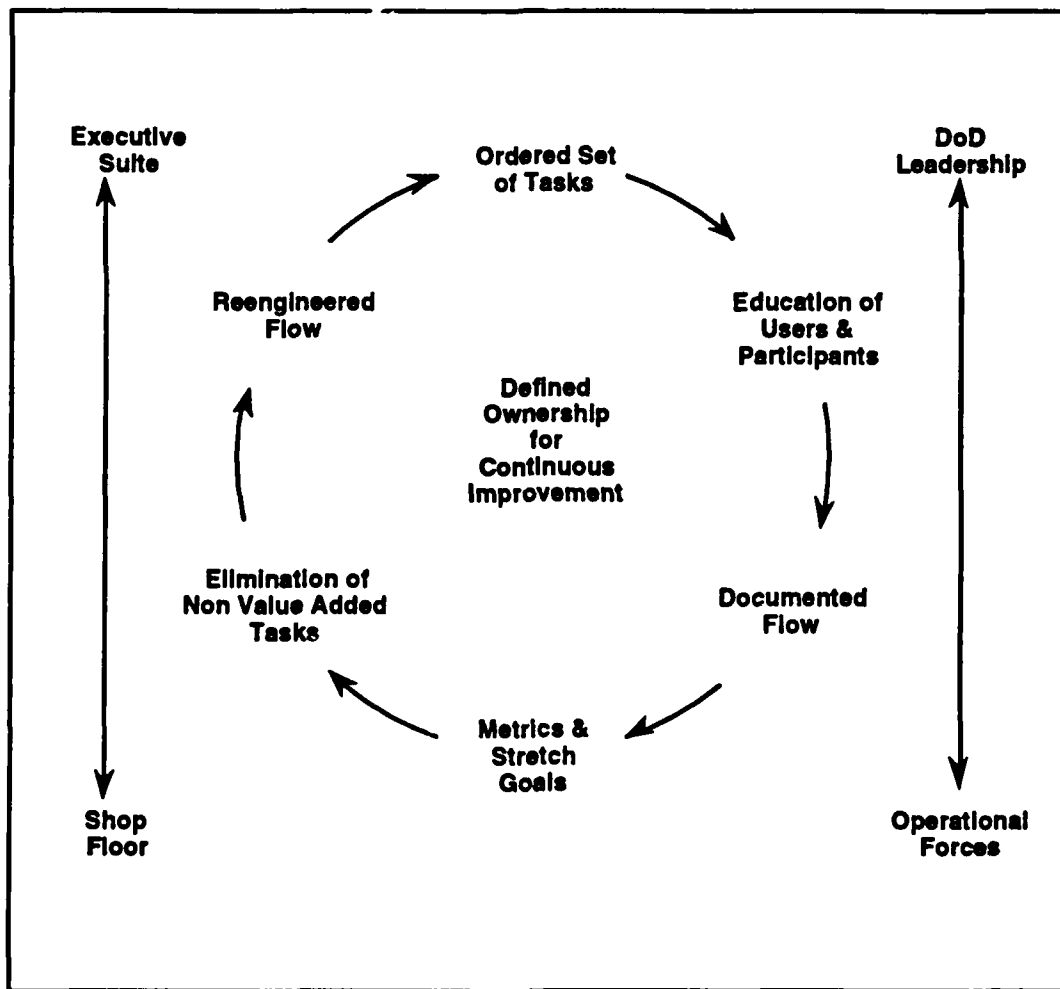


Figure ES-2: Lean Manufacturing Process Improvement Flow

The organizations that have adopted lean manufacturing did not achieve success overnight; it took strong leadership, a clearly articulated strategic plan, and constant focus on value-added processes to move them to improved performance.

The act of becoming "process focused" means that an organization, such as the DoD, needs to concentrate its energies toward improving its processes as a means of improving its products rather than concentrating on the product itself. The critical element in this environment is the understanding that all processes flow from the vision, strategy, and implementation processes established by the senior executive and his/her leadership team.

THE DEFENSE MANUFACTURING ENTERPRISE STRATEGY

The Task Force recommends that the leadership of the Department adopt a bold, enterprising approach to improve processes from top to bottom. In our judgment, nothing less than this will suffice. Using the well-tried concepts and methods of lean manufacturing, the leadership should:

- Begin immediately to achieve a rational streamlining and right-sizing of the defense establishment (public and private) such that the needs of national security continue to be met, even as the defense budget shrinks.
- Create a shared vision of the lean Defense Manufacturing Enterprise and communicate it to all levels of the DoD (see Figure ES-3 for a strawman vision statement).
- Create an Agent of Change to implement the vision.
- Drive the necessary changes by setting priorities for a series of actions guided by an overarching plan. The plan should provide for reducing the DoD overhead burden, rationally downsizing the industrial base, and affecting *ongoing* programs.
- Involve other stakeholders such as the Congress, Office of Management and Budget (OMB), industry, and the users in planning and implementation

Change the spirit of defense acquisition from one of mistrust and risk aversion to confidence in the total enterprise and turn from an inward-looking system to one that fully utilizes the total strength of industry, where processes are continuously improved to reduce cost and improve performance so that U.S. Armed Forces are trained, equipped, and ready to defeat existing or potential threats.

ES-3: Strawman Vision Statement

THE AGENT OF CHANGE

A key element for success will be the creation of an agent to implement process-focused changes throughout the DoD. The Task Force recommends that the Deputy Secretary of Defense (DepSecDef) in partnership with the Undersecretary of Defense for Acquisition (USD(A)) institute a body to be known as the Acquisition Policy and Industrial Base Process Team (APIB) (see Figure ES-4). This team should be chartered as the top-level group to lead the enterprise to develop lean processes and to produce consistent acquisition and industrial base plans for their implementation. The team should be tasked to ensure that:

- The vision of the lean Defense Manufacturing Enterprise is implemented.
- Appropriate policies are developed and promulgated.
- The Industrial Base (public and private) remains capable of serving the broad national security needs of the country.
- Progress towards these goals is facilitated by education and training and measured by appropriate metrics.

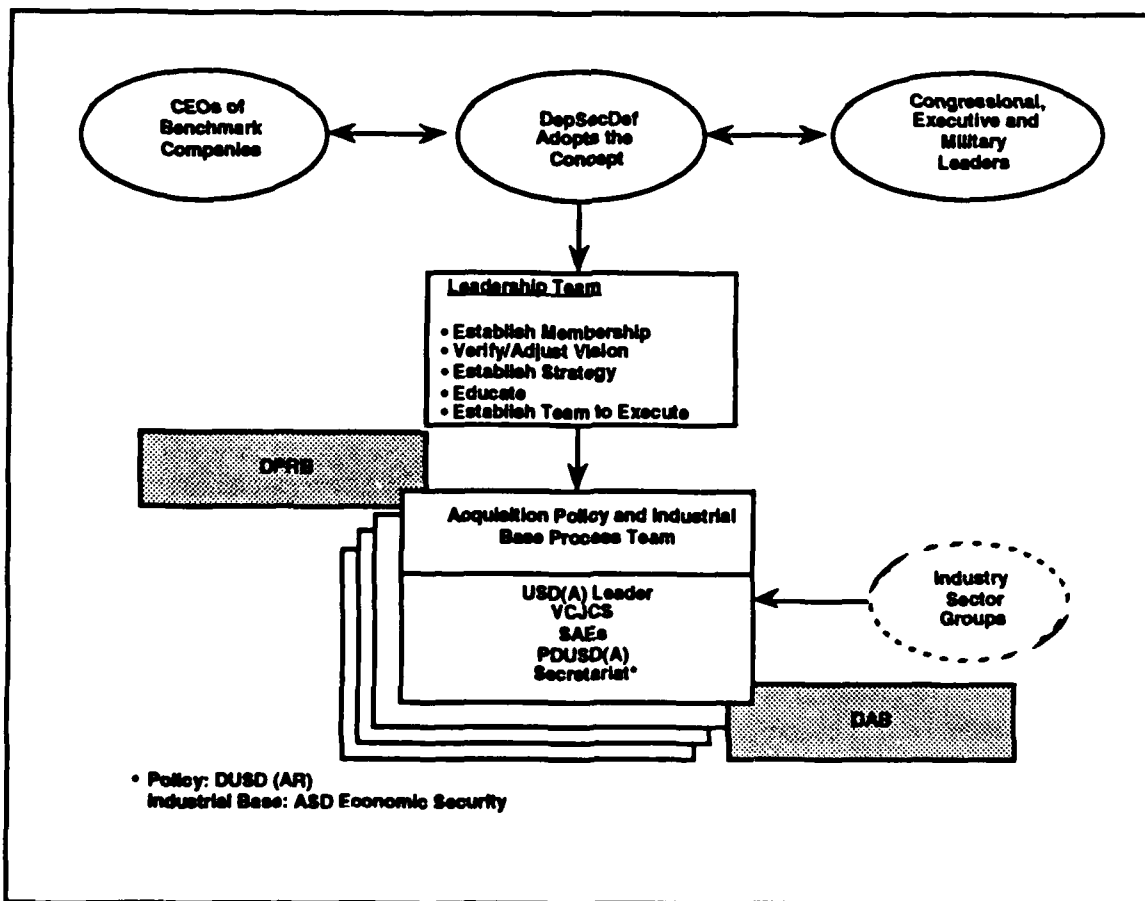


Figure ES-4: The Agent of Change

It is recommended that the USD(A) be team leader, supported by representatives from all areas of DoD. However, we can not over-emphasize the importance of the role of the DepSecDef as the chief proponent of change if the APIB is to be successful. The representatives should include the Principal Deputy Undersecretary of Defense for Acquisition (PDUSD(A)) and the Service Acquisition Executives (SAEs). The SAEs should have line authority for the totality of Service acquisition (including operation and maintenance (O&M) funds associated with industrial operations). The team secretariat should include Deputy Undersecretary of Defense for Acquisition Reform (DUSD(AR)) and the Assistant Secretary of Defense for Economic Security (ASD(ES)). Other areas of the Department may be called upon for support as required. In addition, it will probably be necessary to involve other stakeholders, such as the Congress and industry, in the planning stages of this effort and on an ongoing basis as the team pursues change.

THE AGENDA FOR CHANGE

The process action teams launched by the APIB can start immediately to address the plethora of "what to do" recommendations amassed by prior task forces and commissions. The following recommendations form a start-up agenda that is based on Task Force deliberations and on the review of some 28 prior studies.

Although the Task Force realizes that constraints unique to the DoD may impact the full development of a lean Defense Manufacturing Enterprise, the Task Force none the less believes that the following recommendations can be implemented. It is the responsibility of the process action teams to identify constraints and to pursue the implementation of each recommendation within those constraints. In parallel, the teams should work with OMB and Congress to relax these constraints.

Government/Industry Infrastructure

1. Introduce the concept and practice of Activity Based Costing to identify non-value-added activities that are impediments to the implementation of lean manufacturing.
2. Reduce technical data requirements by making use of performance specifications rather than "build to print." Permit manufacturers to retain configuration control while the government retains control of form, fit, function, and interchangeability.
3. Minimize use of military specifications by, for example, adopting instead the International Organization for Standardization (ISO) quality system standards, the ISO 9000 series.

4. Privatize defense contract auditing by permitting audit to be done through commercial accounting firms. This need not sacrifice any visibility or accountability and would allow costs to be controlled by competition for the business.
5. Eliminate the tracking of government-furnished equipment (GFE) having a real residual fair market value (FMV) less than \$10,000. Permit contractors to buy assets at FMV and/or rent it at a real, commercially determined fair rental value.
6. Request the Base Realignment and Closure (BRAC) Commission to focus specifically on rational downsizing of the public sector of the Defense Manufacturing Enterprise (depots, arsenals, laboratories, Federally Funded Research and Development Centers (FFRDCs), etc.). The overall guidance to the commission should be an affordability target for the total size of the public sector component and an objective to utilize the private sector wherever possible.
7. Establish metrics and stretch goals to stimulate and measure progress toward the vision. At the top level, these might include ratio of DoD/industry personnel in the Defense Manufacturing Enterprise, percentage of defense products manufactured on commercial (dual use) lines, and number of renegotiated contracts and dollars saved.
8. Maintain the trust of the public by relying on competitive pricing where possible; utilizing past excellent performance as a basis for future awards; and ensuring quality of the enterprise by having accounting firms conduct audits. Form a team of stakeholders from DoD, Congress, OMB, and industry to oversee the lean Defense Manufacturing Enterprise as it evolves.
9. Form an Integrated Process Action Team to examine the needs for civilian workforce reduction within the constraints of the Civil Service personnel system, identify the desired process, and recommend an approach for resolving the issue that is consistent with the overall vision of the lean Defense Manufacturing Enterprise.

Technical Process

10. Adopt "turnkey" life cycle support where a single contractor develops, produces, and supports a product or system from its inception until retirement.
11. Adopt integrated product and process development (IPPD) as a management process to facilitate enterprise-wide coordination of all aspects of DoD activity, including the change to a lean Defense Manufacturing Enterprise.
12. Invest in technology for flexible dual-use manufacturing to enable defense products to be made on commercial product lines (and vice versa) with no difference in unit cost. The current Science and Technology (S&T) Strategy for Thrust 7 (Technology for Affordability) work should be harnessed to serve this end.

Incentives

13. Introduce a series of awards for individuals and organizations to recognize contributions towards achieving the lean Defense Manufacturing Enterprise. These awards should be well publicized, substantial, highly regarded, and fairly applied.
14. Devise incentives for contractors to participate enthusiastically in the search for efficiencies and savings in ongoing programs and in new procurements.

Other

15. Apply the concepts of the lean Defense Manufacturing Enterprise to a pilot program in the area of readiness and spares. Using as many of the detailed recommendations as possible, task the Joint Logistics Commanders (JLC) to implement a program to enhance the efficiency of the overall spares procurement and deployment activity. This program does not take the place of the overall program; however, it does provide a means to quickly implement this approach within the enterprise.
16. Education and training in lean manufacturing will be necessary for the entire defense establishment (public and private).

We believe the adoption of an enterprise process approach to defense acquisition is absolutely necessary; we note the many changes which will be required and also that public trust and accountability can be maintained while undergoing these changes.

1. INTRODUCTION

As defense budgets continue to shrink following the end of the Cold War, concern is increasing about how to maintain national security in the fiscally constrained environment of the future. Unless great care is taken, the shrinkage of the massive defense establishment built up over five decades will leave the United States with seriously impaired means of acquiring and modernizing weapon systems.

To address this problem, the Undersecretary of Defense for Acquisition (USD(A)) sponsored two Defense Science Board (DSB) Task Forces in 1993. The first of these was chartered to recommend radical reforms to the defense acquisition process. The second, this Task Force, was tasked to determine how a defense manufacturing strategy could help solve the problem. The Terms of Reference (Task Force charter) and the Task Force membership are documented in Appendices A and B.

In many respects, the obstacles impeding the path to a smaller but viable defense establishment are self-evident: the large superstructure of legislative, audit, and regulatory policies designed for a large defense industrial base; the high burden of regulations, specifications, and accounting practices specifically tailored for defense acquisition; the correspondingly large numbers of personnel (both government and industry) required to make the system work; and the added burden of being largely unable to use more efficient procedures commonly found in commercial industry.

In the judgment of knowledgeable observers, these obstacles could soon absorb most of the available defense acquisition funding, leaving minimal funds for modernization, and readiness would rapidly erode.

The problem has been recognized for years. Various task forces have addressed it and offered solutions—reduce the government infrastructure, reduce technical data requirements, implement concurrent engineering, streamline the system, and adopt commercial practices. These valuable studies and their well-documented recommendations are summarized in Appendices C and D. Only limited success has been achieved in implementing any of these solutions. In the mean time, the severity of the problem has reached the point where action is required and soon. On the positive side, the receptivity of the Department of Defense (DoD) and Congress to make changes has increased, as

witnessed by the recent statements and actions of the DoD leadership. There is hope for real change.

This Task Force has elected not to add to the well documented "what to do" recommendations. Instead, the recommendations of this report are designed to produce real change, by focusing on "how to implement" change. If adopted, these recommendations will provide the defense establishment with a guide to its future so that, in a few years, the residual defense capabilities will continue to meet the needs of national security. This is our intent.

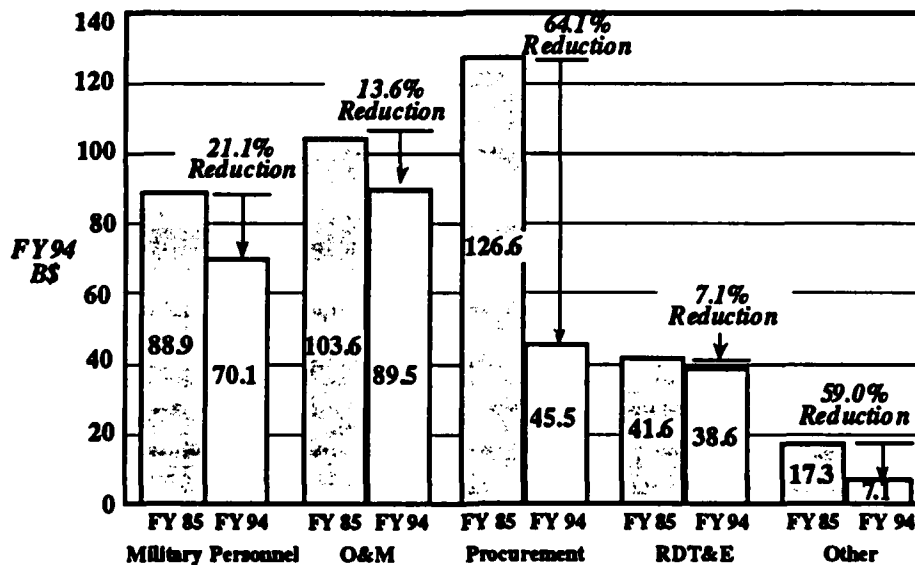
The members of this Task Force have had significant experience with the problems DoD faces and many have direct experience in the recommended approach. The Task Force was structured to include government advisors who cover the spectrum of defense acquisition and who can help implement the approach. All are enthusiastic about the opportunities and concerned about the consequences of failing to make a significant change in direction of the Defense Manufacturing Enterprise.

2. THE CRISIS FACING DOD

The DoD is facing an immediate crisis with significant long-range implications—the modernization of the armed forces is being jeopardized by reduced budgets and high overhead costs.

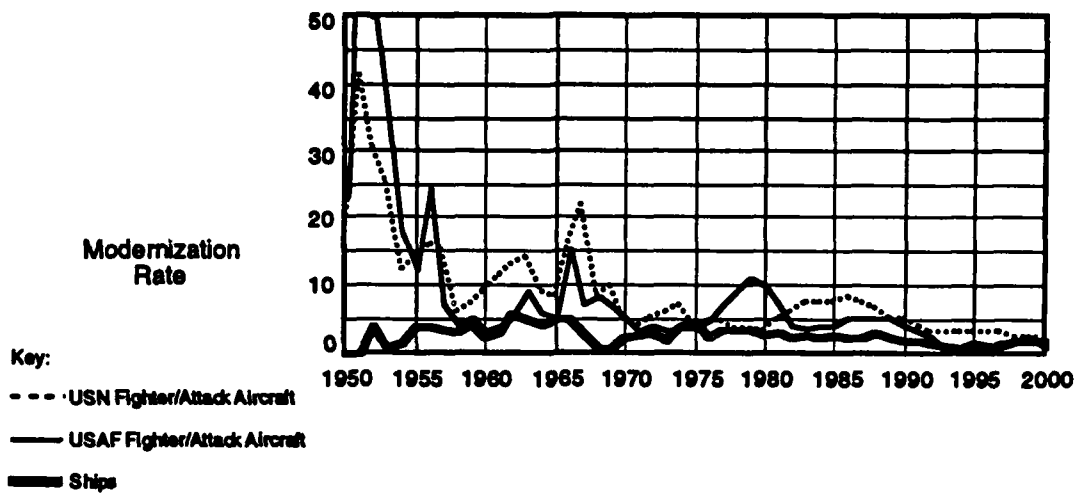
BUDGET PRESSURE

As the DoD budget continues to decline, the procurement budget has suffered the most drastic reduction (Figure 1). Other major elements (military personnel, operations and maintenance (O&M), and research, development, testing, and evaluation (RDT&E)) have been reduced significantly less. As a result, the annual modernization rate of military hardware has been reduced to 1% to 2% (Figure 2). This drastic reduction will clearly impact future readiness and military capability. It would take 50 years to replace the inventory at 2% with the average age of equipment being 25 years. The 50-years replacement time is significantly longer than the service life of almost all military equipment. Due to the overall downward pressures on the DoD budgets, no relief is expected without drastic change.



Source: National Defense Budget Estimates for FY 94

Figure 1: DoD Budget Authority Account Reductions - FY 85-94



Source: Data from OSD/PA&E Presentation

Figure 2: DoD Selected Equipment Modernization Rates

OVERHEAD BURDEN

The procurement budget is also adversely affected because a greater portion of the budget is devoted to administrative and support costs (Figure 3). This imbalance results from a failure to proportionally reduce the administrative oversight and regulations that drive fixed costs. Large government review and audit organizations instigate correspondingly large industry organizations to respond to the government oversight. Many of the technical data requirements imposed on the production process add little value to the ability of the product to meet military objectives. Excess capacity in both industry and government facilities also increases the overhead burden.

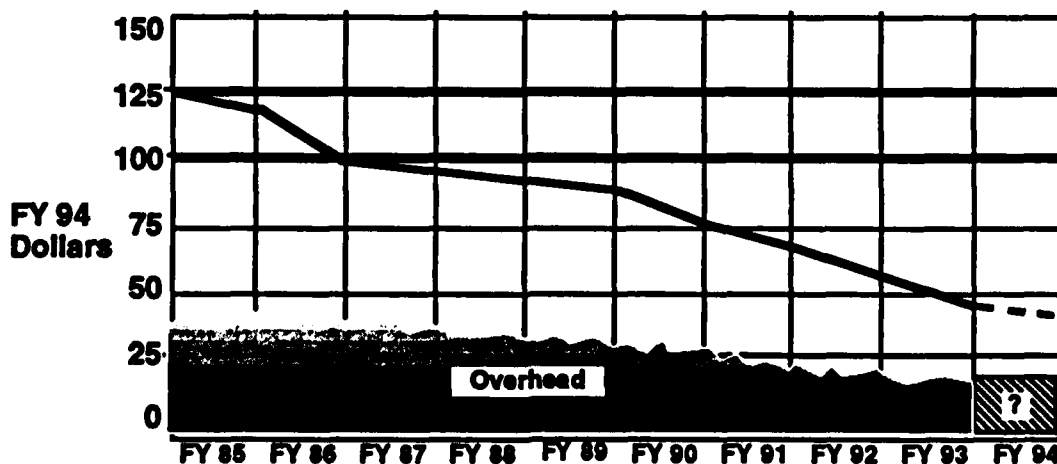


Figure 3: DoD Procurement Budget - FY 85-94

DoD cannot continue to spend such a large portion of the procurement budget on overhead functions. Low value-added rules and regulations imposed on the acquisition system have increased the overhead burden for both industry and the government. Unless these overhead costs are cut rapidly and dramatically, the unit costs of equipment will continue to increase, resulting in even fewer weapons being purchased.

BEHAVIORS THAT DRIVE OVERHEAD

The way that DoD deals with industry in its customer and supplier relationship is quite different from the norm in the commercial marketplace. DoD's monopsony allows it to exercise very tight control over industry. As a customer, DoD:

- Identifies the need for the product.
- Competes with suppliers.
- Defines the market (how many units).
- Issues the specification.
- Invites bids in conformance to Request for Proposals.
- Evaluates and negotiates the proposals.
- Establishes extensive criteria to be followed in producing the product.
- Involves a cadre of people in the internal management of the program.
- Directs the timing and funding.
- Reviews every aspect of program progress—technical performance, quality conditions, schedule accomplishments, change administration, budgets and accounting, cost accumulation, etc.

Much of the DoD oversight is clearly driven by “public trust” considerations that are not a factor in private sector customer behavior, even though there are some counterparts of “public trust” in the private sector. However, this control often results in DoD paying more for a product than its inherent value. The fundamental behaviors in the DoD's customer and supplier relationship with industry need to be adjusted if reforms to the acquisition system are to take place. The question is how to change behaviors throughout the entire Defense Manufacturing Enterprise. The answer that has proven successful in many world-class organizations is known as lean manufacturing.

3. A LEAN DEFENSE MANUFACTURING ENTERPRISE

There is ample evidence that lean manufacturing, as a set of successful manufacturing principles, can be extremely effective. Many firms have benefited from adopting these principles, particularly in the commercial marketplace. It is essential that DoD commit to lean manufacturing as a way of life for itself and its partners in defense.

DEFENSE MANUFACTURING ENTERPRISE STRATEGY DEFINED

In this study, the Defense Manufacturing Enterprise Strategy is defined to include all activities required for force modernization, material readiness, and support. This spans both DoD and the industrial base. It does not include the Congress and other parts of the Executive Branch although the report does recognize and include those interfaces in some of the recommendations. The term "manufacturing" applies to the total enterprise—from the factory floor to the boardroom and from the military operating units to the Secretary of Defense.

The Defense Manufacturing Enterprise Strategy includes all elements of DoD, except warfighting, as well as its industrial base (private and public). It includes organizations responsible for requirements definition, research, development, design, manufacturing, logistics support, and the necessary associated activities such as resource allocation, overall process management, education, and training.

The major external interfaces for this enterprise are with the user—the operating forces—and with the customers in the legislative and executive branches of government. Major internal interfaces exist between government organizations and the industrial base. Each of these interfaces involves an extensive set of guidelines, regulations, traditions, and cultures. In addition, many government activities have similar counterparts in the contractor community. All of these relationships involve a set of processes, some of which have not been explicitly documented and most of which are not subjected to continual improvement. A process improvement focus can provide significant benefits in performance, quality, cost, and schedule associated with the delivery of products to the user and at the same time vastly improve the relationship between the customer and the supplier.

LEAN MANUFACTURING DEFINED

Lean manufacturing stresses a *focus on process improvement* in an integrated manner. The process encompasses the *entire enterprise*—from the factory floor to the boardroom—and the *entire product life cycle*—from customer requirements determination through research and development to product support and phaseout.

Lean manufacturing employs well-known principles such as benchmarking, continuous improvement, employee involvement, concurrent engineering, customer focus, and many others. What is slowly being recognized by many organizations as different is lean manufacturing's *rigid adherence* to total and coordinated application of these principles.

Although lean manufacturing is identified with Japan, the application of its elements by several American manufacturers makes it clear that it is not dependent on the Japanese cultural environment for success. Lean manufacturing provides a proven method used by many benchmark companies throughout the world to reduce cost, improve performance, and ensure quality.

The case for change is well documented. Numerous books and articles have been published on how markets have been lost and profits have declined over the last several decades. The customer has changed from an orientation of just obtaining products to one of obtaining value-added products with defect-free operation. Competitive forces have required organizations to make drastic changes in the way their business enterprises are defined and how they conduct business. There are numerous success stories of companies who decided to attack the paradigms of their business so that this dramatic change could be achieved.

World-class benchmark companies exhibit a set of characteristics that describe what lean manufacturing looks like. These characteristics (shown in Figure 4) are a combination of attributes and methods. The greatest leverage can be obtained by applying process focusing with metrics and stretch goals. To meet cost, time, and quality goals, the manufacturing enterprise should demonstrate controlled, understood, and proven processes.

Key emphasis is placed on eliminating non-value-added activities, focusing on and controlling processes, developing long-term partnerships, empowering teams, and integrating product and process development. World-class companies did not achieve success overnight—it took strong leadership and a robust strategic plan to move them to

improved performance. These characteristics are evident at all levels of the enterprise. They work in concert to achieve world-class performance.

- **Process Focused with Metrics and Stretch Goals**
- **Visions and Strategic Plan**
- **Performance-Based Education**
- **Empowered Teams with Decision Authority**
- **Non-Value-Added Activities Eliminated**
- **Supplier/Customer Partnerships**
- **Process Control vs. Inspection**
- **Concurrent Engineering (IPPD) at All Levels**

Figure 4: Key Characteristics of Lean Enterprises

To accomplish an affordable solution, an enterprise needs to develop its designs in such a way that the key characteristics of the system can be produced with manufacturing processes that are understood, controllable, and have demonstrated capabilities. This is a key concept of integrated product and process development (IPPD).

Excellent enterprises keep their eyes on the goal of customer satisfaction. Everything that the enterprise does leads to customer satisfaction. If customers do not value the product, they will go elsewhere or not buy the product at all.

BRIGHT SPOTS

There are many cases of ongoing initiatives to implement some aspects of lean manufacturing principles within industry and DoD. Specific examples of these DoD "Bright Spots" which focus on process improvements are:

- **Flexible Computer Integrated Manufacturing (FCIM), Joint Services**
- **Defense Acquisition Pilot Program, Congressionally mandated**
- **DSB Task Force on Acquisition Reform, USD(A)**
- **Thrust 7, Technology for Affordability, Office of the Secretary of Defense (OSD)/Deputy Director for Research and Engineering (DDR&E)**
- **Section 800 Panel, Congress/DoD**

- **Business Process Reengineering, Assistant Secretary of Defense (ASD)/Command, Control, Communications, and Intelligence (C³I)**
- **Lean Aircraft Initiative, Air Force**
- **Manufacturing Development Initiatives (MDI), Air Force**
- **Best Manufacturing Practices, Navy**
- **Technology Centers of Excellence, Navy**
- **Integrated Development Team Acquisition Initiative, Army**
- **Corporate Contracting, Defense Logistics Agency**

Appendix E provides a more detailed description of these "Bright Spots." Additionally, many industrial companies have embraced lean manufacturing and are now competitive in world markets.

BARRIERS TO PROCESS IMPROVEMENT

Given the documented benefits, why would any organization resist implementing a lean approach? The answer is that change is painful. Organizations resistant to the change process use many excuses. One common excuse is "We're already doing this." This type of comment often is made by an organization that has not come to grips with its real competitive position. Many large corporations have received considerable publicity recently for not addressing their deteriorating competitiveness. In some cases, boards of directors have forced change.

A second common excuse is "We're different." The U.S. automobile industry continued to use this argument long after loss of market to lean producers was apparent. This Task Force firmly believes that all enterprises can adopt lean manufacturing.

A long-standing excuse is to refer to outside influences as a major barrier. This leads to the thinking that the entire scope of the change process is "outside of my control." For example, the outside influence of the media and its possible misinterpretation can be used as an excuse to avoid risk. There can also be the fear that "somebody in Congress will investigate if we try."

"Leadership is too busy." This always has been and always will be an issue, since leadership time is valuable. The question is "Where should valuable time be spent?" In our view, the answer goes back to the most valuable part of the enterprise—namely its processes. Leadership at the highest levels should be involved with the processes.

Within the defense enterprise, regulations and human resource management problems are often cited as reasons change cannot be implemented. These are merely variations of the "outside of my control" excuse that is applied where implementation of change requires approval or legislation. DoD is different to a degree, but for important matters, the difference is manageable.

The major differences between DoD and corporations are identified in Figure 5. In DoD, the function of the Chief Executive Officer (CEO) is split between the Secretary of Defense, White House, and Congress. DoD has a more disruptive annual budgeting system than industry. DoD's CEO structure places high emphasis on social objectives (small or minority business, geography, etc.), on public trust for funds, and on media "oversight" or exploitation. It also deals with interdiction by individual congressmen on "minor" managerial issues. In DoD, there is little reward for risk taking; instead, the perception is that risk should be avoided. These differences, however, need not be road-blocks to lean manufacturing.

- | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • DoD Is Different, But Differences Are Manageable <ul style="list-style-type: none"> - Civil Service personnel - No CEO-like industry - Rotation/replacement of senior execs - No payoff for risk taking - No "bottom line" - More complex customer - No competition or threat to survival • The Big Issues Are Those That Others Have Faced Down <ul style="list-style-type: none"> - Excess people - Excessive regulation - Not enough education | | <ul style="list-style-type: none"> - Conflicting objectives <ul style="list-style-type: none"> • Budget annually vs. plan • Social vs. program efficiency • Public trust vs. efficient control - Executive Branch and Congress |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Figure 5: DoD Is Different

For example, one of the key differences between DoD and industry is the set of constraints imposed by the civil service personnel system. DoD has an excess of as much as 25% in the areas that should be affected by downsizing the acquisition and force structure. This issue needs to be dealt with in order to have a significant impact on reducing the overhead cost burden. The cost burden not only impacts the government payroll, but has a substantial, adverse effect on industry and the government's cost of doing business with industry.

DoD's flexibility is limited since large, rapid workforce reductions would be politically unrealistic; however, this does not mean that the government should not take the necessary steps to become lean. A moderate pace of downsizing can be achieved through attrition, freezes, early outs, and selected reduction in forces (RIFs), all which are within DoD's authority. Beyond reducing the workforce, the most important goal here is to reorganize DoD civil service personnel so that the concentration is on value-added activities. Flatter organizational and team structures are possible if job descriptions/grade levels are written based on job content and not on the number of people supervised.

Various DoD organizations have been dealing with these issues as they transform their operations to conform more with the lean manufacturing philosophy. Several successful examples exist in Service acquisition commands operating within the current laws and Civil Service regulations. Those examples need to be understood and shared. One such example is the Aeronautical Systems Center at Wright-Patterson Air Force Base, Ohio where they successfully reduced their personnel by approximately 3,000 employees (1/4 of the total). These employees were placed on a surplus list and encouraged to move to another geographic location or retire. The early-out-incentives offered by Congress added to the success of this downsizing effort. Understanding lean principles made the people downsizing problem more manageable. Everyone cooperated to minimize the impact on the mission.

Our recommendation is that an integrated process task team representing the appropriate stakeholders be formed to examine the personnel processes, identify the desired process, and recommend an approach for resolving the issue consistent with the overall vision of the enterprise. In other words, apply the lean manufacturing process focus approach to this issue.

The roadblocks to lean manufacturing identified in Figure 5 are far more cultural than political. All organizations resist cultural change and DoD is no different. This study has identified the most significant cultural resistances that DoD will face. These resistances can be faced down, but only if the leadership fully accepts and personally endorses the new lean manufacturing approach.

OSD has the power to buffer or cushion many of the effects, but must be sensitive to the transcending priorities that Congress has established for Federal procurement. Congress must be part of the team to address soci-economic issues (such as small business and minority set asides, Davis Bacon Act, etc.) and mechanisms to preserve public trust. A "shared vision" of change that includes the House Armed Services Committee (HASC), the Senate Armed Services Committee (SASC), and the White House will greatly help. They

can screen disruptions to programs and commands, stop "killing the messengers," and make it clear that one mistake is not fatal to careers. Using teams with process owners and leaders that are organized around tasks rather than functions will protect and encourage DoD employees to take the risks necessary to make changes in the infrastructure.

In the Services, more than a dozen major process-focused initiatives are under way. This situation is similar to corporate experience where process management has generally also had a bottom-up start. These initiatives work within current DoD constraints, proving process focus can be successful within DoD. Building on these Service initiatives, plus contractor experience, simplifies DoD's task. In our judgment, the enterprise is waiting for senior leadership to endorse and unleash lean manufacturing.

INGREDIENTS FOR CHANGE

For most organizations, radical changes do not take place until leadership and the entire organization believe a crisis exists. If the entire organization does not believe the crisis is real, then it is the responsibility of the senior leadership to clearly communicate the significance of the crisis and the consequences of not making radical changes. The Task Force is convinced the crisis is real, as shown in Chapter 2.

The necessary change won't be easy, but it can be realized if the desire is sufficiently strong and there is a willingness to "stay the course." We understand how and why things need to change, and the benefits are clearly worth the efforts. It will take time and there will be some setbacks, so it will require real, long-term commitment. Since the change will involve several thousand people, we need an approach that will be effective throughout the entire Defense Manufacturing Enterprise.

The recommended approach is built on a *process focus* to achieve continual improvements, both incremental and breakthrough. This approach has successfully brought major change and world-class performance to many U.S. companies and provides integration across all functions and levels of the enterprise.

Change of this scope should start at the top, and top-level DoD support for it should be strong, sustained, and evident. Involvement of people at all levels should be real and proactive. It requires providing education, tools, and credible measures of progress at a level sufficient to achieve acceptance of individual accountability.

To lead, leadership needs to communicate a vision of *where it needs to go*. The Task Force has created a strawman vision (see Chapter 4), but it's only that—a surrogate for the real vision—which needs to be created by the DoD leadership team. The leadership

team should also decide what mechanisms, strategies, goals, and measures it will adopt to drive toward the attainment of the vision. Once again we offer an approach. What we cannot do is substitute for leadership. That needs to come from the Deputy Secretary of Defense and the Undersecretary of Defense for Acquisition. They should form with other key players a leadership team to insert a process focus into the Defense Manufacturing Enterprise Strategy.

PROCESS FOR CHANGE

Our use of the term "process" refers to an ordered set of tasks, usually followed sequentially, to accomplish an objective. A process is any activity found anywhere from the factory floor to the executive suite. The objective of a process is a wide variety of outputs that are sometimes tangible and sometimes simply statements. The act of becoming "process focused" means that an organization concentrates its energies toward improving its processes as a means of improving its products rather than concentrating only on the product itself.

The processes used by the DoD are just as amenable to process focus as the industry examples shown in Figure 6, except they extend from the operational forces to the DoD leadership.

The critical element in this process sequence is the understanding that all processes flow from the Vision, Strategy, and Implementation process established by the senior executive and his or her leadership team. For example, the executive vision may be to automate aircraft factory operations. This would lead to a composite lay-up process and capital investments entirely different from those driven by a vision to reduce cost through outsourcing to the merchant marketplace.

The first step in the lean manufacturing improvement process, as shown in Figure 7, is to identify critical processes and assign ownership. This should be accomplished by the leadership team of the enterprise. The owner is charged with the responsibility of continuous improvement of the process by adhering to the following steps:

- **Ordered Set of Tasks.** Define the process steps that are currently being done.
- **Education of Users and Participants.** Deploy understanding, knowledge, and commitment to users and participants.
- **Documented Flow.** Define task structure, interrelationships, input and output criteria.

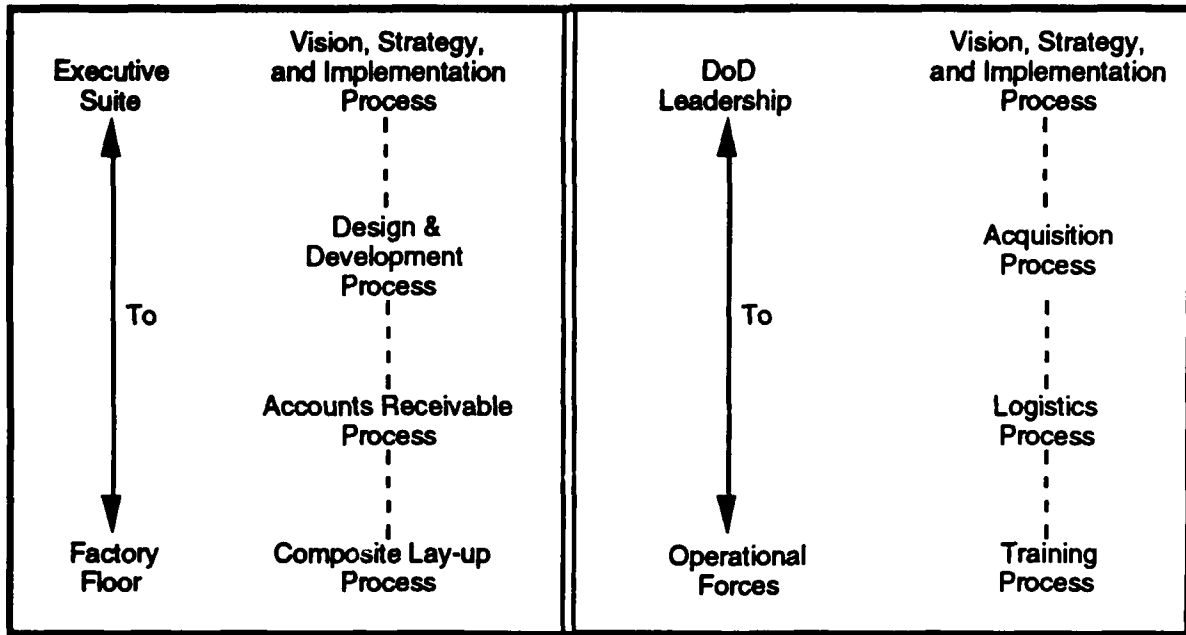


Figure 6: Process: An Ordered Set of Tasks To Accomplish an Objective

- **Metrics and Stretch Goals.** Establish common measurements of success and clear responsibility for achieving them—are we on track?
- **Elimination of Non-Value-Added Tasks.** Answer the question: If your customer knew you did this, would he or she be willing to pay for it?
- **Re-engineered Flow.** Redefined and reallocated tasks.

By focusing on process improvement, management gains maximum leverage in implementing change across all programs and activities. This process improvement flow has been implemented very successfully across a broad range of enterprises.

Stretch goals are established to produce major improvement and to achieve or pace world-class performance. They differentiate the process-focused approach from traditional improvement methodology. Stretch goals must challenge creativity to meet or beat the best-in-class benchmarks. They are deliberately set in a manner that precludes attainment by minor changes and "tweaking." There are two sets of stretch goals: one to monitor progress on implementation; the other to monitor successful achievement of results meaningful to the DoD.

A lean manufacturing process improvement approach is essential. To assure this approach, the process needs to have a responsible, accountable, and authoritative owner who has the responsibility to continually improve that process. Also, the process needs to

be documented in a flowchart series of activities so that non-value-added tasks can be identified and output metrics can be tracked along the process flow to enable process improvement. The process metrics must be output oriented and provide true measures of success so that the process owner can use them for continual improvement.

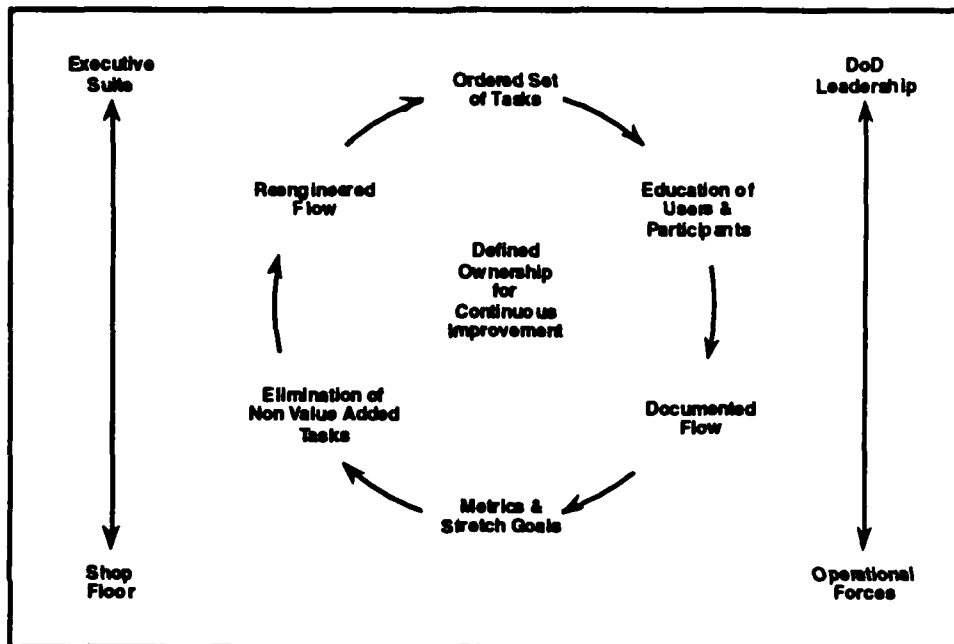


Figure 7: Lean Manufacturing Process Improvement Flow

Metrics tell how well a process is performing against requirements and provide information on the effectiveness of actions taken to improve process performance. They need to measure performance of the process, performance of suppliers to the process, and generate meaningful trend analyses. Establishing effective metrics requires a focused initiative involving all of the process stakeholders. This includes the process/subprocess owners, participants, customers, and suppliers. Care should be taken in metric selection because the application of improper metrics can delay process improvement or actually lead to actions detrimental to process performance. Frequently, the initial metrics considered are not those ultimately proven effective, but their evaluation leads to better understanding of the process and points us in the direction of a more effective selection. For more information on metrics, see Appendix F.

After the goals to achieve the vision have been set and while the metrics to measure progress in achieving goals are being measured, feedback should be continuous. This part of the implementation involves reviewing metrics, identifying process improvements,

eliminating non-value-added tasks, re-engineering process flow, and, if necessary, revising metrics. This feedback process is continuous and is one of the major benefits of the lean manufacturing process approach. The process should be reliable; it should be able to be dependably performed repeatedly by different people over time. The purpose behind documenting the process and using metrics throughout the process is to continually improve the process by eliminating non-value-added activities.

A process focus for lean manufacturing can only be achieved through training of the participants so that improvement goals can be interpreted properly and achieved. Lean manufacturing views all labor as a competitive weapon that needs to be continually developed to be effectively used. Organizations with a process focus see training as an essential component to continual improvement. Education and training are focused in two broad categories: leadership and process.

Leadership training is instituted to help managers understand the three categories of change—technological, social, and organizational—and their role as a change agent.

Management training is a continuous process. Problem solving requires problem recognition and differentiation from symptoms as well as an understanding of the factors that affect the problem and evaluating them to find a viable solution. Training opportunities need to be available regularly to improve these management skills.

Technology introduction and production realization are valued activities of the organization, and the labor force requires the skills to adapt quickly and efficiently to these new requirements.

Every organizational tier needs to listen to its customers, understand their needs and requirements, and be responsive—providing a quality product, on time, and at the right cost. Every organizational tier needs to also understand it has a supplier. The work force should be educated at all levels to optimize the customer-supplier interface.

The work force should be educated to facilitate changing the culture to a mode of continual improvement. Tools for continual change include business process management, benchmarking, re-engineering of the process, cycle time reduction, and quality improvement.

RISKS AND REWARDS

Implementation of the proposed change will be neither easy nor fast. However, the payoff will be extremely significant. Based on industry experience, the Task Force estimates that efficiency gains in the tens of billions of dollars annually are achievable,

along with dramatic improvements in the time-to-field new weapons, in the quality of the weapons, and in their performance. The United States will have a more effective fighting force—even with the reduced budgets—as measured in terms of readiness, modernization, ease of operation and maintenance, and state-of-the-art equipment. And there will be a broader, more responsive, and more competitive defense industrial base—largely integrated with the civilian sector and capable of surges in production (for crisis demands).

However, as has been found in equivalent industrial restructuring, there may be a one-time restructuring cost in resources, leadership energy, and political capital. But the effort required to justify and obtain approval of these expenditures could facilitate change and pay significant dividends in the future.

A significant portion of the required changes (perhaps up to 75%) can be achieved within the DoD itself, but even these will require considerable Congressional support. For the rest, Congress needs to be a significant participant by removing current legislative barriers.

In addition to economic benefits, there will be many operational and working benefits to the establishment of a lean manufacturing enterprise. Some of the most significant of these benefits are as follows:

- **User/Participant Understanding.** People will better understand their role in the enterprise and be much more capable of making creative improvements in their processes so as to contribute to the overall performance. Additionally, they will feel much better about their jobs since they understand its importance to the total enterprise.
- **Compounded Learning.** Learning experiences are built upon past learning experiences. Thus, learning is accomplished much more efficiently, and a higher level of understanding is reached more quickly.
- **Sustained and Stacked Improvements.** Improvements made in a process environment are built upon past improvement, much as learning improves. The technological envelope is pushed higher and faster by concentrating on a disciplined, ordered process. Changes made to a process by one team of participants and users can easily be transferred to other teams using the same or similar processes.
- **Tuned To Meet Enterprise Goals.** In a lean manufacturing environment, all processes fit together and contribute to the enterprise success. Resources are better used. No process expends resources in directions out of step with the total enterprise.
- **Produces Consistent Results.** Well-ordered processes invariably yield consistent results. The immense value of consistent results can be

characterized in two ways. First, both suppliers and customers can depend on consistent processes. They will know what to expect and not have to devote additional resources to provide for contingencies. Second, consistent processes are much easier to improve than random processes.

This is an ambitious and far-reaching initiative. This magnitude of change in direction and management approach will surely face significant resistance and opposition in spite of the high potential benefits. However, there are several reasons this initiative should succeed where others have failed:

- There is greater recognition of need in light of the procurement budget crisis.
- Process focus now has a documented record of success in industry.
- DoD's new leadership is focused on improvement and understands the value of a team approach.
- Pockets of success in DoD provide an opportunity for expansion, rather than a stark beginning.
- Congress should respond positively if treated as a customer.
- The recommended approach is consistent with the Vice-President's National Performance Review

There is a down-side risk, but it can be minimized and it will not jeopardize defense capability. If this process effort does not achieve desired results, it should not have a detrimental effect on cost, quality, time, or technical function of existing programs. Programs will maintain operations for two or three years despite external activities. Rather, the failure to achieve desired results will be seen as another "abortive attempt" at change, and commands that had moved forward in the process change will backpedal. Some committed commands may continue with reduced visibility.

The major loss will be "lost leadership" on the part of management with subsequent loss of the opportunity to bring about future change. The organization will have a difficult time accepting new ideas from leaders who have to back away from commitments to change. In addition, there could be lost opportunities for the leadership. After all, leadership time could be spent on other activities that could otherwise provide benefits.

These risks can best be minimized by careful selection of initial programs and organizations and emphasizing education and communications, especially with regard to keeping skeptics involved at the beginning and throughout the process. Organizational approaches include building in organizations that have already started related efforts, building teams successfully down through the hierarchy, and protecting risk takers as much as possible.

4. VISION STATEMENT FOR THE FUTURE

Implementing a lean Defense Manufacturing Enterprise Strategy will require significant changes within government and industry, changes that can only be implemented through leadership. Leadership needs to initially guide the change process through creation of a vision statement to provide top-level direction and focus. Then, leadership should select and implement the strategies, goals, mechanisms, and measures needed to drive toward attainment of the vision.

The DSB Task Force has drafted a strawman vision statement for DoD that encompasses the total system:

Change the spirit of defense acquisition from one of mistrust and risk aversion to confidence in the total enterprise and turn from an inward-looking system to one that fully utilizes the total strength of industry, where processes are continuously improved to reduce cost and improve performance so that U.S. Armed Forces are trained, equipped, and ready to defeat existing or potential threats.

We offer this draft vision statement for discussion, but the final vision should be developed under the guidance of top DoD leaders: the Deputy Secretary of Defense and Undersecretary of Defense for Acquisition. They should align with other key players and form a team that is chartered to insert continual improvement, using a process focus, into the Defense Manufacturing Enterprise. The team's first step should be to finalize a vision statement that is endorsed by the Secretary of Defense. Then this team can begin to implement the other steps in the plan for change, as described in the next section.

5. PLAN FOR CHANGE

To bring about the necessary radical change, the DoD needs to implement the fundamentally new manufacturing policies, practices, and procedures depicted in Figure 8. In essence, this Task Force has recommended how to re-orient the DoD acquisition work force to one more aligned with that of a lean Defense Manufacturing Enterprise.

From	To
Output Measures	-> Processes Improvement
Large Infrastructure	-> Variable Cost
Inspections and Audits	-> Management by Metrics
Compete with Suppliers	-> Partnerships
Dedicated Resources	-> Shared Resources (Commercial, Military)
Risk Aversion	-> Exercise Initiative
Serial Stovepipe Design	-> Concurrent Engineering (IPPD)
Technology/Products/Performance	-> User Value-Driven/Affordability
Individuals in Stovepipe Structures	-> Empowered Cross-Functional Teams
General Training	-> Performance-Based Education

Figure 8: Changing the Enterprise Management Attributes

Once the vision of the Defense Manufacturing Enterprise is established, the Department leadership needs to harness the power of that vision to *institutionalize* process-improvement-based reform to DoD acquisition as well as a long-term commitment to and a plan for this change.

THE "HOW TO" RECOMMENDATIONS

To institutionalize the necessary change to a lean Defense Manufacturing Enterprise, the leadership should proceed as follows.

1. **Create and communicate the vision of the Defense Manufacturing Enterprise at all levels of the DoD and to Industry.** The vision should align DoD with the lean manufacturing concepts of Figure 8. Unless this is done, and reinforced on a frequent basis, the power of the vision will be weakened and perhaps lost. This crucial first step, discussed in Section 4, should be done at the highest echelons of DoD and industry. Without it, nothing will be accomplished.

2. **Adopt a lean manufacturing process improvement approach within DoD and with members of the Industrial Base.** This will remove the current limiting focus on programs and products. It will foster a view of acquisition activities as being part of a process and amenable to streamlining and beneficial change. Figure 7 illustrates a continuous flow for process improvement in both DoD and industry.
3. **Create an agent of change to implement the process focus.** This Task Force's recommended organization for the agent of change is shown in Figure 9. We recommend the creation of an Acquisition Policy and Industrial Base Process (APIB) Team to be the major instrument of the DoD leadership to bring about the desired changes. Its authority will be DoD-wide in all matters affecting acquisition. It will, moreover, be a guiding agency in managing the inevitable right-sizing of the industrial base. Its charter should be issued by the Deputy Secretary of Defense (DepSecDef).

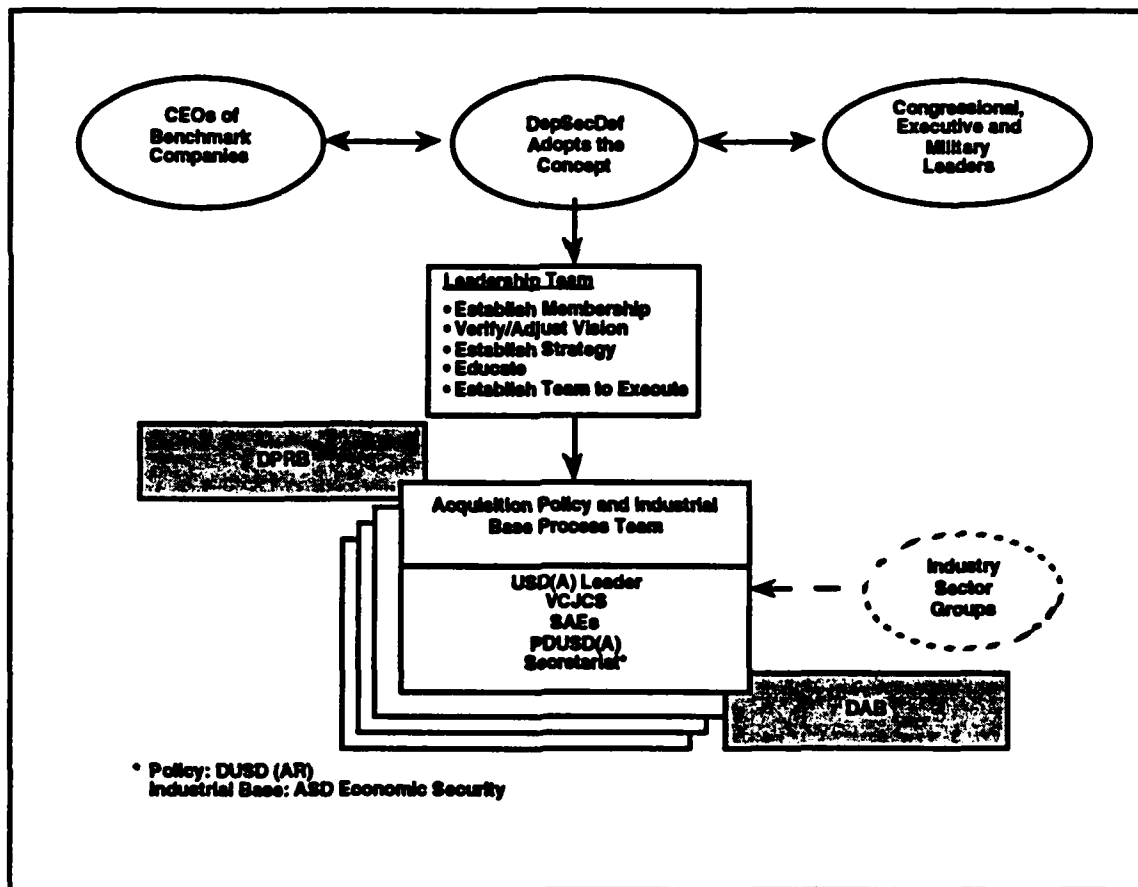


Figure 9: The Agent of Change

Key tenets of this agent-of-change concept are as follows.

- The DepSecDef, with the cognizance and advice of congressional, industrial, and military leaders, should establish an implementing Executive Leadership

Team. Its charter would be to ensure consistent, effective application of the change process, working through the APIB.

- **The APIB Team should include the USD(A) as leader to represent the entire Defense Manufacturing Enterprise Strategy; the Joint Chief of Staff (JCS) Vice Chairman to ensure firm ties to the user requirements process; the Service Acquisition Executives (SAEs) to transfer team actions into Service actions; and the Principal Deputy Undersecretary of Defense for Acquisition (PDUSD(A)) to ensure consistent action in all major program activities. The SAEs need to have line authority for the totality of acquisition within their Services, including O&M funds associated with industrial operations. The APIB Team should have a formal charter issued by the DepSecDef to ensure a consistent basis for action. A suggested draft charter is shown in Figure 10.**
 - **The APIB Team should be supported by a Secretariat whose composition will depend upon the areas affected. As a minimum, the Secretariat should include the Deputy Undersecretary of Defense for Acquisition Reform (DUSD(AR)) to oversee acquisition reform issues and the Assistant Secretary of Defense (ASD) (Economic Security) to oversee industrial base issues (public and private). The USD(A) may also involve other staff elements. Participation of the Secretariat would strengthen the implementing actions taken by the staff elements since they would represent the coordinated position of the team.**
 - **The DoD should establish industry sector groups to ensure meaningful, rapid progress. Their task would be to assist, on an ongoing basis, progress towards the lean DoD Manufacturing Enterprise.**
 - **Other process teams would be formed to address the specific prioritized topics identified by the APIB Team.**
- 4. Drive change by an over-arching plan and a rational set of priorities. These priorities, led by the change agent, may originate in the team itself or in those DoD agencies best able to identify and implement them under team guidance. Specific recommendations and desired results are discussed in the next section.**
 - 5. Facilitate the change process by instituting a program of recognition and reward for the pioneers of change. Rewarding these pioneers (either individuals or teams) for implementing lean manufacturing will send a clear message to other organizations in the enterprise.**
 - 6. Involve other stakeholders, such as the Congress, in formulating DoD acquisition strategy. This will harmonize the process of right-sizing and streamlining.**

- Charter.** Develop lean manufacturing processes to produce consistent acquisition and industrial base plans and their implementation.
1. This team shall be known as the Acquisition Policy and Industrial Base Team.
 2. The team shall have the following general responsibilities:
 - a. Ensure that the vision of the Defense Manufacturing Enterprise is implemented.
 - b. Develop and promulgate appropriate policies affecting DoD acquisition activity.
 - c. Establish mechanisms to ensure that the industrial base (public and private) remains capable of serving the broad national security needs of the country.
 - d. Establish metrics to measure progress.
 3. The team shall meet at the discretion of the Undersecretary of Defense for Acquisition or, where necessary, the Principal Deputy Undersecretary of Defense for Acquisition.
 4. The team shall not be responsible for the normal, day-to-day management activities of DoD acquisition.
 5. The team shall ensure that DoD-wide education and training of relevant personnel in lean manufacturing principles are implemented.
 6. In consonance with the principles of para. 2.a., the team shall at a minimum:
 - a. Establish lean manufacturing principles within DoD and approve their content/ implementation with IPPD-like teams, where indicated.
 - b. Plan and implement the rational sizing of DoD organizations and facilities to remove barriers to the establishment of a lean manufacturing enterprise (including the industrial base).
 - c. Encourage innovation-in-acquisition throughout DoD to harness the best efforts of all personnel.
 - d. Ensure that the mechanisms established for industrial base ability retention address, as a minimum, the following:
 - How and when to achieve the right size of residual defense-unique organizations.
 - How to encourage dual-use (i.e., commercial-military) industrial manufacturing capabilities where similar products have similar prices, regardless of the buyer.
 - Review and establish minimum defense needs by sector (e.g., tanks, aircraft, submarines, etc.). Achieve the rational right size of the residual defense industrial base.
 - How to incentivize individuals and organizations to invest in productivity, even as the defense budget is reduced.
 - e. Create integrated process teams to address crisis issues for high payoff.
 7. The team shall recognize in its activities its *de facto* connections to the Defense Planning and Resources Board (for overall DoD budget structure) and the Defense Acquisition Board (for specific, large programs).

Figure 10: Acquisition Policy and Industrial Base Process (APIB) Team Charter

These "how to" recommendations are simple and straightforward. DoD and industry leaders should execute them with vision and tenacity.

AGENDA FOR CHANGE—THE "WHAT TO DO" RECOMMENDATIONS

It is the Task Force's consensus that there are substantial cost savings to be found by immediately implementing the concepts in ongoing programs. Based on our analysis of prior studies and review of the current situation, the Task Force compiled the detailed "what to do" recommendations shown in Figure 11. The recommendations are mapped against the desired results.

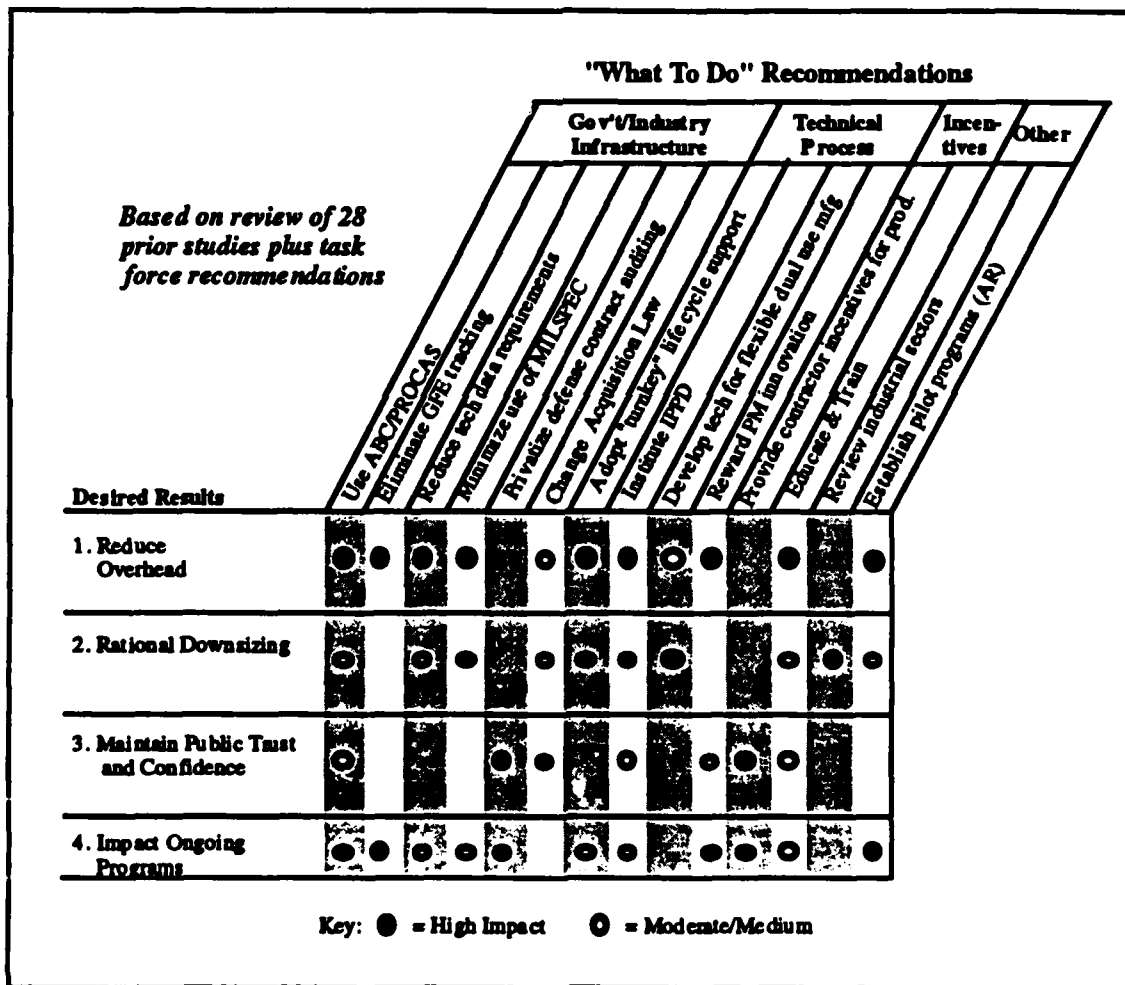


Figure 11: Correlation of Prior Study Results to This Report's Findings

Ongoing programs represent a high-payoff area to be examined because of the amount of money contained in these programs. It is our belief that an immediate payback may be achieved by focusing on these programs. The following suggestions are applicable for

immediate implementation of lean manufacturing principles in ongoing programs. In addition, it may be necessary to concentrate on a facility rather than a program since it will be difficult to deal with a single program in a multi-program facility.

Major desired results are discussed further in the following section in relation to the applicable recommendations from previous studies. Not all recommendations are discussed—only those considered to have a near term, “high impact” on the DoD. For a better understanding of these recommendations and how they were selected, see Appendix C.

Reduce Overhead

The overhead associated with the Defense Manufacturing Enterprise Strategy can be reduced in several key areas. All non-value-added functions should be identified and eliminated. Specific actions related to reducing overhead (as shown above in Figure 11) are discussed next.

Government/Industry Infrastructure

- **Activity Base Costing (ABC)/Process Oriented Contract Administration System (PROCAS):** The DoD should implement ABC to identify the non-value-added costs associated with contractor compliance with government procurement requirements, the significant contribution to overhead costs associated with the tracking of government furnished equipment (GFE), and the cost of capacity of the defense industrial base. ABC is a tool used extensively in the private sector for answering specific questions about product costs, for measuring cost reductions resulting from process improvements, and for understanding the profitability and costs of product lines. The information obtained can then be used to develop strategies to reduce those identified costs. In conjunction with reducing overhead costs, PROCAS is a process that promises reduced overhead costs to both industry and government while increasing manufacturing productivity and product yield.
- **Eliminate GFE Tracking:** Tracking of GFE should be modified to cover only assets with a Fair Market Value (FMV) over \$10,000. All other tracking should be deleted and the contractor held responsible for GFE information. We further recommend that the FMV of GFE be determined using commercial principles and contractors be offered the opportunity to buy the assets at that value. To the extent contractors are not willing to buy the GFE, the Federal Acquisition Regulation (FAR) should be changed so that contractors would only be charged the commercially determined Fair Rental Value (FRV) of the GFE.

- **Reduce Technical Data Requirements:** Historically, the DoD has procured the vast majority of its materiel to detailed technical data packages. These packages include military specifications and standards; detailed manufacturing drawings; manufacturing processes; and detailed inspection procedures, test equipment, and gage designs. The justification for the detailed, government-controlled technical data package has been to assure the quality of the product, to provide configuration control, to achieve part standardization, and to support competitive procurement of the item and its spare parts. This "build to print" philosophy requires a high level of technical and contract administrative activity by both the contractor and the government; offers little opportunity or incentive for the contractor to improve either the product or manufacturing process; and, therefore, limits cost reduction opportunities. As a result of these traditional practices, the DoD has millions of drawings and specifications it needs to maintain to support procurement of end items and spares. These technical data packages consume many resources to control and post engineering changes and to operate technical data repositories. They also represent obsolete technology in many instances. The DoD should stop buying "build to print" or Level 3 technical data packages, thus avoiding expending large in-house resources on their upkeep. Detailed product drawings and specifications should be replaced by the use of performance specifications, supplemented by manufacturers' drawings and specifications only if needed. Further, only that data needed for competition should be acquired. In all cases, commercial drawing formats should be used and the manufacturer should maintain all the technical data throughout the contract. Coupled with use of the performance specification, the manufacturer would retain control of the system configuration throughout the development and production of the system. The government would only retain control of those changes that affect form, fit, function, and interchangeability requirements of the performance specification. Another aspect of control is for the government to have the capability to procure spare parts from a sole-source manufacturer if there were no technical data available. To enable this, there should be a contractual requirement that the manufacturer deliver a current drawing package to the government at its option with the right to procure the parts in the competitive market, using the same performance requirements as the manufacturer does with subcontractors.
- **Minimize Use of Military Specifications:** ISO has adopted a quality system series of standards (the 9000 series). Certification to this standard is being required by companies doing business in the international community. DoD adoption of ISO 9000 to replace the two military specifications, MIL-Q-9858 and MIL-I-45208, will allow companies producing defense products to avoid the costly process of having to be certified under two different standards. This recommendation will also have a high impact on rational downsizing.

Technical Process

- **Adopt "Turnkey" Life Cycle Support:** Under "turnkey" procurements, a single contractor is selected to develop, produce, and support a product or system from its inception until its retirement from use. The "turnkey" concept relies on one contractor for the product, its spares, and depot maintenance. Economies accrue from a more stable business base for the supplying company and greatly reduce oversight and downstream procurement activities for the DoD. This recommendation will also have a high impact on rational downsizing.
- **Institute IPPD:** IPPD is a management process that integrates all activities from product concept through production and field support, using a multi-functional team, to simultaneously optimize the product and its manufacturing and support processes to meet cost and performance objectives. IPPD is widely used in commercial industry to reduce cost and development time. Exit criteria for development phases include both product performance and process maturity (using metrics such as the process capability index C_{pk}). The Task Force endorses the suggestions of the 1992 DSB Study on Engineering in the Manufacturing Process that called for implementation of IPPD in science and technology (S&T) programs as well as acquisition programs. This recommendation will also have a high impact on rational downsizing.

Incentives

- **Reward Program Manager Innovation:** It is imperative that the Program Manager be given every opportunity to try new and innovative approaches that may have significant impact on a program. One way to ensure that the Program Manager takes advantage of these innovations is to offer some kind of reward. These rewards may vary from special recognition to monetary compensation.

Other

- **Educate and Train:** The change to a lean Defense Manufacturing Enterprise should be accompanied and facilitated by a vigorous program of education and training. Personnel at all levels in DoD and industry need to be equipped with the concepts and tools necessary for running a lean manufacturing operation. Education and training must begin at the top and extend to the entire Defense community.
- **Establish Pilot Programs (Acquisition Reform):** The process improvement focus as described earlier applies to all processes extending from the operational forces through DoD leadership. Taking advantage of this feature provides the opportunity to establish "readiness" as a place to start *within* the system to implement the methodology and gain in-depth understanding of the magnitude of the benefits achieved. Other initiatives

within the enterprise can be started in parallel with the top level action under the direct leadership of the DepSecDef. Our recommendations presented thus far center upon developing a DoD vision with goals, the establishment of integrated process teams, and the deployment of the process improvement approach. It is recommended that this methodology be applied directly to the issue of readiness and other issues within the enterprise.

Relative to this specific initiative, it is suggested that the Joint Logistics Commanders (JLC) be tasked to implement a program focused on the overall spares procurement and deployment activity. The process should start by identifying initial and sustainment spares and extend through the procurement task, supply to operational units, repair, and industrial base considerations. The program should identify the process owner, produce a detailed process map, identify barriers to achieve the goal, develop a lean process map based on the removal of non-value-added tasks and process streamlining, identify metrics, and finally, measure the magnitude of benefits derived from the process improvement focus. Interim and final results should be provided as feedback to DepSecDef and the APIB Process Team.

It should be emphasized that this spares program does not take the place of DoD leadership introducing the process focus to the entire DoD enterprise. However, it does provide a means to quickly implement this approach within the enterprise.

Metrics

The use of process metrics in lieu of product inspections can improve product quality and performance while reducing oversight costs. At this time, the Task Force can only survey the utility of metrics and stretch goals and suggest candidate metrics in the evaluation of the institutionalization of the Defense Manufacturing Enterprise Strategy. But this is done very deliberately, since many organizations in both the public and private sectors have used metrics and stretch goals to effectively improve their processes and products. The DSB is prepared to support DoD in the establishment of metrics and stretch goals, and even to help in monitoring them to the degree desired.

Metrics, when properly set, define how well a process is performing against requirements and provide information on the effectiveness of actions taken to improve the process performance. They should be sufficient to understand the performance of the process, the performance of suppliers to the process, and to generate meaningful trend analyses.

Recommended candidate metrics for initial consideration by DoD are shown below. Candidate metrics to monitor progress on implementation are:

- Overhead cost as a percentage of budget
- Commercial content
- Number of people trained in lean manufacturing
- Number of re-negotiated ongoing programs and money saved

Candidate metrics to monitor the health of the Enterprise are:

- Net assessment (force readiness)
- Readiness (mission capable rate and training tempo)
- Modernization rate percentage
- Industrial base capacity utilization
- Customer satisfaction (Congress) through surveys and meeting customer commitments
- Weapon system cost and performance trends

Rational Downsizing

The DoD should establish a rational process, including metrics and stretch goals, for downsizing the public sector of the defense community (including depots, arsenals, laboratories, federally funded research and development centers (FFRDCs), etc.). The process should include sponsorship of a commission similar to the Base Closure Commission. Overall guidance to the commission should be to use the private sector wherever possible. It is further recommended that a position be established at no less than the Deputy USD(A) level which has the authority and responsibility for recommending statutory and regulatory changes, establishing and overseeing the downsizing process (including metrics), and executing line responsibility for the education and training process.

The DoD needs to posture its acquisition program and process to facilitate a rational downsizing of the defense industrial supplier base. The first step is to identify the minimum-sized industrial base required to satisfy unique DoD requirements (tanks, submarines, etc.). Next, DoD should permit the use of dual use or commercial components, parts, and processes to the greatest extent possible, and to purchase these items using best commercial practices. Finally, DoD should establish an acquisition environment where acquisition organizations and officials are encouraged, recognized, and rewarded for adopting innovative acquisition practices at *all* levels of the acquisition process.

Technical Process

- **Develop Technology for Flexible Dual Use Manufacturing:** As the DoD downsizing progresses, both the number of weapon systems and the quantities purchased of these systems will be reduced. Historically, as smaller quantities are purchased, unit costs go up dramatically. Anticipated resources will not allow this historical volume to unit cost relationship to remain the same. The DoD has the opportunity to learn from commercial industry success in reducing unit costs with smaller production lot sizes. Through the development and installation of flexible production technology, processes and capital equipment can be used and thus amortized over a number of products, resulting in unit costs being controlled as production volumes are reduced. DoD should establish an adequate budget for the development of flexible production technology for application in active and anticipated acquisition programs. This program should also extend efforts to monitor commercial developments in this area for defense adoption of dual use technology.

Maintain Public Trust and Confidence

Public trust and confidence in the DoD can be improved through the use of tools that are already practiced in the commercial marketplace. A few of the tools available to DoD and already used in the commercial marketplace to ensure the protection are listed below. Most of these tools are included in the recent DSB report on Acquisition Reform.

- Rely on competitive pricing where possible.
- For sole source suppliers, stress continued value improvements (with sample audits versus continual audits).
- Rely on supplier metrics of processes and cost improvement trends.
- Enlist "Quality Assurance" accounting firms to conduct audits.
- Expand application process of metric sampling to replace item inspection/continuous audit approach.
- Utilize past performance for future awards.

Government/Industry Infrastructure

- **Privatize Defense Contract Auditing:** A means of auditing defense contractors other than by the Defense Contract Audit Agency (DCAA) should be explored. We recommend an experiment under which one or more defense contractors would be audited by the independent public accounting firm that performs the audit function for the firm's Securities and Exchange Commission reports. If this experiment were to be undertaken, we recommend that it be closely monitored by the General Accounting Office (GAO). If the evaluation proved successful, contractors could then be given

the option of dealing with the Big Six firm or DCAA. The government's interests would be protected by maintaining visibility and accountability. Costs would be controlled by competing the business.

- **Change Acquisition Law:** It is recommended that the DoD Defense Manufacturing Enterprise Strategy emphasize the recommendations found in the DSB Acquisition Reform report¹. We suggest that a multi-function team be formed to review these recommendations and propose changes to the acquisition laws.. A drastic reduction in overhead costs is needed and the oversight function found in these laws is a major driver in increased costs to both DoD and industry). The team should include the primary stakeholders with this accountability, for example, Defense Contract Management Command (DCMC), DCAA, Director, Defense Procurements (DDP), OSD Inspector General (IG), GAO, etc., with industry in a consulting capacity.

¹ *Report of the Defense Science Board Task Force on Defense Acquisition Reform*, Robert J. Hermann, Chairman, July 1993

APPENDIX A
TERMS OF REFERENCE - DEFENSE SCIENCE BOARD
TASK FORCE ON DEFENSE MANUFACTURING STRATEGY



THE UNDER SECRETARY OF DEFENSE
WASHINGTON, DC 20301

APR 22 1993

ACQUISITION

MEMORANDUM FOR CHAIRMAN, DEFENSE SCIENCE BOARD

SUBJECT: Terms of Reference - Defense Science Board Task Force
on Defense Manufacturing Strategy

You are requested to form a Defense Science Board (DSB) Task Force to address the Defense Manufacturing Strategy for the 1990s and into the next century. This is a critical issue for the DoD since the appropriate use of science and technology to achieve U.S. industrial competitiveness may be the single most important contribution science and technology can make to U.S. security over the long term. The study should be a synthesis and extension of the work accomplished from the Packard Commission through the DSB 1991 and 1992 Summer Studies on manufacturing. The study should focus primarily on creating a manufacturing strategy within a Defense Department's new lean acquisition policy that is in concert with commercial industry. This will allow the defense industry to become world-class providers serving the Department of Defense and to be competitive in the commercial marketplace.

This task force shall build upon the existing studies to create lean acquisition processes for the DoD and lean manufacturing processes for Industry. The task force shall examine commercial production processes and methods as a baseline to recommend DoD acquisition policies and defense industry manufacturing processes. This will help defense industry to become world-class providers serving the Department of Defense and to be competitive in the commercial marketplace.

This task force shall (1) identify those government acquisition policies that impede lean manufacturing, (2) make recommendations to streamline or change appropriate DoD policies to enhance world-class production, and (3) identify lean manufacturing methods that can be utilized by defense contractors for affordable low rate production.

Technology-rich weapons systems of the future will be procured in relatively small quantities and at relatively low rates. Therefore, this task force shall also address the efficient manufacture and support of weapons as so called "silver bullet fleets." The task force should address lean manufacturing models to be implemented above and on the manufacturing floor. In particular, the study should examine how the DoD can break traditional cost and volume relationships and recommend how unit costs can be contained despite the anticipated drop in the procurement quantities of the future.

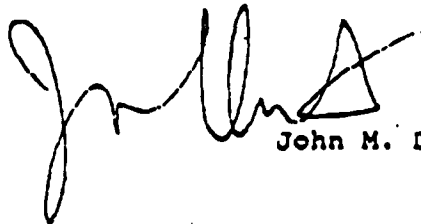
The task force shall review current DoD manufacturing activities including the DDR&E Science and Technology Thrust Seven, "Technology for Affordability," for adequacy and consistency with DSB recommendations. Once a strategy is established, the task force shall recommend pilot project experiments for ARPA and each Service, as well as experiments that can be undertaken jointly across the DoD, that will help to demonstrate the value of a DoD lean acquisition plan which will feature the new lean manufacturing strategy for the DoD. These experiments may include advanced technology demonstrations (ATDs) or a group of ATDs that could potentially lead to a more inclusive top level demonstration.

A particular effort of this study shall be to recommend how the DoD can leverage its resources as part of the manufacturing strategy by cooperative activities such as the "Defense Conversion Technology Reinvestment Project" with other organizations. Again, specific cooperative programs and research projects shall be suggested.

Within the currently defined acquisition phases, the task force shall build upon the recommendations of integrated product/process development and establish guidelines for entrance and exit criteria at each milestone of weapon system development.

The study will also develop specific recommendations in the areas of training and education on how the Department should proceed to reorient the Defense Acquisition Workforce to these fundamentally new manufacturing policies, practices and procedures.

The study will be sponsored by the Under Secretary of Defense (Acquisition). Mr. Edwin L. Biggers and Mr. Gordon R. England will serve as Co-Chairmen. ARPA will provide the necessary funding and support contractor arrangements. The Executive Secretary will be Dr. Michael McGrath, and Mr. John V. Ello will be the DSA Secretariat representative. It is not anticipated that this study will need to go into any "particular matters" within the meaning of Section 208 of Title 18, U.S. Code, nor will it cause any member to be placed in the position of acting as a procurement official.



John M. Deutch

APPENDIX B

MEMBERSHIP

Executive Group

Mr. Edwin L. Biggers, Hughes Missile Systems, Co-Chair
Mr. Gordon England, Lockheed Fort Worth Company, Co-Chair
Mr. A.J. Beauregard, Lockheed Aeronautical Systems Company
Mr. Ed Burke, SAIC
Dr. Gary Denman, ARPA
LtCol John Dertzbaugh, Defense Science Board
LtGen Thomas Ferguson (USAF Ret), Dayton Aerospace Associate, Inc.
Dr. Mike McGrath, ARPA, Executive Secretary

Lean Manufacturing Subgroup

Mr. G. Dean Clubb, Texas Instruments, Inc., Subgroup Chair
Ms. Patricia Byrne, Naval Air Warfare Center
Mr. Robert L. Cattoi, Rockwell International Corp.
Mr. Harold Edmondson, Independent Consultant
Ms. Lorna Estep, Joint Center for Flexible Computer Integrated Manufacturing
Mr. Bruce Gissing, Boeing Commercial Airplane Co.
RADM James B. Greene, Jr., Naval Operations
Dr. Robert Henderson, South Carolina Research Authority
Mr. James Hughes, Westinghouse Electric
Dr. William Kessler, WL/MT
BG George Muellner, HQ, ACC/DR
Mr. Herm Reininga, Rockwell Collins
Dr. Karen Richter, Institute for Defense Analyses
Ms. Judy J. Rumsey, Naval Operations
Mr. John Stewart, McKinsey and Company, Inc.

Lean Acquisition Subgroup

Mr. Robert Fuhrman, Lockheed Corp., Subgroup Chair
Mr. Dale W. Church, Pillsbury, Madison and Sutro
Mr. Jay Dutcher, OUSD(A)
Mr. John E. Fidler, Lockheed Corp.
Dr. Jacques S. Gansler, TASC
Gen Donald R. Keith (USA Ret), Cypress International
Dr. Leslie Lewis, RAND Corporation
Mr. Adolph M. Quilici, Independent Consultant
Mr. Howard D. Samuel, Council on Competitiveness
Mr. John Smith, OASD (AP&PI)

Projects Subgroup

LTG August M. Cianciolo (USA Ret), Cypress International, Subgroup Chair
MG Charles R. Henry (USA Ret), Allied Research Corporation
Mr. Hal Bertrand, Institute for Defense Analyses
Mr. Darold L. Griffin, Army Materiel Command
Mr. Ira Kemp, OASD(Acquisition)
Mr. Charles Kimzey, OASD(P&L)
Mr. Alfred King, Institute of Management Accountants
Mr. Roger Koren, OASD (P&L)
Ms. Catherine McDonald, Institute for Defense Analyses
Mr. David Rossi, OASN (RDA)
Mr. Max Westmoreland, Army Materiel Command
Mr. George Williams, Army PEO
RADM Leonard Vincent, DCMC/DLA

APPENDIX C

SYNTHESIS OF RECOMMENDATIONS

The Task Force's focus in this portion of the study was to define a set of "what to do" recommendations. Figure C-1 depicts the process used to determine the key recommendations. The analysis began by examining previous studies on the topic. It also generated many of its own recommendations. This was done through a series of round tables held during scheduled meetings.

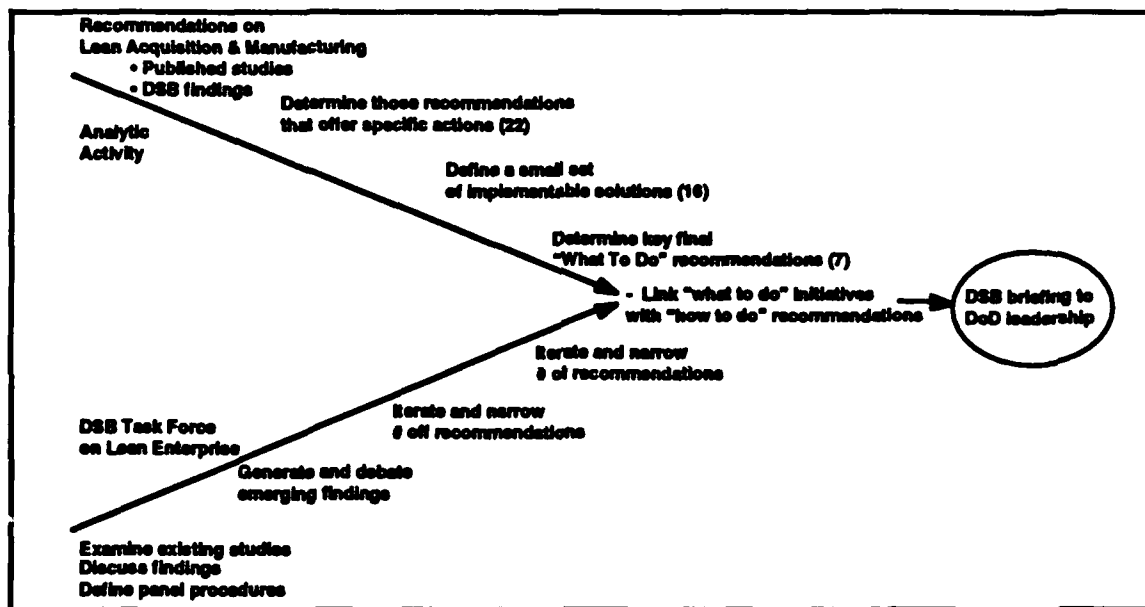


Figure C-1: The Process Used To Determine the Key "What To Do" Recommendations

A number of studies on acquisition reform encompass lean manufacturing issues. Roughly 31 studies were examined, beginning with the Hoover Commission in 1947 and concluding with the recent DSB study on acquisition reform entitled *Defense Acquisition Reform* (July 1993). Most of these studies asserted that there was a strong linkage between lean acquisition and lean manufacturing reform. One of the earliest studies concluded that acquisition reform had to include manufacturing issues. One recommendation that permeated all the analyses was that DoD should adopt "best commercial practices." The Task Force also generated several recommendations of its own. These range from alterations to the acquisition process to specific recommendations on lean manufacturing: the empowerment of the work force, education of the total workforce, including management, and examination of cost issues.

Approximately 105 recommendations were identified. These were either garnered from previous studies or developed by the DSB Task Force. Appendix D lists all the recommendations (including those of this Task Force) and their source. The recommendations cover a wide range from organizational and policy recommendations, such as the SecDef establishing an administration position to oversee industrial and technology base capabilities, to empowering the DoD workforce to change the process.

The Task Force concluded that many of the recommendations could be subsumed under other high-level ones. To obtain a smaller set of recommendations, they used a Delphi technique (Figure C-2).¹ The Task Force viewed itself as a panel of experts and evaluated the 105 recommendations. Steps 1 through 4 show how the Delphi process was used. The smaller set of recommendations (Figure C-2, Step 4) was obtained by evaluating the total set of recommendations in order to eliminate redundancies and ensure that many recommendations were subsumed. This iterative process resulted in 41 recommendations (see Figure C-3).

Many of the 41 recommendations, however, lacked specificity in how they might be implemented. Since the charter of the DSB Task Force was to provide a manageable list (6 to 10) of "what to do" or implementable recommendations to the DoD leadership, another assessment of the recommendations was necessary. Next, the recommendations were evaluated in such a way so that the most important ones—those that could generate near- or mid-term improvements to streamlining DoD acquisition and manufacturing—could be identified.

The Task Force iteratively evaluated each of the recommendations in terms of how specific they were in identifying some immediate actions that could be taken in the areas of lean acquisition and manufacturing (Figure C-2, Step 5). The discussions were influenced by individual viewpoints concerning the impact the various initiatives would have on existing DoD processes and the organizational structure. The iterative discussion produced 21 recommendations or suggestions. These recommendations are shown on Figure C-4. This list, however, contained several initiatives that were too broad or merely stated what would be accomplished if certain recommendations were adopted. For example, we found this to be true with the recommendations of "develop a vision" and "DoD should adopt best

¹ The Delphi technique is a process by which a panel of experts agree to a framework for analysis based on a set of criteria. Through each phase of the discussions, the panel utilized the criteria or define a new set of criteria in order to reach conclusions or recommendations on an issue. The Delphi technique is used most often in analyses that require qualitative inputs and where there is a dearth of quantitative inputs.

business practices." The team determined that there were 16 key recommendations that contained specific actions.

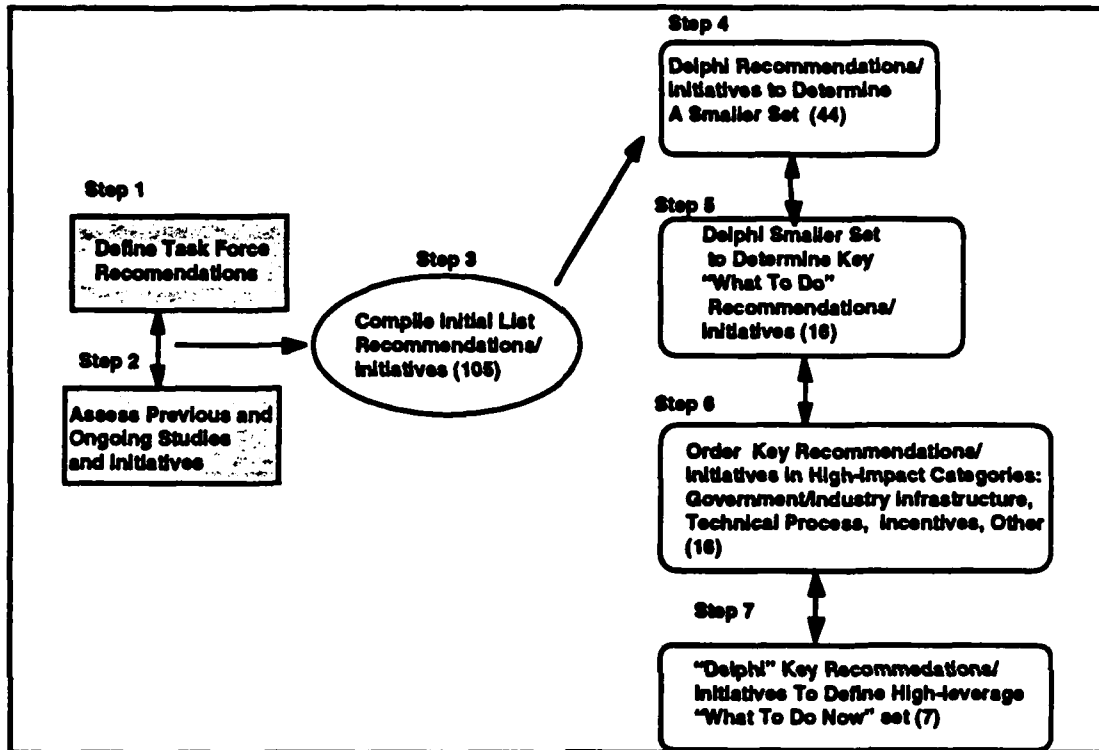


Figure C-2: The Delphi Technique Used By the DSB

1. Support IPPDs and dual-use manufacturing.
2. Educate and train the workforce.
3. Reduce the barrier to manufacturing efficiency by military specifications, procurement regulations, and cost accounting standards.
4. Utilize the best commercial practices in manufacturing.
5. Reward workforce innovation.
6. Perform a sector analysis for industrial base/DoD analysis.
7. Develop an integrated industrial base policy.
8. Establish centers of excellence for semi-conductor science and engineering.
9. Use commercial components, where appropriate, in military hardware.
10. Implement the intent of Goldwater-Nichols.
11. Utilize simulation.

Figure C-3: Key Recommendations Culled from Initial List

12. **Communicate the priority of technology and competitiveness to the American public.**
13. **Adopt a procurement strategy that places a high priority on efficiency, system effectiveness, and industrial responsiveness.**
14. **Conduct activity-based studies on engineering workforce to assess impact on DoD acquisition requirements.**
15. **Adopt concurrent engineering.**
16. **Reward program manager innovation.**
17. **Develop an implementation plan with metrics.**
18. **Encourage the tradeoffs among all DoD resource categories.**
19. **Reduce government infrastructure.**
20. **Reduce industry infrastructure.**
21. **Create an acquisition board to integrate various policy positions.**
22. **Develop a system acquisition plan before system start.**
23. **Eliminate GFE tracking.**
24. **Adopt a no-flow down policy.**
25. **Establish turnkey life cycle support.**
26. **Provide contractor incentives.**
27. **Examine the role of foreign military sales (FMS).**
28. **Streamline technical data process.**
29. **Develop a standard oversight process with metrics.**
30. **Develop R&D for on-going lean enterprises.**
31. **Develop the catalogue order concept.**
32. **Define a vision for lean acquisition and manufacturing.**
33. **Encourage lean manufacturing principles be adopted in the provide sector.**
34. **Review on-going contracts for lean manufacturing attributes.**
35. **Reduce industry infrastructure.**
36. **Implement pilot programs.**
37. **Change the requirements process to include a "needs" document that includes commercialization tradeoffs and selected contractor inputs.**
38. **Establish short, unambiguous lines of authority.**
39. **Give a high priority to building and testing prototype systems and subsystems before proceeding with full-scale development.**
40. **Rely on operational testing to begin early in advanced development and continue through full-scale development, using prototype hardware.**
41. **Institutionalize baselining for major weapon systems at the initiation of full-scale engineering development.**

Figure C-3: Key Recommendations Culled from Initial List (Continued)

1. Provide a vision for lean acquisition and manufacturing.
2. Require implementation plan (with metrics) with all system acquisition programs.
3. Convert existing programs to lean manufacturing.
4. Reduce government infrastructure.
5. Create an acquisition board.
6. Require a complete acquisition plan with all new program starts.
7. Reward program manager innovation.
8. Review all DoD industrial base sectors.
9. Eliminate GFE tracking.
10. Eliminate flow-downs.
11. Establish "turnkey" programs.
12. Provide contractor incentives.
13. Examine foreign military sales to access industrial base implications.
14. Streamline technical data process.
15. Define a streamline process and metrics for oversight.
16. Review all R&D for on-going lean enterprises.
17. Develop R&D "order" book.
18. Produce on-going contractor restricting.
19. Implement best business practices in DoD.
20. Reward lean-manufacturing activities in the private sector.
21. Adopt non-value-added cost model.

Figure C-4: Assessment of 21 Recommendations

The remaining recommendations were then evaluated against a set of criteria. Figure C-5 shows the evaluation. The criteria was defined by what could lead to change and is "do-able." Three major criteria were developed: (1) efficient process, (2) effective result, and (3) implementable. Under each evaluation criterion, subcriteria were defined. Under *efficient process* the subcriteria were cut costs, streamline the workforce, eliminate unnecessary layering, define clear lines of authority, and provide stability. The subcriteria could be read as "if this recommendation were adopted, would the actions result in cutting costs, streamlining the workforce, etc.?"

The second category was *effective result*. This means that "if this recommendation were adopted, would it result in greater effectiveness?" The subcriteria in this category were support for the current administration's vision of reducing government inefficiencies;

support for DoD's goals of reducing infrastructure and streamlining the department's management functions; the stronger linkage of budget goals to programs; and finally, the capability of the recommendation to be sustainable over time, or to be institutionalized.

The final evaluation criterion was *implementable*. This portion of the analysis was to define a set of implementable or "what to do" recommendations. Subcriteria included such issues as organizational disruption, acceptability of change to the DoD culture, the political acceptability of a particular recommendation, and finally, timeliness. By timeliness we mean "should the recommendation be implemented (1) now, (2) in the near-term (3-5 years), or (3) in the long term (beyond 5 years)?"

To evaluate the criteria against the recommendations, a weighting scheme was devised: (1) high/easy, (2) moderate/medium, or (3) low/hard. "N/A" meant "not applicable." For instance, a ranking of one (1) meant that the recommendation had a high value against a specific criterion or was easy to implement.

The horizontal axis of Figure C-5 shows the recommendations. Even though our initial culling yielded 44 recommendations, upon closer examination several were eliminated because of duplication or because they could be subsumed under a broader "what to do" recommendation. This was the case with several of the recommendations on infrastructure and acquisition planning.

The remaining recommendations were assessed with several questions in mind:

- (1) Could a definitive set of the most important "what to do" recommendations be vetted from remaining set?
- (2) Does the definitive set identify the initiatives that would provide near-to-mid improvements?
- (3) How might the recommendations provide a crosswalk between lean acquisition and lean manufacturing?

This phase of the evaluation was shaped by a set of criteria designed to drive out the high-leverage, "do-able" recommendations. These criteria are referred to as *focus areas*. The focus areas were drawn from current publications on streamlining government bureaucracies and processes: David Osborne and Ted Gaebler's *Reinventing Government* (1992); James P. Womack, Daniel T. Jones and Daniel Roos, *The Machine That Changed to World* (1990); and Michael Hammer and James Champy, *Reengineering The Corporation* (1993). For instance all the studies argued that the public needed to trust and have confidence in the government. This could be achieved in various ways:

Evaluation Criteria	Recommendations																	
	Produce Vision	Implement Plan with Metrics	Convert Progs to Lean Mgmt	Reduce Government Infrastructure	Reduce Industry Infrastructure	Create Acquisition Board	Revise Acquisition Plan/Program	Reward Innovation	Eliminate Sectors	Eliminate GFE Tracking	Establish Flow-Downs	Provide Contractor Incentives	Streamline Technical Data Processes	Dev Process & Metrics for Oversight	Develop R&D On-Going Lean Enter	Produce Ongoing Contractor Residual	Imple. Best Business Practices - Private	Adopt Non-Value-Added Cost Model
Efficient Process	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
a) Cut costs	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
b) Streamline workforce	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
c) Eliminate unnecessary layering	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
c) Clear lines of authority	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
e) Provide stability	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Effective Result	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
f) Support Admin. vision	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
g) Support DoD goals	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
h) Links budget to programs	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
i) Sustainable	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Implementable	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
j) Organizational disruption	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
k) Acceptable to the culture	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
l) Acceptable politically	1	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
n) Timeliness (1=Now, 2=Near, 3=Long)	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Key: 1=High/Easy, 2=Moderate/Medium, 3=Low/Hard, N/A=Not Applicable

Figure C-5: Initial Assessment of Recommendations

streamlining, cost savings, etc. The focused areas also met DoD and administration guidelines for current National Performance Review (NPR) goals.

The four focus areas are as follows:

- (1) **Reduce Overhead:** The elimination of redundant or non-essential functions is essential to the creation of lean enterprises. The costs and bureaucratic apparatus associated with supporting non-essential functions places a heavy "drag factor" on organizations and, in particular, DoD.
- (2) **Rational Downsizing:** Frequently when streamlining, organizations tend to downsize according to seniority. Our concept, and one that is consistent with the administration, is that the roles and functions of personnel need to be examined against experience. An organization needs to have a vision of how it is to streamline and what mix of personnel and skills is needed in order to achieve the desired goals.
- (3) **Maintain Public Trust and Confidence:** In the area of government this is one of the most significant issues. The public needs to believe that its government (and the organizations that make up government) are performing to an acceptable standard. This includes both how it operates and the products that it delivers.
- (4) **Impact Ongoing Programs:** Important to any implementation of recommendations is how they can affect acquisition programs currently underway in DoD. This is particularly important since there are few new system starts scheduled for DoD. Thus, if cost savings are to be gained from reform, they must be achieved through implementing cost-effective changes to current programs.

The Delphi technique again was used to ferret out the high-leverage recommendations from the remaining set (see Figure C-6). Figure C-1, Step 5 shows the process as it was applied to the remaining initiatives. The remaining recommendations were grouped according to four major categories: Government/Industry Infrastructure, Technical Process, Incentives, and Other. The categories enabled the Task Force to link the specific recommendations to high impact. Although most of the key recommendations fit under the first three categories, some had no direct applicability to the categories but were judged to have such a high-value impact that they were included under a category heading entitled *Other*. There were three that fell into this category: educate and train the acquisition workforce, review industrial sectors, and identify key pilot programs where acquisition and management reforms can be applied.

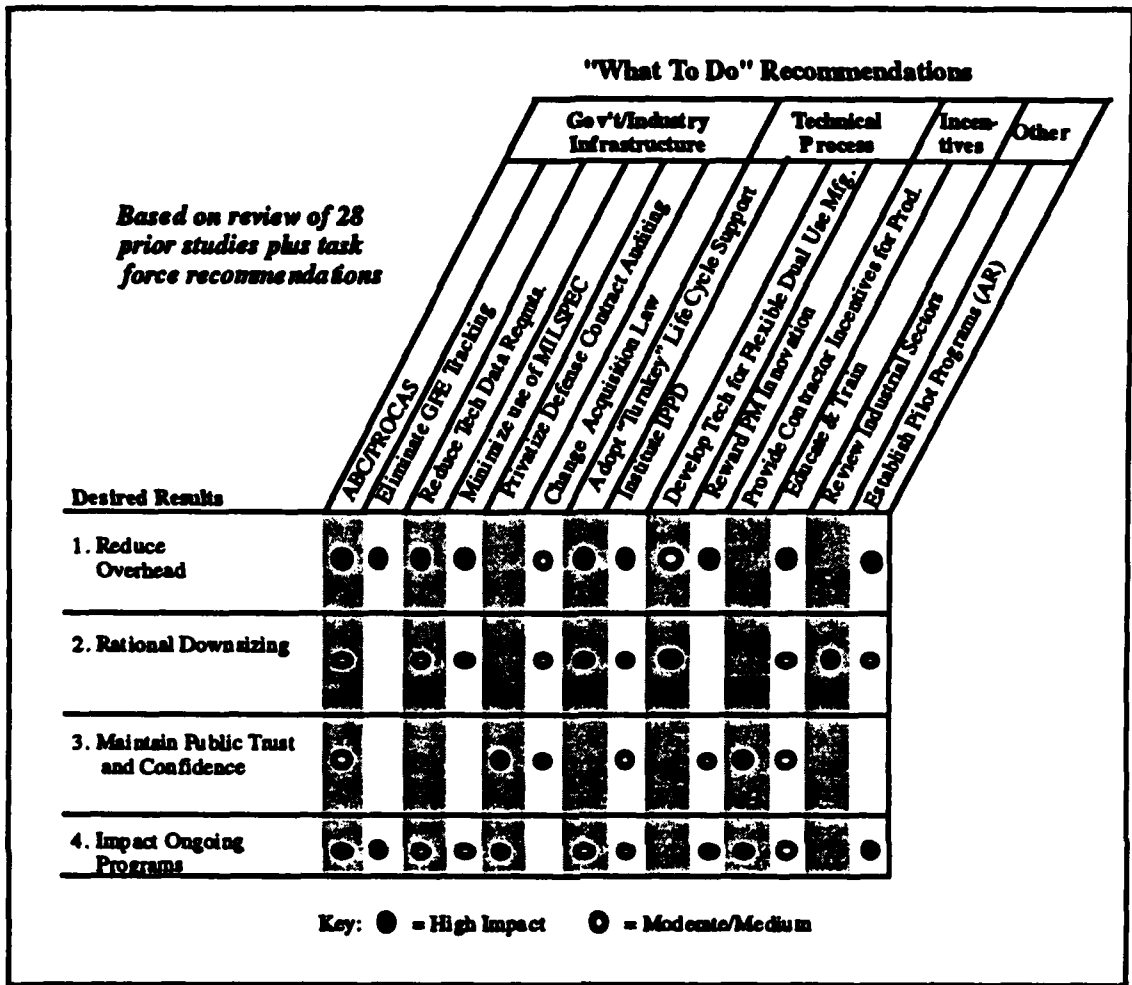


Figure C-6: Weighting of Major Recommendations

The recommendations were then evaluated by the Task Force against the criteria. This final phase of the analysis sought to weight the recommendations in terms of value so that the key 6 to 10 recommendations could be ferreted out. Figure C-6 shows the analysis. A weighting schema was devised: (●) for *high impact*, (○) for *moderate/medium*, and *blank*, indicating that no value has been attached to this suggestion. Some comment is necessary concerning the rankings.

We concluded that a well-educated acquisition workforce could lead to streamlining and reduction of overhead; however, it might not contribute immediately to a rational downsizing of the DoD infrastructure or to the development and maintenance of the public trust and confidence. A reduction of overhead accompanied by a rational downsizing plan, however, would contribute to the reduction of the government infrastructure (as indicated by the high impact symbols). The recommendations also clustered around the first two criteria: (1) the reduction in overhead, and (2) the rational downsizing of the infrastructure.

The Delphi team felt that in a few areas the public trust could be immediately raised and ongoing programs would be immediately affected. The "clustering effect" provided a time dimension to how one might think change is effected, and processes are affected. For instance, such visible changes as *contract restructuring* would almost immediately increase public trust (at least in those manufacturing sectors affected by the restructuring), and it would immediately affect ongoing programs. Based on this analysis seven high-leverage "what to do" recommendations were identified:

- (1) Educate and train the acquisition workforce.
- (2) Reorient DoD to activity-based costing.
- (3) Reduce government infrastructure.
- (4) Adopt "turnkey" life cycle support.
- (5) Contract restructuring.
- (6) Minimize use of military specifications.
- (7) Institute IPPD.

This process could be adopted by DoD as a way to evaluate how the various members of the workforce view what changes should occur in DoD. Such a process would ensure widespread participation among all levels of the leadership and workforce.

APPENDIX D
RECOMMENDATIONS FROM PRIOR STUDIES

RECOMMENDATIONS FROM PRIOR STUDIES

I. DEFENSE SCIENCE BOARD STUDIES

A. 1993—Defense Manufacturing Strategy

1. Government/Industry Infrastructure Recommendations

- a) Introduce the concept and practice of Activity Based Costing to identify non-value-added activities that are impediments to the implementation of lean manufacturing.
- b) Reduce technical data requirements by making use of performance specifications rather than "build to print." Permit manufacturers to retain configuration control while the government retains control of form, fit, function, and interchangeability.
- c) Minimize use of military specifications by, for example, adopting instead the International Organization for Standardization (ISO) quality system standards, the ISO 9000 series.
- d) Privatize defense contract auditing by permitting audit to be done through commercial accounting firms. This need not sacrifice any visibility or accountability and would allow costs to be controlled by competition for the business.
- e) Eliminate the tracking of government-furnished equipment (GFE) having a real residual fair market value (FMV) less than \$10,000. Permit contractors to buy assets at FMV and/or rent it at a real, commercially determined fair rental value.
- f) Sponsor the creation of a commission similar to the Base Closure Commission to address and downsize the public sector of the defense community (depots, arsenals, laboratories, Federally Funded Research and Development Centers (FFRDCs), etc.). The overall guidance to the commission should be to utilize the private sector wherever possible.
- g) Establish metrics and stretch goals to stimulate and measure progress toward the vision. At the top level, these might include ratio of DoD/industry personnel in the Defense Manufacturing Enterprise, percentage of defense products manufactured on commercial (dual use) lines, and number of renegotiated contracts and dollars saved.
- h) Maintain the trust of the public by relying on competitive pricing where possible; utilizing past excellent performance as a basis for future awards; and ensuring quality of the enterprise by having accounting firms conduct audits. Form a team of stakeholders from DoD, Congress, OMB, and industry to oversee the lean Defense Manufacturing Enterprise as it evolves.

2. Technical Process Recommendations

- a) Adopt "turnkey" life cycle support where a single contractor develops, produces, and supports a product or system from its inception until retirement.
- b) Adopt integrated product and process development (IPPD) as a management process to facilitate enterprise-wide coordination of all aspects of DoD activity, including the change to a lean Defense Manufacturing Enterprise.
- c) Invest in technology for flexible dual-use manufacturing to enable defense products to be made on commercial product lines (and vice versa) with no difference in unit cost. The current Science and Technology (S&T) Strategy for Thrust 7 (Technology for Affordability) work should be harnessed to serve this end.

3. Recommendations Related to Incentives

- a) Introduce a series of awards for individuals and organizations to recognize contributions towards achieving the lean Defense Manufacturing Enterprise. These awards should be well publicized, substantial, highly regarded, and fairly applied.
- b) Devise incentives for contractors to participate enthusiastically in the search for efficiencies and savings in ongoing programs and in new procurements.

4. Other Recommendations

- a) Apply the concepts of the lean Defense Manufacturing Enterprise to a pilot program in the area of readiness and spares. Using as many of the detailed recommendations as possible, task the Joint Logistics Command (JLC) to implement a program to enhance the efficiency of the overall spares procurement and deployment activity. This program does not take the place of the overall program; however, it does provide a means to quickly implement this approach within the enterprise.
- b) Education and training in lean manufacturing will be necessary for the entire defense establishment (public and private).

B. 1993—Acquisition Reform

1. Broaden the procurement of commercial products.

- a) Effectively implement and enforce the use of DFARS 211 which relaxes the requirement for cost or pricing data and technical data rights
- b) Implement the Section 800 panel recommendations by regulation wherever possible.
- c) Support the related legislative proposals of the Section 800 panel.
- d) Substitute commercial item descriptions for milspecs in every procurement of a commercial item. The use of a DoD specification or process standard should be prohibited unless it is the only practical alternative.

2. Increase the use of simplified procurement procedures by support the legislative proposal of the Section 800 panel to raise the threshold to \$100,000.
 3. Reduce reliance on cost or pricing data:
 - a) Eliminate cost or pricing data when there is adequate price competition or where fair and reasonable price can be established through "other means," e.g., independent price analysis (via market research).
 - b) Support the Section 800 panel's recommendation that the definition of adequate price competition be expanded and adopt this definition in the DFARS.
 - c) Support the Section 800 panel's recommendation to make permanent the current \$500,000 threshold for submission of cost or pricing data.
 4. Select some industrial sectors which are dominated by the commercial market but are also important to defense, and acquire systems and services in those sectors with commercial practices.
 5. Select two major Unified Commands and increase their military systems capabilities for technology insertion and requirements definition.
 6. Prepare the first of a series of Annual Plans for "commercialization" that lays out in detail goals, action steps, time schedules, and responsible parties.
 7. Establish a standing outside Review Group
 8. Establish a comprehensive education, training, communications, and outreach program for government, industry, and the public.
- C. 1992—Engineering in the Manufacturing Process**
1. DepSecDef articulate the DoD manufacturing philosophy.
 2. DepSecDef designate a champion for integrated product and process and for Dual-Use-Mfg responsible for:
 - a) Working with USD(A) and SAEs to implement the philosophy.
 - b) Education/Training—e.g., DSMC/ICAF Curricula.
 - c) Instituting metrics (e.g., C_{pk}) and incentives to drive change.
 3. USD(A) modify post-Milestone I development process to take advantage of S&T reduction in risk.
 4. USD(A) incorporate IPP in post-Milestone I phases (process maturity metric).
 5. USD(A) incentivize industry use of IPP but avoid IPP how-to specs.
 6. DDR&E implement IPP and exit criteria in ATDs.
 7. DDR&E accelerate capabilities for early learning through modeling and simulation.
 8. DDR&E maximize draw on modern commercial capabilities.
 9. DDR&E conduct recommended experiments (on new or modified ATDs) to be a catalyst for change.
 10. Continue joint planning with P&L and Service Acquisition Executives to maximize IPP continuity.

D. 1992—Simulation, Readiness, and Prototyping

1. The DDR&E and T&E communities and the Services should:
 - a) Establish and enforce standards and protocols to facilitate the interoperability and reusability of ADS tools and technologies in training and materiel development.
 - b) Incorporate standards and protocols into all developments and procurements which contribute to enhancing the ADS environment and its use.
 - c) Fully internet training ranges, test facilities, laboratories, service schools, and industry, and make them DIS compatible.
2. The CJCS and DDR&E should establish a constantly available ADS joint warfare environment and build on existing technology.
3. The DDR&E, the T&E community, and the Services, should carry out a series of experiments and demonstrations using the ADS environment to:
 - a) Refine military hardware concepts and requirements.
 - b) Explore opportunities to shorten development time
4. DDR&E should give priority to investing in ADS tools and technologies.
5. The DepSecDef should:
 - a) Direct procurement of ADS technologies in a modular/evolving process which closely couples users and developers and exempts ADS from the 5000.1 process.
 - b) Select and execute several acquisition programs which will employ an ADS environment for all steps from concept for fielding to build confidence in modification of 5000.1, to include fast track and step skipping measures.

E. 1991—Weapon Development and Production Technology

1. USD(A) balance production process with product technology R&D investment by establishing a production process R&D plan (DDR&E), and increasing emphasis on the ManTech program.
2. USD(A) designate lead-the-fleet programs to effect integration of on-time critical detailed planning for the entire program life cycle, from requirements through the end of the system's service.
3. USD(A) reduce the barriers to manufacturing efficiency caused by "how-to" specifications, procurement regulations, and cost accounting standards.
4. USD(A) conduct industrial base studies for individual defense sectors and incorporate results into strategic plans, including the annual Defense Industrial Base Report.
5. USD(A) capitalize on on-going strategic planning efforts of the ManTech program, and begin development of a broader DoD "Defense Manufacturing Plan" that encompasses all DoD technology, acquisition, and human resource activities related to defense manufacturing.

6. USD(A) should take advantage of all existing means to incentivize industry investment and further defense manufacturing technology and operations.
- F. 1990—Simultaneous Engineering of Defense Products and Processes**
1. Modify acquisition timing and expectations and clarify R&D resource allocation.
 2. Modify organizations and practices.
 - a) Establish team relationships.
 - b) Modify business practices.
 - c) Integrate design-to-cost, performance, schedule.
 - d) Establish acquisition processes self-benchmarking.
 3. Educate the acquisition workforce.
- G. 1989—Use of Commercial Components in Military Equipment**
1. The SecDef and USD(A), as appropriate, should direct the Services, DLA, and the Office of the Secretary of Defense to take appropriate action to implement establishing a components demonstration program, using microcircuits as a case study.
 2. SecDef should direct all Services to cooperate with industry in the development of the open systems architectural standards for both hardware and software. If warranted, these standards should become the basis for all future hardware and software acquisition.
 3. The pilot program proposed legislation should be submitted to the Congress and should be vigorously supported.
 4. SecDef should establish a Directorate for Commercial Acquisition within the USD(A) and direct that the Services and DLA establish or designate appropriate organizational entities at headquarters and at buying commands.
 5. SecDef and USD(A) should continue to support actions associated with the Enhancing Defense Acquisition report at a high level of attention and interest.
 6. SecDef and USD(A) should continue to support the OFPP/DoD proposed legislation on commercial buying, Commercial Products Acquisition Act.
- H. 1988—Defense Industrial and Technology Base**
1. SecDef should establish permanent Cabinet-level mechanism to determine industrial and technology base capabilities.
 - a) Compare with national objectives.
 - b) Develop national policy initiatives to reconcile differences between industrial and technology base capabilities and national security objectives.
 2. Improve the planning mechanism affecting surge capabilities.
 - a) SecDef should issue guidance on planning, programming and budgeting to ensure service planning for surge.

- b) USD(A) should incorporate decisions on surge capability acquisition strategies at the defense acquisition board milestone reviews.
 - c) JCS 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."
3. DoD should implement those policies and procedures necessary to adequately compensate and reward high quality technical talent.
 4. DoD should propose an organizational structure for select facilities which could enable private sector operation under government control.
 5. USD(A) should develop and implement centralized and integrated policies to effect industrial base development, acquisition processes, and coordinated service implementation.
 6. USD(A) should implement a set of consistent and integrated acquisition policies.
 7. Because IR&D has profound influence on the ability of industry to satisfy DoD's evolving needs, the SecDef should:
 - a) Reaffirm the importance of IR&D to DoD.
 - b) Determine IR&D ceilings in the context of long-term assessment of technology requirements.
 - c) Endorse the existing method of IR&D/B&P cost recovery.
 8. USD(A) 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.
 9. DoD should undertake to reverse the deterioration of the maritime segment of the industrial base to ensure the credibility of our conventional deterrent.
 10. Further improvements should be made to the policies governing the use of best and final offers.
 - a) USD(A) should convene a high-level joint government-industry group to consider further modifications of regulations governing best and final offers.
 11. SecDef should support current investigations and any resulting prosecutions to ensure fair, firm, and rapid resolution.
 12. SecDef should 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.
 13. SecDef should ensure that government and industry managers have adequate knowledge of relationships among consultants, suppliers, and the government to avoid possible conflicts of interest.
- I. 1987—Defense Semiconductor Dependency**
1. Support establishment of a Semiconductor Manufacturing Technology Institute.

2. Establish at eight universities Centers of Excellence for Semiconductor Science and Engineering.
3. Increase DoD spending for research and development in semiconductor materials, devices, and manufacturing infrastructure.
4. Provide a source of discretionary funds to the Defense Department's semiconductor suppliers.
5. Establish under the Department of Defense a Government/Industry/University forum for semiconductors.

J. 1986—Use of Commercial Components in Military Equipment

1. USD(A) change the requirements process to include a "needs" document that includes commercialization tradeoffs and selected contractor inputs.
2. ASD(P&L) revise FAR to implement policies, guidance, and procedures for acquisition of commercial products and using commercial practices.
3. ASD(P&L) strengthen the emphasis on the specifications and standards initiatives—Mil Prime, commercial specifications, streamlining, variable environments, etc.
4. ASD(P&L) shift the integrated circuit procurement process to include removing the precedence of MIL-STD-454, certifying designs and processes vs. parts, streamlining the MIL drawing system, and adopting a military/industrial specification.
5. DAE and SAEs give PM discretionary authority to use commercial practices and products when appropriate.
6. DAE and SAEs implement pilot programs to validate benefits of legal regulatory exemptions explicit in commercial practices.

II. DOD STUDIES

A. 1993 DDR&E—Technology for Acquisition Reform Study

1. Make advanced distributed simulation (ADS) the key decision making tool within the DoD acquisition process.
2. Broadly implement IPPD and select a few "lead the fleet" programs.

B. 1993 DoD—Streamlining Defense Acquisition Law Executive Summary: Report of the DoD Acquisition Law Advisory Panel

1. Ease of administration requires a single definition for commercial items to be used uniformly throughout DoD (study recommends new definition).
2. An expanded exemption for 'adequate price competition' in the Truth in Negotiation Act.
3. Relief from inappropriate requirements for cost or pricing data when a contract for commercial items or services, awarded competitively, is modified.
4. New exemptions to technical data requirements in commercial item acquisitions.

5. A new structure for "Buy American" restrictions in a proposed new chapter on Defense Trade and Cooperation.
 6. A new subchapter of 10 U.S.C. §2302 for commercial acquisitions which creates a new rule structure and provides exemptions for statutes that create barriers to the use of commercial items, and includes provisions on pricing, documentation, and audit rights tailored for commercial item acquisitions.
- C. 1991 ISAT/DARPA—Intelligent Manufacturing**
1. Establish key pilot programs.
- D. 1986 Blue Ribbon Commission on Defense Management—A Quest for Excellence: Final Report to the President (Packard Commission)**
1. National Security Planning and Budgeting
 - a) Defense Plan should start with a comprehensive statement of national security objectives and priorities.
 - b) President should issue provisional five-year budget levels to the DoD.
 - c) SecDef should instruct JCS to prepare a military strategy for national objectives.
 - d) Chairman should prepare broad military options.
 - e) Chairman should prepare a new assessment of the effectiveness of US and Allied Forces as compared to those of possible adversaries.
 - f) President should select a particular military program and the associated budget level.
 - g) President should submit to Congress two-year budget and five-year plan on which it is based.
 - h) DoD should present budget to Congress on basis of national strategy and operational concepts rather than line items.
 2. Military Organization and Command
 - a) Chairman, JCS should be the principal uniformed military advisor to the President, NSC, and SecDef.
 - b) Joint Staff and Organization of the Joint Chiefs of Staff should be under the exclusive direction of the Chairman.
 - c) Commands to and reports by the CINCs should be channeled through the Chairman.
 - d) Service Chiefs should serve as members of the JCS.
 - e) Unified Commanders should be given broader authority to structure subordinate commands, joint task forces, and support activities.
 - f) The Unified Command Plan should be revised to assure increased flexibility.

- g) The SecDef should have the flexibility to establish the shortest possible chains of command for each force deployed.**
- h) The SecDef should establish a single unified command to integrate global air, land, and sea transportation.**

3. Acquisition Organization and Procedures

- a) Create new position - Under Secretary of Defense (Acquisition).**
- b) Army, Navy, and Air Force establish a comparable senior position filled by a Presidential appointee.**
- c) Establish short, unambiguous lines of authority.**
- d) Recodify all federal statutes governing procurement into a single government-wide procurement statute.**
- e) Joint Requirements and Management Board should be co-chaired by the USD(A) and the Vice Chairman of JCS.**
- f) DoD should make greater use of components, systems, and services available "off-the-shelf."**
- g) High priority should be given to building and testing prototype systems and subsystems before proceeding with full-scale development.**
- h) Operational testing should begin early in advanced development and continue through full-scale development, using prototype hardware.**
- i) Federal law and DoD regulations should provide for substantially increased use of commercial-style competition.**
- j) DoD should fully institutionalize "baselining" for major weapon systems at the initiation of full-scale engineering development.**
- k) DoD and Congress should expand the use of multi-year procurement for high-priority systems.**
 - l) The President, through the National Security Council, should establish a comprehensive and effective national industrial responsiveness policy to support the full spectrum of potential emergencies**

4. Government-Industry Accountability

- a) Continued aggressive enforcement of federal, civil, and criminal laws governing defense acquisition.**
- b) Defense contractors must promulgate and vigilantly enforce codes of ethics that address the unique problems and procedures incident to defense procurement.**
- c) DoD should vigorously administer current ethics regulations for military and civilian personnel.**
- d) Oversight of defense contractors must be better coordinated among the various DoD agencies and Congress.**

- e) Government actions should foster contractor self-governance.
- f) The Federal Acquisition Regulation should be amended to provide more precise criteria.

III. NATIONAL RESEARCH COUNCIL

A. 1993 NRC—Breaking The Mold: Forging a Common Defense Manufacturing Vision

1. There must be a major investment in both “hard” (e.g., process technology) and “soft” (e.g., education and training) technology .
2. DoD must invent its own unique change process—a new Defense Manufacturing Strategy:
 - a) Create a vision of manufacturing
 - b) Create a working cadre
 - c) Select a change strategy
 - d) Communicate the initiative

B. 1991 NRC—Improving Engineering Design

1. Develop better working relationship between academia and industry.
2. Form a National Consortium for Engineering Design (NCED).

C. 1991 NRC—The Competitive Edge: Research Priorities for U.S. Manufacturing

1. Research in the area of intelligent manufacturing control should be aimed at:
 - a) Developing technique-oriented communication standards.
 - b) Refining sensor technology in data integration, pattern recognition, and actionable models.
 - c) Building knowledge bases of design, manufacturing, and management intelligence that can adapt to changing knowledge and organization structures.
 - d) Creating a dynamic model of manufacturing.
 - e) Identifying ways to use the human-machine interface to facilitate learning in an integrated environment.
 - f) Redefining methods to accommodate holistic research in a production environment.
2. Research should focus on:
 - a) Needs in the areas of materials science and engineering, expanded.
 - b) Revised education programs and objectives.
 - c) Methods for better integrating materials-specific issues in manufacturing paradigms.
3. Research in the area of product realization process should be directed at:
 - a) Defining, identifying specific instances of, and developing intelligent images.

- b) Identifying and establishing the requisite connections among images.
- c) Devising an organization structure in which these concepts can be made operational.

IV. NATIONAL SCIENCE FOUNDATION

A. 1992 NSF—Fundamental Research in Manufacturing for National Competitiveness

- 1. Enhance technology transfer to industry.
- 2. Enhance coordination of funding within government agencies; team up federal agencies to implement new programs to complement NSF's basic research role in manufacturing engineering.
- 3. Build interfaces between researchers from different universities.
- 4. Rebuild the university infrastructure.
- 5. Broaden manufacturing research programs.
- 6. Broaden education programs in manufacturing.
- 7. Reorganize NSF to better utilize intellectual resources in manufacturing.

V. OFFICE OF TECHNOLOGY ASSESSMENT

A. 1992 OTA—Building Future Security

- 1. DoD must make greater efforts to exploit civilian technology.
- 2. The government should ensure that an essential capability continues to exist in the DTIB.
- 3. Funding for the DTIB should reflect the fact that it is a critical component of U.S. national security.

VI. SERVICE STUDIES

A. 1992 Air Force—Manufacturing 2005

- 1. Adoption of six key manufacturing elements: IPPD, selective international sourcing, quality focus, flexible/agile manufacturing, vertical partnering, commercial-military production integration .
- 2. Implementation through pilot programs, focus on both program and industrial base impacts.

B. 1991 Army—Simulation Strategy Summer Study

- 1. Require simulation in the form of electronic prototypes throughout all phases of the force development and materiel acquisition process
- 2. Mandate the Electronic Battlefield for early evaluation of operational utility.

VII. OTHER STUDIES

A. 1993 TASC—Comparative Assessment of the Defense and Commercial Sectors

- 1. USD(A) should conduct activity-based case studies on the engineering workforce to assess the impact of DoD acquisition requirements.

2. USD(A) should conduct a comprehensive survey to determine the extent, nature, and causes of both integration and segregation.
3. OSD should designate a single office with primary responsibility for coordinating, collecting, and distributing Federal agency data within DoD.
4. OSD should work closely with other Federal agencies to enhance the usefulness of this data for DoD.
5. OSD should encourage BLS to make available its industry/occupation database at the four-digit SIC level.
6. Federal data should be incorporated into the Defense Industrial Base Information System to be established under the Defense Production Act.
7. DEIMS translator should be updated to accurately reflect full contributions of lower tier suppliers.

B. 1992 Carnegie Commission—A Radical Reform of the Defense Acquisition System

1. The SecDef should undertake with high priority a radical reform of the defense acquisition system.
 - a) Conversion from a regulation-based system to a market-based system.
 - b) The current system and the new price-based, commercial-practice system would operate in parallel for several years; it would be possible to move most of the procurement activity within the first four-year term.

C. 1991 Council on Competitiveness—Gaining New Ground: Technology Priorities for America's Future

1. Make research on generic industrial technologies a national R&D priority.
2. Create U.S. economic climate more conducive to manufacturing, innovation, and investment in technology.
3. Communicate the priority of technology and competitiveness to the American public and involve key policymaking bodies more closely in the issue.
4. Develop policies and programs to ensure that America has a world-class technology infrastructure

D. 1991 CSIS—Integrating Commercial and Military Technologies for National Strength

1. DoD should adopt a procurement strategy that places higher priority of efficiency, system effectiveness, and industrial responsiveness through linkage to a broad commercial infrastructure wherever possible.
2. Support clarification of the Competition in Contracting Act to allow "effective competition."
3. Support modification of TINA to exempt commercial companies or business units from the cost or pricing requirements of the act.

4. Amend the 1983 supplement to the Defense Production Act to allow "market acceptance" as one of the evaluating criteria for product selection.
 5. Accept the Defense Management Improvement Act proposal to establish a "list of sources for repetitive commercial procurements."
 6. Enact legislation to make cooperative industry-laboratory R&D ventures an explicit mission of the federal and national laboratories.
 7. Support all DoD initiatives that come out of the above actions (including those from the joint government-industry forum on legislative clauses inconsistent with commercial-style buying practices that are to be waived when appropriate).
- E. 1989 CSIS—Deterrence in Decay: The Future of the U.S. Defense Industrial Base**
1. U.S. must maintain a defense industrial base that is efficient, competitive, and flexible.
 2. Executive and legislative leadership must reorganize the way they manage the government's involvement in the defense industrial base to take account of the realities of the base as it exists.
 3. The government must finance special incentives to attract the best industrial talent available.
- F. 1989 ADPA—Manufacturing Technology: The Key to the Defense Industrial Base**
1. Establish an OSD Plan for ManTech.
 2. Expand the ManTech budget to a level sufficient to accomplish the objectives of the plan.
 3. Demonstrate and pursue a clear link between ManTech and related DoD initiatives.
 4. Establish a realistic set of goals and risk vs. reward expectation for ManTech projects.
 5. Pursue implementation and innovative methods of technology transfer.
- G. 1988 IDA—Concurrent Engineering Study**
1. DoD should adopt current engineering and, therefore, determine how to implement it in the acquisition process.
- H. 1988 IDA—Defense Acquisition: Observations Two Years After the Packard Commission**
1. Organization
 - a) The Secretary should delegate acquisition policy authority to USD(A).
 - b) The Secretary should act to standardize and simplify acquisition oversight and policy responsibilities within the Services.
 - c) The Secretary should revise directives to clearly establish the program manager's decision authorities, and eliminate management involvement by staffs at all levels.

- d) **The Under Secretary should review his staff for possible reductions.**
 - e) **The Secretary should direct the Under Secretary and Service Acquisition Executives to consult with Congress in developing a plan for reducing the micro-management of programs by Congressional staff, and for consolidating reporting requirements.**
- 2. Decision-Making Processes**
- a) **The Secretary and Chairman of the JCS should review the defense program and budget with the President and Congress as soon as possible after taking office in order to achieve an agreement on stable defense funding.**
 - b) **The Secretary should direct the Under Secretary and the DAB to review the ongoing acquisition program and offer alternative acquisition programs that meet conservative fiscal guidance.**
 - c) **The Secretary should enforce a long-range strategic approach in the acquisition decision-making process and direct the Under Secretary to develop better long-range planning tools.**
 - d) **The Secretary should use the Defense Guidance as a strategic planning tool, and discipline the resource-allocation process and acquisition process to comply with it.**
 - e) **The Under Secretary should use the DAB to discipline the acquisition process.**
- 3. Policy and Regulation**
- a) **The Under Secretary and the Service Acquisition Executives should develop more uniform regulations, and require that they are uniformly interpreted and applied.**
 - b) **The Under Secretary should aggressively support Defense Enterprise programs as a vehicle for experimental changes in regulations.**
 - c) **The Under Secretary should strive to eliminate barriers to the use of commercial-style competition and the use of commercial products wherever militarily appropriate.**
- 4. Management of Personnel, Technology, and the Industrial Base**
- a) **The Under Secretary should upgrade and standardize the criteria for experience, education, and training for all acquisition personnel.**
 - b) **The Secretary should direct the Under Secretary to establish program management career incentives to retain experienced program managers.**
 - c) **The Under Secretary should assign a senior staff member to monitor programs and developments in acquisition personnel management.**
 - d) **The Under Secretary, with the DAB, should conduct an annual strategic review of infrastructure programs relating to science and technology programs and the industrial and technology base.**

- e) The Secretary should work with the Executive Branch and Congress to develop improved "revolving door" legislation that meets the public's concerns with ethics while reducing the financial barriers to government service.

I. 1987 IDA—A Perspective on the Defense Weapons Acquisition Process

1. Research should continue in the area of the defense weapons acquisition process and it should be pursued along two paths:
 - a) Select specific initiatives for more detailed examination as to their impact on the acquisition process and whether they contributed positively or negatively to decisions.
 - b) Expand the decades experience comparison, particularly of the 1960s, 1970s, and 1980s in terms of program outcomes.

J. 1987 CSIS—U.S. Defense Acquisition: A Process in Trouble

1. Congress should establish a commission to examine the role and responsibility of Congress through all stages of the acquisition process.
2. Three broad actions to aid government in retaining and attracting sufficient numbers of professional competent acquisition personnel:
 - a) Make full use of Public Law 313 criteria to retain and attract qualified personnel.
 - b) Restructure and reclassify job descriptions and professional qualification requirements to ensure an appropriate match between critical positions and qualified personnel.
 - c) Expand mid-career training and educational opportunities for acquisition personnel.
3. A General Advisory Board on Defense Acquisition should be formed, with congressional support:
 - a) Include executive and legislative branch representatives and experts from the private sector.
 - b) Would monitor the implementation of acquisition reforms
 - c) Would prepare annual report to Congress on the progress being made toward improving national capabilities in these areas.
 - d) Would be chartered for a maximum of five years.

VIII. SUPPLEMENT—Summary of Previous Recommendations on Department of Defense Acquisition, 4 November 1985

APPENDIX E

BRIGHT SPOTS

The process improvement approach can work in the DoD enterprise. Grass roots initiatives, which embody the principles of the lean Defense Manufacturing Enterprise, are sprouting up throughout the Services and agencies. These bright spots can be the building blocks for continued development and expansion of process improvement in the DoD.

- **Air Force Lean Aircraft Initiative (LAI)** includes academia (Massachusetts Institute of Technology), industry, and the government, and is making a dynamic change toward lead practices and processes. The *Manufacturing 2005* initiative establishes pilot programs to demonstrate the combined efforts of manufacturing technology and lean acquisition practices. The *Manufacturing Development Initiative (MDI)* focuses on concurrent development of product and process during the acquisition of a weapon system.
- **Army Integrated Development Team Acquisition Initiative** is a series of training and education briefs to encourage formation of integrated development teams.
- **ASD C³I Business Process Reengineering** program provides the tools and methodologies for formal process modeling and process improvement *before* investing in process automation.
- **Congress/DoD Section 800 Panel report** presented recommendations for specific and far reaching changes to acquisition laws.
- **Congressional Defense Acquisition Pilot Program**, mandated in Section 809 of Public Law 101-510, authorizes DoD to nominate programs as pilots to waive selected statutory and regulatory rules to improve the acquisition process and test acquisition reform.
- **DLA Corporate Contracting** is a prototype to combine requirements into sole source long-term contracts on a corporate basis with major suppliers.
- **DSB 1993 Task Force on Defense Acquisition Reform** defines the scope and method to comprehensively modify the process by which DoD should acquire goods and services.
- **Joint Logistics Commanders Flexible Computer Integrated Manufacturing (FCIM)** is a joint initiative which includes DoD and industry cross-functional teams conducting experiments in process improvement and cycle time reduction.

- **Navy Best Manufacturing Practices (BMP)** links government, industry, and academia to exchange information on benchmarking, problem solving, quality, productivity, and competitiveness by sharing *proven* best practices.
- **Navy Centers of Excellence** are cooperative centers established with government and industry partnerships to advance manufacturing technology and facilitate its implementation.
- **OSD DDR&E S&T Thrust 7, Technology for Affordability**, focuses S&T investment to develop and execute technology and process demonstration programs aimed at significant affordability improvements.

APPENDIX F

METRICS

Metrics, like the vision statement and strategic plans, need to be set by the process owners and stakeholders. DoD leadership should establish some overall measures, with each process then establishing metrics within specific activities to support these high level measures of accomplishing the vision. Establishing metrics that reflect the new vision and goals is a primary mechanism to send a clear signal on the behavior changes expected within an organization. Changing metrics from traditional cost control and inspection-based measures to performance-based measures will reinforce timely delivery, quality processes, and affordability. Metrics internal to DoD need to reenforce the intent to reduce infrastructure and overhead, and change behaviors to the process focus critical to a lean enterprise. Metrics must be dynamic to support the continuous improvement thrust of lean production.

Establishing effective metrics requires a focused initiative involving all the stakeholders. This includes the process and subprocess owners, participants, customers, and suppliers. Adequate metrics deserve some amount of careful thought since effective metrics can support change at a maximum rate, while application of improper metrics may lead to actions detrimental to the goals established by the new vision. Frequently the initial metrics considered are not ultimately the ones proven most effective, but their evaluation by the process team leads to better understanding of the process, and the cause and effect of actions on the process.

In commercial enterprises, the overall success metric has to do with return on investment or opportunity to gain a competitive advantage. Every activity is measured in terms of its potential for increased profitability. DoD is not profit driven, but is driven by readiness and capability to meet threat and contingency situations. The overall mission metric should be set to ensure operational forces are available, with operational weapons and technology to meet the threat. The metric should also monitor and drive a trend to improved affordability for required readiness and capability.

Every activity should be measured in terms of its potential contribution to readiness and capability. Examples include:

- Operational availability of systems to contingency plans per support and related infrastructure dollar spent. The operational availability measure focuses on

those systems required to meet the projected contingency. Dollars should include the logistics materiel pipeline, as well as infrastructure costs to include materiel managers, repair depots and oversight and HQ overhead.

- New weapon system value per investment dollar and related infrastructure dollar spent

In a vision that includes affordability through commercial practices, metrics need to be set to monitor performance towards dual use or commercial product. Such metrics might include cost of commercial product included or total delivered cost.

In the proposed environment of "rollover plus" and limited production, the ability to produce quickly in response to a contingency will have a direct correlation to DoD readiness. Thus it is imperative that metrics be established to support a continuous improvement in capability to rapidly deliver an affordable product to meet a newly emerged contingency. Examples of time-driven metrics which drive improved performance include:

- Non-value-added Cost removed/total labor cost
- Supplier on-time quality
- Overtime hours
- Percent of contract items delivered by due date

In the current budget crisis, it is imperative that DoD internal metrics be established to ensure infrastructure and direct processes are balanced with technology investment and operational forces. Without a metric to continuously drive down indirect and overhead costs, through process improvements which drive out non-value-added steps, infrastructure costs will increase to an inappropriate percentage of the total available budget, and readiness will suffer. Metrics which might be used at lower levels to measure progress towards affordable support might include:

- Commercial equivalent cost/contractor cost
- Cost to government/agreed to price
- Inventory turns (total material purchases/current material in use)

Metrics could be set up that monitor the recommendations made in this report. Such metrics include:

- Number of people by process in DoD
- Overhead costs as a percentage of budget
- Commercial content

- **Number of people trained in lean production techniques**
- **Number of existing contracts renegotiated to lean emphasis and dollar value saved**

As critical as establishing metrics is the establishment of stretch goals for improved performance. Stretch goals are established to produce major improvement and achieve and pace world-class performance. They differentiate the process focus approach from traditional improvement methodology. When realized or even partially accomplished, they separate winners from losers. Stretch goals challenge creativity to meet and/or beat best in class benchmarks. They are deliberately set in a manner which precludes attainment by minor changes and "belt tightening."

Finally, teams, process owners, and individuals need to be rewarded based on achievement in making major progress in attaining the vision as documented in the revised metrics and defined by the stretch goals. Old metrics should be eliminated to ensure consistent articulation of the vision and rewarding of behavior that leads to the vision. Once a goal is achieved, new stretch goals need to be established.

Defense Science Board

Summer Study Task Force
on the



Edwin L. Biggers Gordon R. England
Co-Chairmen

August 20, 1993

1

Good Morning, Mr. Secretary, Ladies and Gentlemen.

We are pleased to present the results of the Summer Study Task Force on "Defense Manufacturing Enterprise Strategy." We have added the word "Enterprise" to more accurately reflect the scope of the study. We have also adopted a logo to further emphasize that our study results will impact a broad spectrum of the enterprise; namely, Readiness, Support, Production, Development and Requirements.

In some ways this is a follow-on task force to last year's study, "Engineering in the Manufacturing Process." But in most ways, this is a significant departure. In this study, we are dealing with systemic issues in the total enterprise and are making recommendations to address these systemic issues. In a broad sense we are recommending a break with the current system and the implementation of a new system based on the proven principles of lean manufacturing.

Terms of Reference

This Task Force shall build upon existing studies to create lean acquisition processes for the DoD and lean manufacturing processes for industry. The study should primarily focus on creating a manufacturing strategy that is in concert with commercial industry.

This Task Force shall:

- 1) Identify those Government acquisition policies and practices that impede lean manufacturing**
- 2) Make recommendations to streamline or change appropriate DoD policies to enhance world-class production**
- 3) Recommend manufacturing strategies to break traditional cost and volume relationships**
- 4) Recommend how to re-orient the DoD acquisition workforce to these fundamentally new manufacturing policies, practices, and procedures.**

2

Our Terms of Reference (TOR) are fairly broad but are also very focused and our study is fully responsive to the intent of the TOR. The study has identified the barriers to lean manufacturing. The study has addressed how to make the DoD enterprise world class, not only in production as stated in the TOR, but across the enterprise. Recommendations are made to implement fundamentally new manufacturing policies, practices, and procedures.

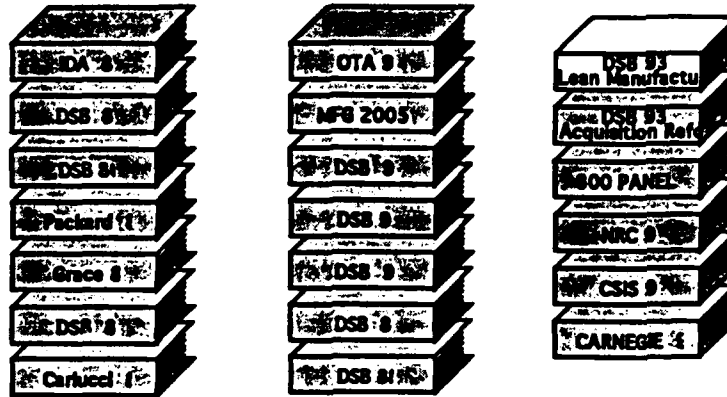
It is important to note that while the TOR addresses a manufacturing strategy, the study has used this terminology in the broadest sense. In this study, the term "manufacturing" applies to the total enterprise, from the factory floor to the executive suite and from the military operating units to the Secretary of Defense.

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Mr. Edwin Biggers	Mr. Gordon R. England
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(Ed Biggers/Gordon England) and I would like to thank Under Secretary Deutch, Deputy Under Secretary Preston, ARPA Director Denman, DSB Chairman Kaminski, and the members of the summer study task force. This includes a special thanks to our immediate membership, advisors, and staff, but also to those in the other two task forces who have added their insight to this critical topic which affects us all. This was an expert, close-knit, and highly-integrated team that interacted very positively to achieve the product of this study.

Appropriately, our task membership includes OSD, DDR&E, the Services and industry, many of whom have served in previous and related task forces. We intentionally included a broad spectrum of Government advisors, as these people will be the initial DoD force that will accept and implement the new enterprise.

Earlier Studies Have Exhausted This Subject



...and what to do is well documented

4

As you are all aware, a myriad of valuable studies, accomplished over the years, have addressed the problems of defense manufacturing reform and acquisition strategies.

This chart depicts a sampling of those more recent studies which have produced well documented recommendations. Few of these, however, have been implemented. For instance:

- Replace military specifications with commercial practice
- Implement concurrent engineering (i.e. integrated product/process development)
- Reduce tech data requirements
- Reduce government infrastructure
- Integrate the civil/military industrial base

We have elected not to add to these "what to do" recommendations. We recognize that more "what to do" recommendations would merely add to the burden already in place.

Existing Barriers Have Prevented the Implementation of Prior Recommendations

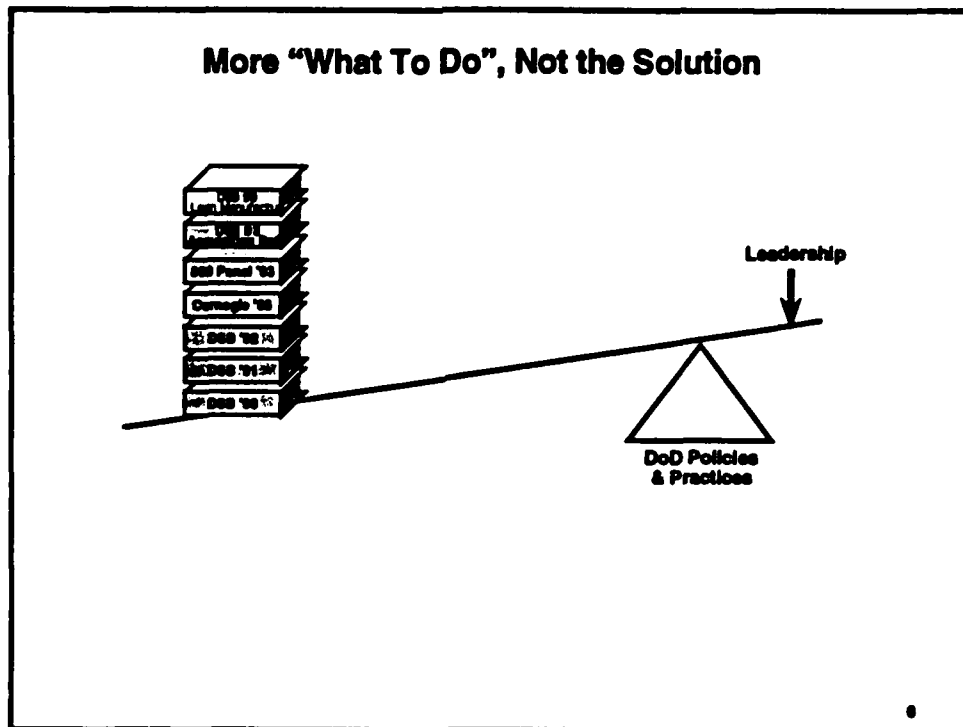
- 1) Performance-Driven Program Definition ("Requirements")**
 - Does not balance costs and performance
- 2) Cost-Based Contracting**
 - Focus is on justifying costs (not reducing them) - - incompatible with market-based, value prices
- 3) Expensive and Sluggish Design**
 - Focus is on mil-specs and standards, incremental design and production/support, and pushing new technology before it's ready
- 4) Risk Aversion Procurement**
 - Excessive focus on prevention of "Fraud and Abuse" - - no mistakes allowed, rather than broadly improving efficiency and effectiveness

Many of the historic defense practices have created large disincentives toward the implementation of prior recommendations, and to the implementation of changes to the system which will reduce costs and improve responsiveness.

Prior studies have identified four areas that have created major barriers to the successful implementation of the prior recommendations:

1. Weapons' requirements are almost totally performance driven - - thus, there is little incentive to strive for cost/performance tradeoffs, or for cost-reducing design changes;
2. Defense contracting is unduly based on justifying and auditing costs, rather than striving to reduce costs (thus, more oversight is considered better, even if it drives up costs significantly);
3. DoD developments now take over 16 years (from concept through first production) and result in increasingly expensive weapon systems. The use of military specifications and standards, the separation of design and manufacturing, the forcing of new technology into the field before it is proven and other such historic DoD practices, directly cause higher cost and longer development times. Conversely, many available technologies take too long to field.
4. The thrust to improve has been overshadowed by a risk averse approach driven by an excessive focus on fraud and abuse. This focus permeates the entire enterprise and adds significantly to cost while detracting from efficiency and effectiveness objectives.

The focus must be shifted back to broadly improving the efficiency and effectiveness of the total system.

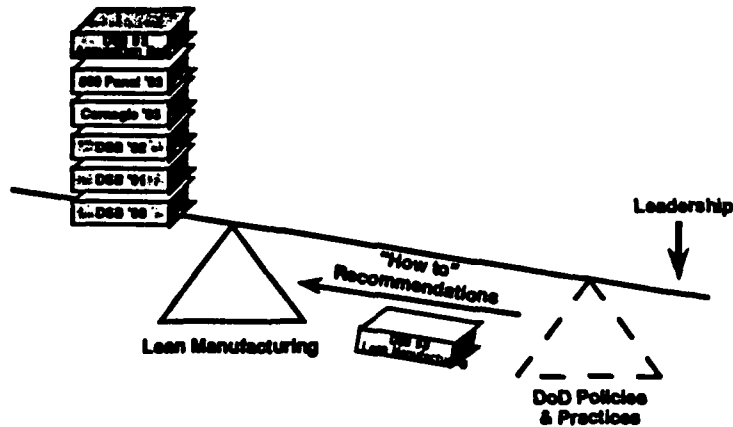


The many recommendations on the subject of manufacturing, acquisition and defense industrial management have not had the impact the report drafters intended. Why?

Fundamentally, we believe it can be traced to the lack of a process, especially within the Pentagon, to deal with the specific recommendations. Leadership did not have an adequate lever arm to implement the changes proposed. This Summer Study recommends a different approach. Our approach suggests "how to" implement change in the Defense Manufacturing Enterprise, rather than more "what to" implement.

In our judgment, the enterprise is too focused on products and programs rather than on management practices that impede change.

**This Study Focuses on How to Implement
a Revolutionary Management Approach for DoD**

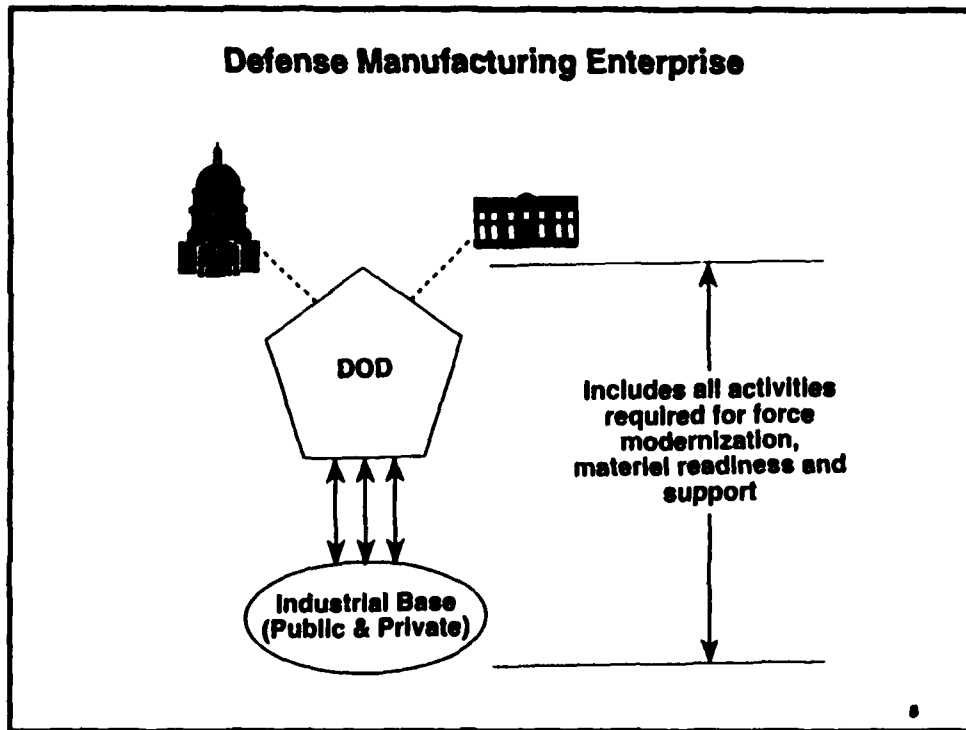


"Give me somewhere to stand and I can move the earth."
- Archimedes, 287 - 212 BC

"...and maybe the defense enterprise"
- DSB, 1993 AD

7

Just as Archimedes, we are suggesting the DEPSECDEF and USD(A) find a different place to stand. That stand is to implement principles that best capture those practiced by lean manufacturing organizations. These organizations know the principles apply not just to manufacturing but to the entire organization. When Dr. Edwards Deming was first asked to help Ford Motor Company, Ford wanted to ask him about what to do...technical specifics. Deming wanted to talk about management, about people...how change would occur. That is what this report is about -- how to insert a continuous improvement, process-oriented culture into the Pentagon and the entire Defense Manufacturing Enterprise.



In this study, the Defense Manufacturing Enterprise is defined to include all activities required for force modernization, materiel readiness, and support. This spans both DoD and the industrial base. It does not include the Congress and Executive Branch although the report does recognize those interfaces and includes those interfaces in some of the recommendations.

The process improvement focus being promoted by this study is applicable to the entire enterprise including processes within DoD, those utilized by the industrial base (public and private), and also the interface between DoD and the industrial base.

In our judgment, improvements cannot be implemented on a piecemeal basis. Rather, a holistic approach needs to be adopted. For example, commercial procurement will not be achievable unless the current procurement rules, regulations, oversight, and audit changed. For this reason, our study encompasses the total enterprise.

The desired outcome is a much more efficient Defense Manufacturing Enterprise that can continue to provide technological superiority at an affordable price.

**What is a
Lean Manufacturing Enterprise?**

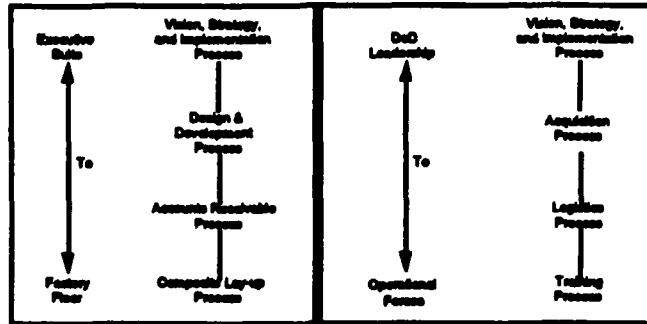
A dynamic Management System in which the entire enterprise employs Process Improvement Focus with metrics and stretch goals throughout the full product life cycle to achieve world class quality, cost, schedule, and product performance.

Lean manufacturing stresses a focus on process improvement that encompasses, in an integrated manner, the *entire enterprise*—from executive suite to the factory floor—and the *entire product life cycle*—from customer requirement determination, through research and development to product support and phaseout.

This system is slow in being recognized as different by many organizations because it employs well-known principles such as benchmarking, continuous improvement, employee involvement, concurrent engineering, customer focus, and many others. The difference is a rigid adherence to total and coordinated application of those principles.

Lean manufacturing was first introduced in Japan. Recent successful introduction of its elements by several manufacturers in America make it clear that it is not dependent on Japanese cultural environment for success.

Process: An Ordered Set of Tasks to Accomplish an Objective

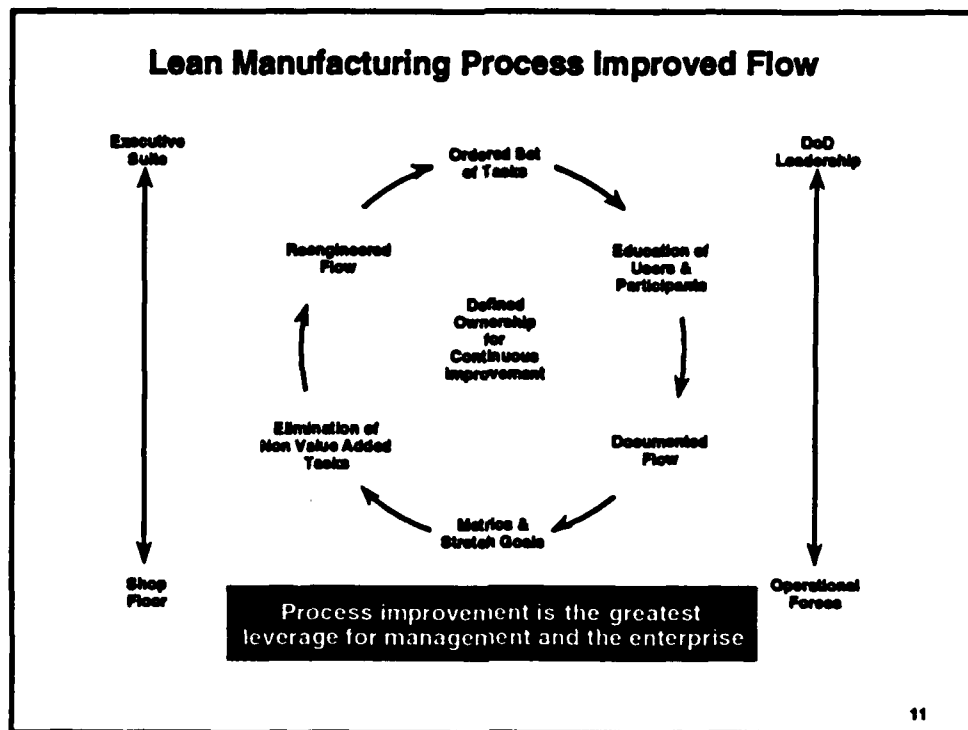


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Our use of the term "process" refers to an ordered set of tasks, usually followed sequentially, to accomplish an objective (every activity from the factory floor to the executive suite is a process). The objective of a process is a wide variety of outputs that are sometimes tangible and sometimes simply statements. The act of becoming "process focused" means that an organization concentrates its energies toward improving its processes as a means of improving its products rather than concentrating only on the product itself.

The processes utilized by the DoD are every bit as applicable to a process focus as are the industry examples shown on the facing page except they extend from the operational forces to the DoD leadership.

The critical element in a process sequence is the understanding that all processes flow from the Vision, Strategy, and Implementation process established by the senior executive and his leadership team. For example, if the executive vision is to automate factory operations then the composite lay-up process will be entirely different versus a vision to reduce cost by outsourcing to the merchant marketplace.



The first step in the introduction of process improvement is to identify critical processes and assign ownership. This should be accomplished by the leadership team of the enterprise. The owner is charged with the responsibility of continuous improvement of the process by adhering to the following steps:

Ordered Set of Tasks Define the process steps that are currently being done

Education of Users Deploy understanding, knowledge, and commitment to users and participants

Documented Flows Define task structure, their interrelationship, input and output criteria

Metrics & Stretch Goals Establishment of common measurements of success and clear responsibility for achieving them -- are we on track?

Elimination of Non-Valued Answers the question -- if your customer knew you did this,

Added Task would he be willing to pay for it?

Re-engineering Flow Tasks are redefined and reallocated

By focusing on process improvement, management gains maximum leverage in implementing change across all programs and activities. This process improvement flow has been implemented very successfully across a broad range of enterprises.

Key Characteristics of Lean Enterprises

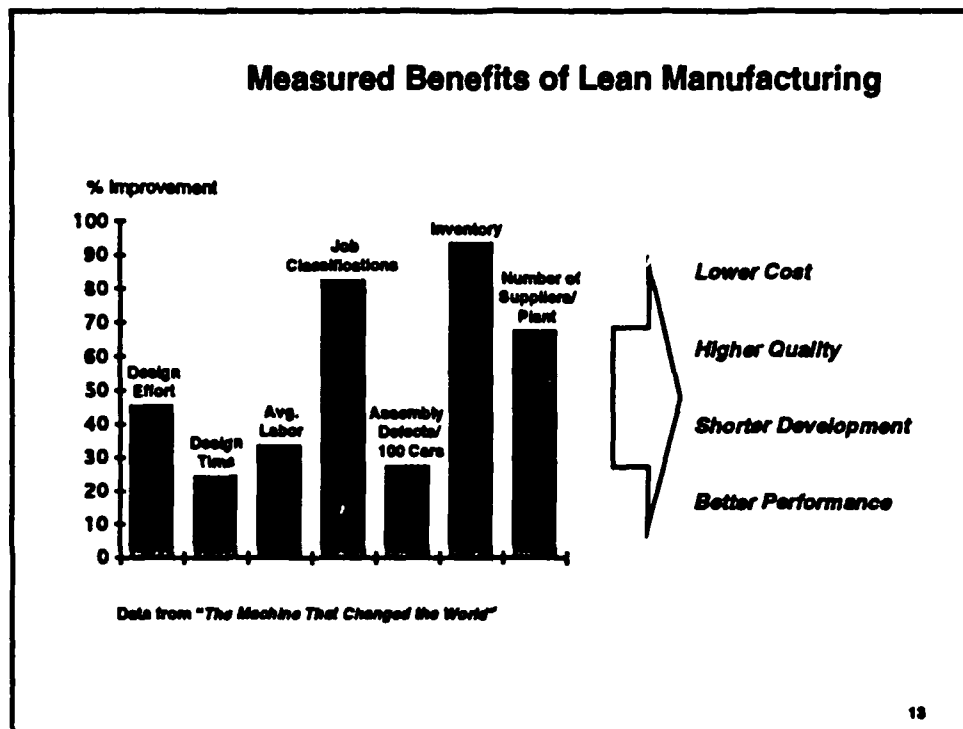
- **Process Focused with Metrics and Stretch Goals**
- **Vision and Strategic Plan**
- **Performance-Based Education**
- **Empowered Teams with Decision Authority**
- **Non-value-added Activities Eliminated**
- **Supplier/Customer Partnerships**
- **Process Control vs Inspection**
- **Concurrent Engineering (IPPD) at all levels**

12

World class -- bench mark -- companies exhibit a set of characteristics that describe what they look like. These characteristics are a combination of attributes and methods.

- The greatest leverage can be obtained from being process focused with metrics and stretch goals
- To accomplish an affordable solution, the manufacturing process must demonstrate controlled, understood and proven characteristics.

Key emphasis is placed on eliminating non-value-added activities, focusing on and controlling processes, developing long-term partnerships, empowering teams, and integrating product and process development. The companies did not achieve success overnight—it took strong leadership and a robust strategic plan to move them to improved performance. These characteristics are evident at all levels of the enterprise. They work in concert to achieve world-class performance.



A study completed in 1989 by the MIT Center for Technology, Policy, and Industrial Development through the International Motor Vehicle Program documented some of the characteristics and dramatic benefits achievable through lean manufacturing. The resulting book, *Machine that Changed the World*, summarizes the study and shows in fact that the process focus and teaming structure of a lean enterprise works. Other organizations have implemented these same principles of lean manufacturing and have validated that these principles can be transferred.

Some key findings of the study are of particular interest to DoD while "rightsizing" and striving to maintain readiness goals.

- Design effort in terms of absolute manhours were reduced by 45% while taking 1/3 the time to complete the design. Empowerment of the team leads to less oversight and overhead in the corporate structure.
- Assembly labor hours per vehicle was 1/3 less, with flexibility from cross training reflected in the fact that there are approximately 80% fewer job classifications. With fewer and empowered people, and using flexible job structures, defects were reduced by almost 30%.
- Reductions in inventory possible with lean manufacturing provide substantial opportunity for the DoD logistics system. Lean producers reduced inventory on hand by an order of magnitude. In addition, the number of suppliers were reduced by 2/3 of traditional levels which significantly reduced material overhead costs.

The bottom line is a significant and proven potential to lower cost, improve quality, compress cycle time, and better performance.

Excuses Organizations Offer

- **"We're Already Doing This"**
- **"We're Different"**
- **"Outside of My Control"**
- **Leadership is Too Busy**

14

There are a myriad of excuses organizations use to avoid the change process. One often used excuse is "We're already doing this". This type of comment often is made by an organization that has not come to grips with their real competitive position. Many large corporations have received considerable publicity recently for not addressing their deteriorating competitiveness. In some cases, boards of directors have forced change.

A second common excuse is "We're different". The American automobile industry continued to use this argument long after loss of market share to lean producers was apparent. This study membership firmly believes that all enterprises can adopt lean manufacturing.

A long-standing excuse is to refer to outside influences as a major barrier. This leads to the thinking that the entire scope of the change process is "outside of my control". For example, the outside influence of the media and its possible misinterpretation can be used as an excuse to avoid risk. There can also be the fear that "somebody in Congress will investigate if we try."

"Leadership is too busy." It always has been and always will be an issue as leadership time is valuable. The question is, where should valuable time be spent. In our view, the answer is on the most valuable part of the enterprise -- namely on the enterprise's processes.

DoD Is Different

• DoD is Different, But Differences Are Manageable

- No CEO like industry
- Rotation/replacement of senior execs
- Single item crisis-of-the-moment
- No Payoff for risk taking
- Conflicting objectives
 - Budget annually vs plan
 - Social vs program efficiency
 - Public trust vs efficient control
- Executive Branch and Congress

... The Big Issues are Those That Others Have Faced Down

- Excess people
- Excessive regulation
- Severe resistance to change
- Not enough education
- Suspicion of process management
- Few risk takers
- Too much financial control

Process Change Has Already Surfaced In
Many "Islands" Of The Enterprise

15

DoD is different, to a degree, but for important matters, the difference is manageable. In spite of the differences, process management does apply and is underway in many areas within the existing DoD system.

The major differences between DoD and corporations have been identified. In DoD, the CEO function is split between the Secretary, White House, and Congress. DoD has a more disruptive annual budgeting system than industry's more stable plan. DoD's CEO structure places high emphasis on social objectives (small/ minority business, geography etc.), on public trust for funds and on media "oversight"/exploitation. It must also deal with interdiction by individual congressmen on "minor" managerial issues. And in DoD, there is little reward for risk taking; instead, the perception is that risk should be avoided. These differences are manageable. They are not the road blocks to lean manufacturing.

The roadblocks to lean manufacturing are far more cultural than political. All organizations resist cultural change and the DoD will be no different. This study has identified the most significant cultural resistances that DoD will face. These resistances can be faced down but only if the leadership fully accepts and personally endorses the new lean manufacturing approach.

OSD has the power to buffer/cushion the worst impacts. A "partial vision" with HASC, SASC, White House on change will greatly help. They can screen disruptions to Programs and Commands, stop "killing the messengers", and make it clear that one mistake is not fatal to careers. Using teams with process owners and leaders which are organized around tasks, versus functions, will protect and encourage DoD employees to take the risks necessary to make changes in the infrastructure.

In the Services, more than a dozen major process focused initiatives are underway. This situation is similar to Corporate experience, where Process Management has generally also had a bottoms-up start. These initiatives work within current DoD constraints, proving process focus can be successful within DoD. Building on these Service initiatives plus contractor experience, simplifies DoD's task. In our judgment, the enterprise is waiting for senior leadership to endorse and unleash lean manufacturing.

One Key Difference: Civil Service Personnel

DoD Overhead Burden Must Be Reduced

- DoD has excess personnel in areas that do not add value
- Burdens not only government payroll, but also industry

DoD's Flexibility Is Limited

- Large, rapid workforce reductions are politically unrealistic
- Civil service regulations inhibit ability to reallocate right people to the right jobs

But

- Moderate pace of reduction is within DoD's authority
 - Attrition, freezes, early outs, and selected RIFs
- The important task is to reorganize to concentrate on value-added activities
- Many DoD organizations have already started

An Integrated Process Action Team should be formed to address this issue and provide recommendations consistent with the vision of the enterprise.

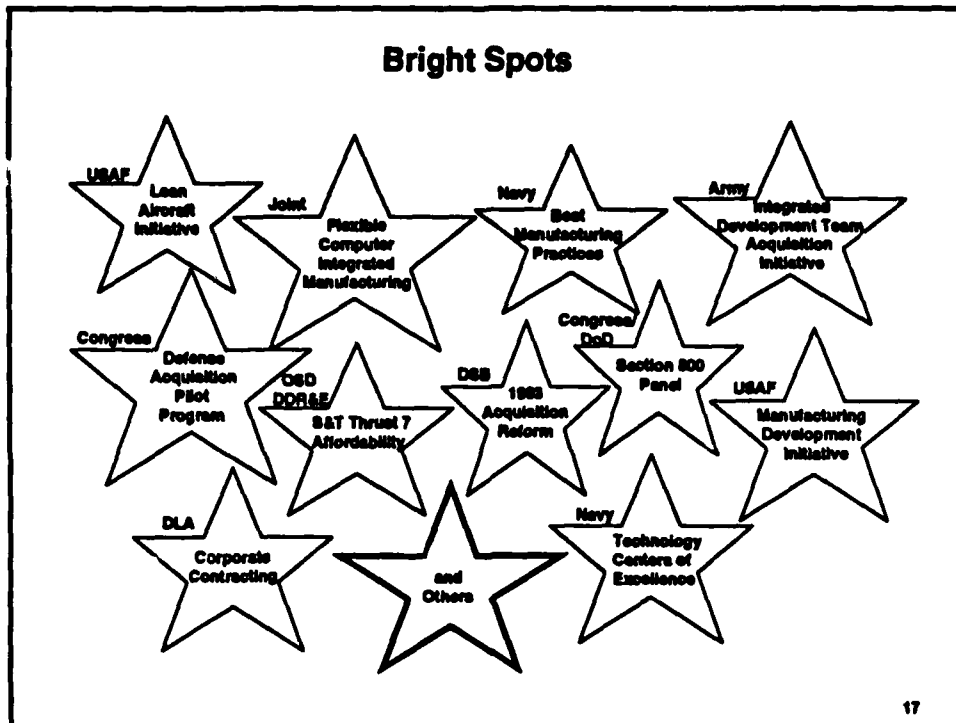
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One of the key differences between DoD and industry is the set of constraints imposed by the civil service personnel system. DoD has an excess of as much as 25% in the areas that should be affected by downsizing the acquisition and force structure. This issue must be dealt with in order to have a significant impact on reducing the overhead cost burden. The cost burden not only impacts the government payroll, but has a significant, adverse effect on industry and the government's cost of doing business with industry.

DoD's flexibility is limited since large, rapid workforce reductions would be politically unrealistic; however, this does not mean that the government should not take the necessary steps to become lean. A moderate pace of downsizing can be achieved through attrition, freezes, early outs, and selected RIFs, all which are within DoD's authority. Beyond reducing the workforce, the most important goal here is to reorganize DoD civil service personnel so that the concentration is on value-added activities. Flatter organizational and team structures are possible if job descriptions/grade levels are written based on job content and not on the number of people supervised.

Various DoD organizations have been dealing with this issues as they transform their operations to conform more with the lean manufacturing philosophy. Several successful examples exist in Service acquisition commands operating within the current laws and civil service regulations. Those examples need to be understood and shared.

Our recommendation is that an integrated process task team representing the appropriate stakeholders be formed to examine the personnel processes, identify the desired process, and recommend an approach for resolving the issue consistent with the overall vision of the enterprise. In other words, apply the lean manufacturing process focus approach to this issue.



This process improvement approach can work in the DoD enterprise. Grass Roots initiatives are sprouting up throughout the services and agencies which embody the principles of the lean enterprise. These bright spots can be the building blocks for expanding process improvement.

- Air Force Lean Aircraft Initiative (LAI) includes academia (Massachusetts Institute of Technology, industry and the government and is making a dynamic change toward lead practices and processes. The Manufacturing 2005 initiative establishes pilot programs to demonstrate the combined efforts of manufacturing technology and lean acquisition practices. The Manufacturing Development Initiative (MDI) focuses on concurrent development of product and process during the acquisition of a weapon system.
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- DSB 1993 Task Force on Defense Acquisition Reform defines the scope and method to comprehensively modify the process by which DoD should acquire goods and services.
- Joint Logistics Commanders Flexible Computer Integrated Manufacturing (FCIM) is a joint initiative which includes DoD and industry cross functional teams conducting experiments in process improvement and cycle time reduction.
- Navy Best Manufacturing Practices (BMP) links government, industry and academia to exchange information on benchmarking, problem solving, quality, productivity, and competitiveness by identifying and sharing proven best practices. Navy Centers of Excellence are cooperative centers established with government and industry partnerships to advance manufacturing technology and facilitate its implementation.
- OSD DDR&E S&T Thrust 7. Technology for Affordability focuses S&T investment to develop and execute technology/process demonstration programs aimed at significant affordability improvements.

Ingredients for Change

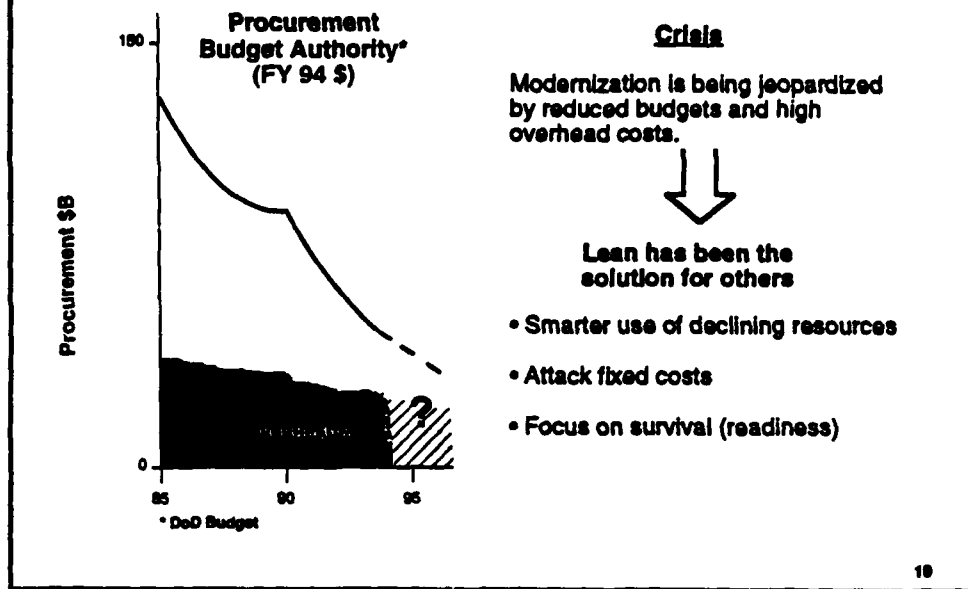
- A Crisis → *Exists today*
- A Vision → *Essential (strawman provided)*
- A Mechanism → *Our Study*
- Leadership → *Your task*

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For most organizations, radical change does not take place until leadership and the entire organization believes a crisis exists. If the entire organization does not believe the crisis is real, then it's leadership's responsibility to clearly communicate the reality of the crisis environment. We know the crisis is real, as the following chart will show.

Leadership must also communicate a vision of where it must go . . . to lead. We've created a strawman vision, but it's only that... a surrogate for the real vision which must be created by the DoD leadership team. The leadership team must also decide what mechanisms, strategies, goals, and measures it will adopt to drive toward the attainment of the vision. Once again we offer an approach. What we cannot do is substitute for leadership. That must come from the Secretary and Undersecretary. They must form, with other key players . . . the stakeholders . . . a leadership team to insert continuous improvement -- a process focus into the Defense Manufacturing Enterprise.

**The Current Crisis is Real
(and Needs to be Accepted Throughout the Enterprise)**



As the DoD budget continues to decline, the procurement budget has sustained the most drastic reduction. This is the result of the other major elements of the budget (military personnel, O&M, RDT&E) having a much lower reduction. As a result, the annual replacement rate of military hardware has been drastically reduced to 1-2%. This will clearly impact future readiness since it would take 50 years to replace the inventory at a 2% rate with the average age of equipment being 25 years. Another factor which adversely affects what can be accomplished with the procurement budget is that a greater portion of the budget is devoted to administrative and support costs. This is a result of failing to reduce the administrative oversight and regulations, which drive fixed costs in proportion to the total budget reduction.

As private industry encounters such crisis situations, drastic actions are taken to survive. The most common approach and the most successful approach has been to adopt the "lean manufacturing" philosophy. An assessment is made of resource utilization and a reallocation of assets (including disposition of assets) is a critical element. It is imperative to avoid a continually increasing overhead burden rate or the operation will cease to be viable. Fixed costs are aggressively attacked with an attempt to move as many costs as possible to variable costs.

Identifying and eliminating non-value-added cost by empowering cross-functional teams that clearly understand that survival is at stake is a common solution. These teams identify processes that need improvement, map the processes, identify non-value-added tasks, and recommend changes to improve the operation.

Strawman Vision

Change the spirit of defense acquisition from one of mistrust and risk aversion to confidence in the total enterprise and turn from an inward looking system to one that fully utilizes the total strength of industry, and where processes are continuously improved to reduce cost and improve performance so that U.S. Armed Forces are trained, equipped, and ready to defeat existing or potential threats.

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A vision is necessary to establish the broad, general direction that the enterprise will pursue.

The 1993 Lean Manufacturing DSB Study Group has provided the strawman vision to indicate that one is needed and to provide a guide. We are now convinced that a relatively short and concise vision statement can be written to encompass the total enterprise.

Our recommendation is that DEPSECDEF initiate a process to develop a vision which is owned and endorsed by himself and by his leadership team.

The vision should be used to guide the development of focused strategies necessary to achieve near- and long-term goals.

Challenge Is To Change the Enterprise Management Attributes

<u>From</u>		<u>To</u>
Output Measures	➡	Processes Improvement
Large Infrastructure (fixed costs)	➡	Variable Cost
Inspections and Audits	➡	Management by Metrics
Compete with Suppliers	➡	Partnerships
Dedicated Resources	➡	Shared Resources (Commercial, Military)
Risk Aversion	➡	Exercise Initiative
Serial Stovepipe Design	➡	Concurrent Engineering (IPPD)
Technology/Products/Performance	➡	User Value Driven/Affordability
Individuals in Stovepipe Structures	➡	Empowered Cross Functional Teams
General Training	➡	Performance-Based Education

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Industry experience clearly shows that the best technique for changing enterprise attributes is process focus. Through this approach the Defense Enterprise can begin to undergo a significant cultural transformation. The vision needs to transition DoD from its current position to attributes more aligned with lean manufacturing concepts. DoD needs to transition:

- From program unique activities which design, develop and produce program specific products which are controlled through metrics relating to output and cost constraints, to a focus on consistent processes which allow for compounded learning and improvement between programs with metrics relating to time and cost management.
- From traditional organizations and a large infrastructure that tends to avoid risk and is resistant to change to agile organizations which embrace change and accommodate variable costs. (From Economy of Scale to Economy of Scope)
- From a structure which attempts to achieve high quality and performance through after-the fact inspections and audits of product, to an enterprise which prevents defects through controlling all of its processes and uses sampling metrics to ensure a quality process.
- From an organization which carries an infrastructure to internally develop software, hardware and products which have commercial equivalents to an organization which partners with its suppliers to provide needed products in the most affordable, lean structure, leveraging on commercial products.
- From a defense accounting and property control environment which forces a separate dedicated capital investment structure between commercial and military divisions to a structure that allows military and commercial production to occur on the same plant infrastructure, maintaining accountability without carrying intense unique DoD overhead functions for accounting and property control.
- From a system which perpetuates risk aversion to one which encourages initiative and provides incentives to taking risk.
- From a design to production process which is primarily serial in nature to concurrent Integrated Process/Product Development (IPPD)
- From technology, performance-based weapon systems to products that are designed for affordability and support the operators needs.
- From functionally oriented, stovepipe structures which reward individual performance to cross functional teams empowered to make rapid decisions.
- From general, individualized training to education which is tuned to meet enterprise goals

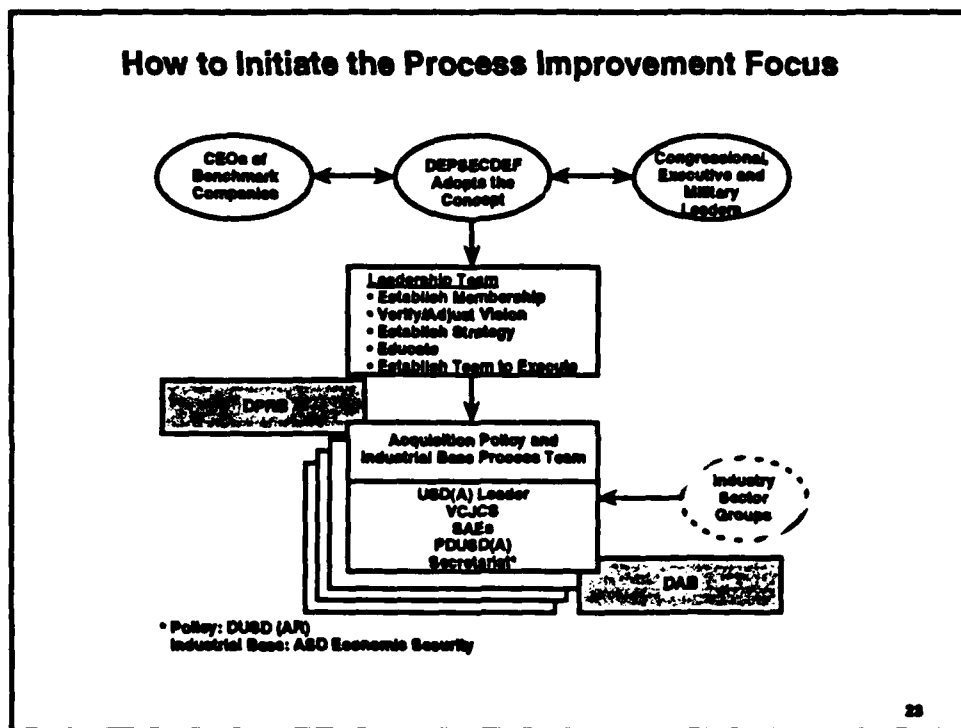
"How To" Recommendations

- 1. Create and communicate the vision**
- 2. Adopt process improvement focus within DoD and the industrial base**
- 3. Create a change agent to implement the process focus**
- 4. Drive change through a prioritized set of actions**
- 5. Recognize and reward the "process progress" teams & individuals**
- 6. Involve other stakeholders (like Congress) in formulation of DoD strategy**

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To make the necessary change to a lean DoD Manufacturing Enterprise, the leadership should proceed as follows:

- 1. State and communicate the vision of the Lean Manufacturing Enterprise at all levels of the DoD. Unless this is done, and reinforced on a frequent basis, the power of the vision will be weakened and perhaps lost.**
- 2. Adopt process focus within DoD and with the Industrial Base. This will remove the current, limiting focus on programs and products. It will foster a view of acquisition activities as being part of a process and amenable to streamlining and beneficial change.**
- 3. Create an agent of change to implement the process focus. We recommend that the Acquisition Policy and Industrial Base Process Team be the major instrument of the DoD leadership to bring about the desired changes. Its authority will be DoD – wide in all matters affecting acquisition. It will, moreover, be a guiding agency in managing the inevitable right-sizing of the industrial base.**
- 4. Charter the agent of change to drive that change by means of a rational, prioritized set of actions. These actions may originate in the team itself, or in those DoD agencies best able to identify and implement them, under team guidance. We later recommend four prioritized actions.**
- 5. To facilitate the process of change (which lies ultimately with individuals) the leadership should institute a program of reward/recognition for the "islands" of the enterprise that are implementing lean manufacturing. This will send a clear message to other organizations in the enterprise.**
- 6. To harmonize the process of right-sizing and streamlining, to the extent possible the leadership should involve other stakeholders, such as the Congress in formulating DoD acquisition strategy.**



The Team

- To realize the full power of this vision, the DEPSECDEF, with the cognizance and advice of Congressional, Executive, and military leaders and the CEOs of benchmark companies, should establish an implementing executive team. Its charter would be to ensure consistent, effective application of the process for acquisition policy and the industrial base.
- We suggest the team be named the Acquisition Policy and Industrial Base Process Team.
- The team membership should include: the USD(A) as leader, representing the entire Defense Manufacturing Enterprise; the Vice Chairman, JCS, to ensure firm ties to the users and the basic requirements process; the Service Acquisition Executives, who must have the same responsibilities in each of their services and be able to transfer team actions into service actions; the PDUSD(A) to ensure consistent action in all major program activities.
- The team should be supported by a secretariat whose composition will depend upon the areas affected. As a minimum: for acquisition reform issues, the DUSD(AR); for industrial base issues (public & private), the ASD (Economic Security). Both functions may be required to participate from time to time. The USD(A) may, in addition, involve other staff elements.
- Participation of the Secretariat offices in this way would strengthen their implementing actions, in that they would be representing the coordinated position of the team.
- To ensure meaningful, rapid progress, the DoD should establish sector assistance group of respected individuals from all areas of the defense industry. Their task would be to assist, on an on-going basis, progress towards the lean DoD Manufacturing Enterprise
- Finally, the team should have a formal charter, developed by the USD(A) and the DoD leadership. This will ensure a firm, consistent basis for action. A suggested draft charter has been prepared by the Task Force and is presented next.
- Other process teams will be formed to address the specific prioritized topics identified by the Acquisition Policy and Industrial Base Process Team.

Acquisition Policy and Industrial Base Process Team is the Change Agent

- **Charter:**
 - Develop lean manufacturing processes to produce consistent acquisition and industrial base plans and their implementation
- **Process Actions**
 - Establish and communicate lean enterprise principles
 - Establish metrics to measure progress
 - Establish incentives/rewards for organizations and individuals contributing to change
 - Provide for education and training to achieve the cultural change
 - Institutionalize an integrated product/process development approach (IPPD)
- **Create integrated process teams to address the crisis issues for high payoff**

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Preamble: Because of the critical nature of this team, its charter should grant wide powers, encompassing the entire DoD acquisition community. This charter should be issued by DEPSECDEF.

- 1) This team shall be known as the Acquisition Policy and Industrial Base Team.
- 2) The team shall have the following general responsibilities:
 - a) Ensure that the vision of the DoD lean manufacturing enterprise is implemented
 - b) Develop and promulgate appropriate policies affecting DoD acquisition activity.
 - c) Establish mechanisms to ensure that the Industrial Base (public and private) remains capable of serving the broad national security needs of the country.
 - d) Establish metrics to measure progress.
- 3) The team shall meet at the discretion of the USD(A) or, where necessary, PDUSD(A).
- 4) The team shall not be responsible for the normal, day-to-day management activities of DoD acquisition.
- 5) The team shall ensure that DoD-wide education and training of relevant personnel in lean manufacturing principles is implemented.
- 6) In consonance with the principles of para. 2.a., the team shall, at a minimum:
 - a) Establish lean manufacturing principles within DoD and approve their content/implementation with Integrated Product/Process Development-like teams, where indicated
 - b) Plan & cause to be implemented the rational sizing of DoD organizations and facilities to remove barriers to the establishment of a lean manufacturing enterprise (including the Industrial Base)
 - c) Encourage innovation-in-acquisition throughout DoD to harness the best efforts of all personnel
 - d) Ensure that the mechanisms established for Industrial Base ability retention address, as a minimum, the following:
 - How & when to achieve the right size of residual defense-unique organizations.
 - How to encourage dual-use (i.e., commercial-military) industrial manufacturing capabilities where similar products have similar prices, regardless of the buyer.
 - Review & establish minimum defense needs by sector (e.g., tanks, aircraft, submarines, etc.). Determine & aim to achieve the rational right size of the residual Defense Industrial Base.
 - How to incentivize individuals and organizations to invest in productivity, even as the defense budget is reduced.
 - e) Create integrated process teams to address crisis issues for high payoff.
- 7) The team shall recognize in its activities its de facto connections to the Defense Planning and Resources Board (for overall DoD budget structure) and the Defense Acquisition Board (for specific, large programs).

High Pay-Off Crisis Areas to be Addressed

1. Reduce the DoD overhead burden on the lean manufacturing enterprise

- Quantify current "overhead" costs
- Reduce/eliminate non-value-added functions
- Reduce oversight while retaining performance
- Rational reduction of DoD workforce and facilities

2. Rational downsizing of the enterprise

- Manage down to minimum defense needs by sector (tanks, submarines, etc.)
- Aim for right size of residual defense industrial base (public and private)
 - Retain only minimum necessary for national security needs
- Promote fewer defense-unique and more dual use (military-commercial)
- Encourage innovation-in-acquisition at all levels

3. Maintain public trust and confidence in the Department

4. Impact on-going programs/facilities

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The DoD overhead on the lean manufacturing enterprise can be reduced in several key areas. Modern cost accounting principles like Activity Based Costing (ABC) should be used to identify and quantify overhead cost. All non-value-added functions should be identified and eliminated, or significantly reduced and the use of process metrics in lieu of product inspections can improve product quality and performance while reducing oversight requirement. The DoD should establish a rational process, including metrics and stretch goals, for downsizing the DoD acquisition workforce, so that the remaining people will be the best qualified for executing the new process.

DoD must posture its acquisition program and process to facilitate a rational downsizing of the defense industrial supplier base. The first step is to identify the minimum-sized industrial base required to satisfy unique DoD requirements (tanks, submarines, etc). Next, DoD should permit the use of dual use or commercial components, parts, and processes to the greatest extent possible, and to purchase these items using best commercial practices. Finally, DoD should establish an acquisition environment where acquisition organizations and officials are encouraged, recognized, and rewarded for adopting innovative acquisition practices at all levels of the acquisition process.

Public trust and confidence in the Department can be improved through the use of tools that are already practiced in the commercial market place. Most of these recommendations are also included in the recent DSB Acquisition Reform report.

On-going programs represent a high-payoff area to be examined because of the amount of money contained in these programs. It is our belief that an immediate payback may be achieved by focusing on these programs. We will offer specific suggestions for immediate implementation of lean manufacturing principles in ongoing programs. In addition, it may be necessary to concentrate on a facility rather than a program since it will be difficult to deal with a single program in a multi-program facility. To start, consider a facility with a single program.

Sanity Check

Based on review of 28 prior studies plus task force suggestions

High Payoff	Suggestions										
	Examine & Utilize Available Evidence	Health Effect Studies (HES)	Review of Literature	Public Community Involvement	Public Health Interventions	Formulate O&E Policies	Public Outreach / Education	Health Effect Studies Research	Public Community Involvement / Participation	Public Health Policy Research	Public Health Policy
1. Reduce Overhead	●	●	●	●	●	●	●	●	●	●	●
2. Reduce Deteriorating	●	●	●	●	●	●	●	●	●	●	●
3. Maintain Public Trust and Confidence	●	●	●	●	●	●	●	●	●	●	●
4. Impact Ongoing Programs	●	●	●	●	●	●	●	●	●	●	●

Key: ● = High Impact ○ = Moderate/Medium

This study identifies four high payoff areas for immediate attention. This study also reviewed the suggestions of earlier studies and evaluated those earlier suggestions relative to these four findings. Many of the findings from earlier studies map into the four high payoff areas of this study and show high correlation between prior study suggestions and the high payoff areas identified by the task force.

Growing Nationalization of the Defense Industry

- **FY94 Defense Authorization Bills**
 - Senate Armed Services -- "60% in Depots"
 - House Armed Services -- "100% in Depots"
- **FY87 to FY94, Defense Industry manpower down 32%, military down 25%, civil service down 19%**

Solution: Commission on Rational Downsizing of the Public Sector of the Enterprise

- Similar to base closure commission
- Objective being privatization, wherever appropriate
- Covers depots, arsenals, labs, etc.

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As the defense budget has been shrinking, the private sector of the defense industry (R&D, production, and support) has been shrinking much faster than the public sector, with the result that there is a significant shift taking place toward the public sector.

While members of both the executive and legislative branches give speeches on capitalism vs socialism, they are passing laws and taking actions that are contrary to a free market system. For example, in the FY 94 Armed Services Bills, both the House and the Senate have proposed that between 60% and 100% of "all work that can be done in a depot must be done in a depot" (rather than in private sector plants). Similarly, actual reductions in defense industry manpower have been significantly higher than the cuts in the civil service workforce in the public sector (38% vs 19%).

To address this problem, the DoD must immediately initiate a serious effort to "right-size" the defense industrial base -- including the public sector. For example, in the depot area, this would include downsizing and consolidating, shifts from the public sector to the private on some current systems, and plans to have most future systems supported on a "turn-key" basis (in the private sector). Similar steps will be required in each area of the industrial base (R&D, production, and support).

However, solving this problem, as was the case with the needed base closures, is so politically volatile that it cannot be sufficient to have it addressed by the DoD, or even by the Congress, on a case-by-case basis. Thus, an overall commission on rational downsizing of the Public Sector of the Defense Industry is recommended. It would operate in a fashion similar to the Base Closure Commission and address the overall public sector of the defense industry (depots, arsenals, labs, FFRDCs, etc.). The guidance provided to the Commission would be to utilize the private sector wherever possible.

**In Our Judgment ,
Trust and Accountability Can Be Maintained**

- Rely on competitive pricing where possible
- For sole source suppliers, stress continued value improvements (with sample audits vs continual audits)
- Rely on supplier metrics of processes and cost improvement trends
- Enlist "Quality Assurance" accounting firms to conduct audits
- Expand application process of metric sampling to replace item inspection/continuous audit approach
- Past performance precedent to future award

Process for Change

Establish a Multifunctional Team to develop a process approach to maintain trust and accountability while dramatically reducing overhead costs.

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The Task Force recognizes that any change to present processes and practices needs to ensure continued protection of public trust and accountability. As we all know, the taxpayers are the ultimate customer of DoD.

We believe, moreover, that the public's protection offered by the current system, is not a very high standard. To quote from the recent Acquisition Reform study:

- It discourages suppliers from investing in more efficient production processes and actually encourages suppliers to increase the cost of goods because that is one of the few ways available to increase profit over the long run--especially in a declining market. It also creates contention between the government and its suppliers, around which large numbers of auditors, accountants, and other overseers scrimmage with an equally large number of supplier personnel.
- We believe that these scrimmages and costly practices can be avoided and still protect the public trust.

Shown here are a few of the tools available to DoD and already practiced in the commercial market place to ensure the protection. Most of these recommendations are also included in the recent DSB Acquisition Reform report.

We suggest that a multifunction team be formed to review these recommendations and examine other alternatives to satisfy the accountability concern at a lower cost. A drastic reduction in overhead costs is needed and the oversight function is a major driver in those costs (in DoD and in industry). The team should include the primary stakeholders with this accountability; for example, DCMC, DCAA, DDP, OSD IG, GAO, etc. with industry in a consulting capacity.

Lean Manufacturing Suggestions for Immediate Implementation in On-Going Programs/Facilities

"... because that's where the money is."
- Willie Sutton

1. Reduce technical data requirements
2. Adopt "turnkey approach" for life cycle support
3. Deploy integrated product/process development
4. Replace obsolete/costly specifications, e.g.,
 - MIL Q 9858 family replaced with ISO 9000
 - Family of solder specs replaced with interim Common Solder Spec.
 - GFE tracking replaced with best business practices
 - Institute pilot project with commercial software

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1. For the vast majority of its material, DoD requires delivery of detailed technical data packages. The justification has been to assure the quality of the product; to provide configuration control; to achieve part standardization; and to support competitive procurement of the item and its spare parts. The DoD needs to stop buying "built to print" technical data packages, thus avoiding the commitment of large in-house resources and their upkeep. Detailed technical data packages should be replaced by the use of performance specifications.
2. Under "turnkey" procurements, a single contractor is selected to develop, produce, and support a product or system from its inception until its retirement from use. The "turnkey" concept relies on one contractor for the product, its spares, and depot maintenance. Economies accrue from a more stable business base for the supplying company and greatly reduced oversight and downstream procurement activities for the DoD.
3. Integrated Product/Process Development (IPPD) is a management process that integrates all activities from product concept through production/field support, using a multi-functional team, to simultaneously optimize the product and its manufacturing process to meet cost and performance objectives. Exit criteria for development phases include both product performance and process maturity (using metrics such as the process capability index, C_{pk}). The task force endorses the suggestions of the 1993 DSB Study on "Engineering in the Manufacturing Process" which called for implementation of IPPD in science and technology (S&T) programs as well as acquisition programs.
4. The International Standards Organization (ISO) has adapted a total quality system series of standards (the 9000 series). DoD adoption of ISO 9000 to replace military specifications, MIL-Q-9858 and MIL-I-45208, will allow companies producing defense products to avoid the costly process of having to be certified under two different standards. This will facilitate the drive toward commercial/military integration in production facilities.

Implementation of an interim common solder specification will reduce costs and facilitate commercial military/integration.

Under existing FAR, contractor use of GFE on commercial production must be paid for by applying a monthly rental rate to the original cost of the GFE assets, irrespective of its current fair market value. We recommend that the Fair Market Value (FMV) of GFE be determined and contractors offered the opportunity to buy the assets at FMV. Additionally, the tracking of GFE should be modified to only track assets with a FMV over \$10,000 with all other GFE tracking deleted and hold the contractor responsible for GFE information.

Implementation of Ada requirements across all aspects of software development may be a costly process as it exists today. A pilot program is suggested that enables the use of commercial software development practices and languages to be used in parallel with Ada to demonstrate the cost savings associated with flexibility in implementation. There appears to be an appropriate role for both.

Use (Your) Metrics to Measure Success

- **Candidate metrics to measure against recommendations**
 - Number of people by process in DoD
 - Overhead Cost as % of budget
 - Commercial Content
 - # People trained in lean manufacturing
 - # Renegotiated on-going programs & \$ saved
- **Candidate metrics to measure health of the Enterprise**
 - Net assessment (force readiness)
 - Readiness (mission capable rate & training tempo)
 - Modernization Rate %
 - Industrial base capacity utilized
 - Customer satisfaction (Congress) – Survey, meeting customer commitments
 - Weapon system cost and performance trends

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Metrics, when properly set, tell us how well a process is performing against requirements and provide information on the effectiveness of actions taken to improve the process performance. They must be sufficient to: understand performance of the process; understand performance of suppliers to the process, and generate meaningful trend analyses.

Establishing effective metrics requires a focused initiative involving all of the process stakeholders. This includes the process/subprocess owners, participants, customers, and suppliers. But, because effective metrics are absolutely essential to continuous (incremental and step) improvement, care must be taken in metric selection, since application of improper metrics not only delays process improvement, but can actually lead to actions detrimental to process performance.

Frequently, the initial metrics considered are not those ultimately proven effective, but their evaluation leads to better understanding of the process and points us in the direction of an effective selection.

Stretch goals are established to produce major improvement and achieve/pace world class performance. This is exactly the result required by the current crises. They differentiate the process focused approach from traditional improvement methodology and when realized, they separate winners from losers. Stretch goals challenge creativity to meet/beat best in class benchmarks. They are deliberately set in a manner that precludes attainment by minor changes & "tweaking."

Stretch goals are not just another theoretical concept. They are used successfully and consistently by world class enterprises. They also reflect a fundamental philosophy. Recommended candidates for initial consideration by DoD are shown opposite. There are two sets: one to monitor progress on implementation; the other to monitor successful achievement of results meaningful to the DoD.

The DSB is prepared to support DoD in the establishment of metrics (and, even, to help in monitoring them), to the degree desired.

**Also, Start Within the Enterprise
... like Readiness**

DoD Leadership →

Consistent with the enterprise vision, develop the readiness vision and goals, establish a readiness Integrated Process Team (IPT), deploy process improvement approach, and;

In Parallel

Logistics (Critical Process in Readiness) →

Task the JLC to form an IPT to address a spares procurement and deployment program under the lean process

Operational Forces

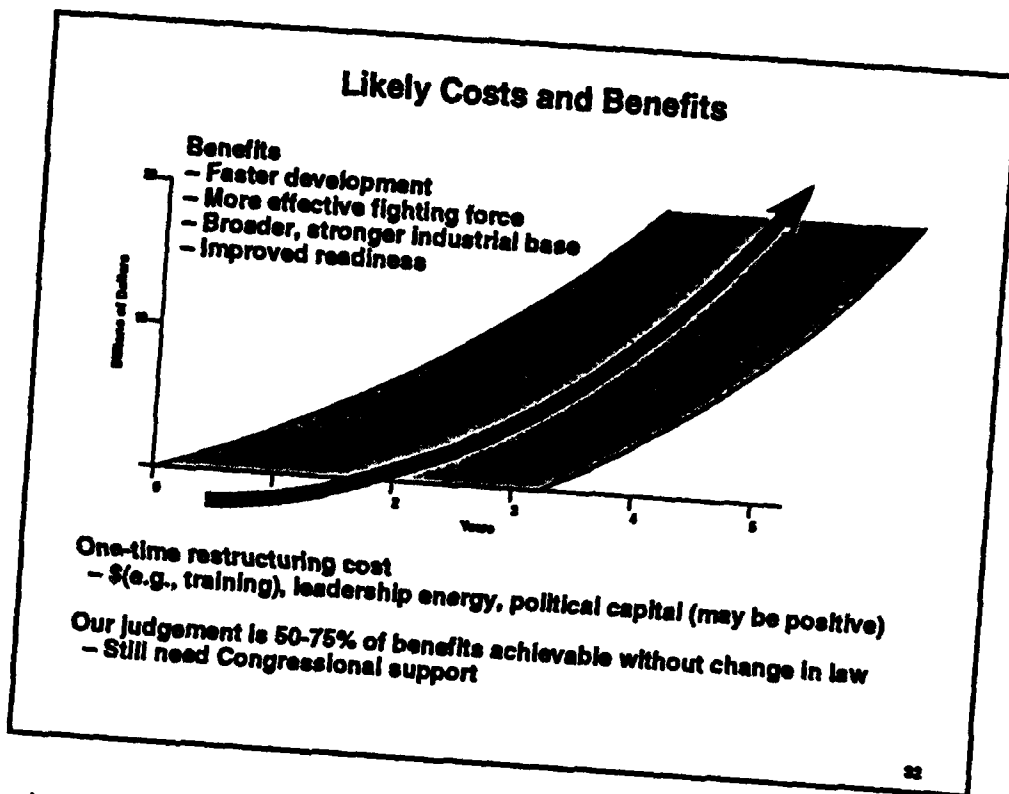
	Owner	Process Map	Barriers	Lean Process Map	Metrics	Measured Benefits
SPARES (Acquisition to Delivery) • Define Initial & Sustainment Spares • Procurement • Supply to Operational Forces • Repair • Industrial Base						
ASK FOR THIS FEEDBACK						

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It is emphasized that this spares program does not take the place of DoD leadership introducing the process focus to the entire DoD enterprise; however, it does provide a means to quickly implement this approach within the enterprise.

The process improvement focus as described earlier in this briefing applies to all processes extending from the operational forces through DoD leadership. Taking advantage of this feature provides the opportunity to establish "Readiness" as a place to start within the system to implement the methodology and gain indepth understanding of the magnitude of the benefits achieved. Other initiatives within th enterprise can be started in parallel with the top level action under the direct leadership of the DEPSECDEF. Our recommendations presented thus far center upon developing a DoD vision with goals, the establishment of integrated process teams, and the deployment of the process improvement approach. It is recommended that this methodology be applied directly to the issue of readiness and other issues within the enterprise.

Relative to this specific initiative, it is suggested that the JLC be tasked to implement a program focused on the overall spares procurement and deployment activity. The process should start by identifying initial and sustainment spares and extend through the procurement task, supply to operational units, repair, and industrial base considerations. The program should identify the process owner, produce a detailed process map, identify barriers to achieve goal, develop a lean process map based on the removal of non-value-added tasks and process redesign/ streamlining, identify metrics, and finally, measure the magnitude of benefits derived from the process improvement focus. Interim and final results should be provided as feedback to DEPSECDEF and the Acquisition Policy and Industrial Base Process Team.



Implementation of the proposed change will be neither easy nor fast. However, the payoff will be extremely significant. After a 5-year implementation period, the efficiency gains will be in the 10s of billions of dollars annually. There will be a dramatic improvement in the time to field new weapons, in the quality of the weapons, and in their performance. America will have a more effective fighting force -- even with the reduced budgets -- as measured in terms of readiness, modernization, ease of operation and maintenance, and state-of-the-art equipment. And there will be a broader, more responsive, and more competitive defense industrial base -- largely integrated with the civilian sector, and capable of surges in production (for crisis demands).

However, as has been found in equivalent industrial restructuring, there may be a one-time restructuring cost (in resources, leadership energy, political capital -- but this could be positive).

A significant portion of the required changes (perhaps up to 75%) can be achieved within the DoD itself, but even these will require considerable Congressional support. For the rest, Congress must be a significant participant, by removing the current legislative barriers.

Why Will This Succeed When Prior Initiatives Have Failed?

- **Greater recognition of need**
- **Process focus has a track record of success**
- **Leadership focused on improvement and understands the value of team approach**
- **Pockets of success provide an opportunity for expansion, rather than a stark beginning**
- **Congress should respond positively if treated as a customer**
- **Consistent with Vice-President's National Performance Review**

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This is an ambitious and far reaching initiative. This magnitude of change in direction and management approach will surely face significant resistance and opposition in spite of the high potential benefits. We believe that this is the opportune time to initiate such a change.

First of all, the budget crisis is well known across the enterprise. Its associated impact and projected impact on replacement rate and industrial base could become devastating over a few years if the historical approach continues, i.e. high leverage initiatives are not implemented.

This lean manufacturing process improvement approach has gained wide recognition in industry and within many segments of DoD. It has proven to yield benefits beyond expectations in most areas that have committed themselves to adopt the process. Leveraging these exciting beginnings across the enterprise accelerates the payoff when the leadership encourages and builds on the pockets of success.

The new DoD leadership has clearly expressed an intent to initiate change, eliminate non-value-added cost, and support new initiatives directed towards teamwork and improved effectiveness.

We also believe that involving Congress in the process and treating Congress as a customer is vital to the success of the approach. It is also likely that they would support the initiative since it helps address a major dilemma – namely, avoiding a hollow force in the face of a continually declining budget.

Finally, this initiative is consistent with the recently released National Performance Review and offers an opportunity to be a major part of the DoD effort to implement Review recommendations.

There is a Down Side Risk

What if this doesn't work?

- Programs not the problem – they continue
- Personal "lost leadership" can be substantial
- Personal lost opportunity

Risk can be minimized Lessons learned.

- Get a personal support structure
- Build on organizations already underway
- Build teams that reach down into organization
- Educate and over-communicate
- Include all the skeptics close to you
- Protect risk takers

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If this process effort does not achieve desired results, it should not have a detrimental effect on cost, quality, time, or technical function on existing programs. Programs will maintain operations for two or three years, despite external activities. Rather, the failure to achieve desired results will be seen as another "abortive attempt" at change and commands that had moved forward in the process changes will back pedal. Some committed commands may continue with reduced visibility.

The major loss will be "lost leadership" on the part of management with subsequent less ability to bring about future change. The organization will have a difficult time accepting new ideas from leaders who have to back away from commitments to change. In addition, there could be lost opportunity for the leadership. After all, the leadership time could be spent on other activities that could otherwise provide benefits.

This risk can best be minimized by careful selection of initial programs and organizations and an emphasis on education and communications, especially with regard to keeping skeptics involved at the beginning and throughout the process. Organizational approaches include building in organizations that have already started related efforts, building teams successfully down through the hierarchy, and protecting risk-takers as much as possible.

You Should:

- ✓ Concentrate on the fulcrum (process) to get maximum leverage
- ✓ Establish your leadership team and vision
- ✓ Impact existing programs
- ✓ Measure and everything else will follow
- ✓ Stay personally engaged and institutionalize the process
- ✓ Get help

Making this succeed could be the difference in having a ready force and a viable industrial base.

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Mr. Secretary, you need to decide what area of your enterprise requires your personal attention and commitment. It is the judgment of this study, that a portion of your valuable time needs to be dedicated to improving the processes within the enterprise. This is where maximum executive leverage is achieved. All products and programs are impacted positively as processes are improved.

It is essential that you establish a leadership team and create your own vision for the enterprise. Your vision is critical. As the chief executive, you need to set the "guiding star" for others to follow. Otherwise, well intentioned personnel under your command could operate at cross purposes. Take time with your leadership team to create your vision and strategy. This study group spent about 40 person hours in creating the strawman. Plan for an offsite where your team can focus on this objective.

Prior studies (including the Carnegie Report) have placed too much emphasis on actions to achieve future benefits. The greatest benefits will be gained from existing on-going programs. While future programs are important, expenditures during the FYDP address programs already in process. Many valid reasons may exist to maintain the status quo, but we believe that the benefits greatly outweigh the disadvantages. Additionally, we believe that immediate near-term actions to implement lean manufacturing on existing programs will have an immediate positive, cultural impact on the enterprise.

Insist on metrics and constantly measure against the metrics. The enterprise will respond by always striving to improve the metrics. By so doing, you will unleash the creative skills of your personnel to continuously improve their processes.

Based on the experience of other organizations, this shift to process focus is difficult and takes from 3 to 8 years to implement. It can only be achieved with a strong, determined, and highly focused leadership team with a shared vision and common goals. Experience with other organizations also indicates that the enterprise will quickly revert to past practices unless the leadership is consistently engaged in the process improvement during the first 2 to 3 years. Therefore, it is essential that this process be institutionalized so that a new culture for decision making takes root. Stay engaged.

Experience with other organizations also indicates that help from outside the organization is generally necessary and beneficial. Third party assistance provides an unbiased, fact-based assessment and removes blocking emotions from discussions and decisions. Outside help also provides a support structure for the change agent.

In our judgment, this lean manufacturing approach is essential for the DoD to maintain a ready and superior force supported by a viable industrial base. As defense dollars decline, it is essential that the DoD adopt a lean enterprise approach to maintain force readiness. Otherwise, scarce dollars will be consumed by the management system and control system rather than being allocated to military needs.

The Term "Enterprise" was Carefully Chosen

Remember that the word "Enterprise" has three meanings:

- 1) A business organization
- 2) A systematic purposeful activity
- 3) Readiness to engage in daring action; initiative

The third is the most important.

The enterprise is counting on you!

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APPENDIX H
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APPENDIX I

ACRONYMS

ABC	Activity Based Costing
ACC/DR	Air Combat Command, Director of Requirements
ADPA	American Defense Preparedness Association
APIB	Acquisition Policy and Industrial Base
ARPA	Advanced Research Projects Agency
ASD	Assistant Secretary of Defense
ASD(ES)	Assistant Secretary of Defense for Economic Security
BMP	Best Manufacturing Practices
BRAC	Base Realignment And Closure
C3I	Command, Control, Communications and Intelligence
CEO	Chief Executive Officer
CSIS	Center for Strategic and International Studies
DAB	Defense Acquisition Board
DCAA	Defense Contract Audit Agency
DCMC	Defense Contract Management Command
DDP	Director, Defense Procurement
DDR&E	Deputy Director for Research and Engineering
DepSecDef	Deputy Secretary of Defense
DFARS	Defense Federal Acquisition Regulation Supplement
DLA	Defense Logistics Agency
DoD	Department of Defense
DPRB	Defense Planning and Research Board
DSB	Defense Science Board
DTIB	defense technical and industrial base

DUSD(AR)	Deputy Undersecretary of Defense for Acquisition Reform
ES	Executive Summary
FAR	Federal Acquisition Regulation
FCIM	Flexible Computer Integrated Manufacturing
FFRDC	federally funded research and development center
FMV	fair market value
FRV	fair rental value
FY	fiscal year
GAO	General Accounting Office
GFE	government-furnished equipment
HASC	House Armed Services Committee
HQ	headquarters
IDA	Institute for Defense Analyses
IG	Inspector General
IPP	integrated product/process
IPPD	integrated product and process development
ISO	International Organization for Standardization
JCS	Joint Chiefs of Staff
JLC	Joint Logistics Commanders
MDI	Manufacturing Development Initiatives
NAS	National Academy of Science
NCED	National Consortium for Engineering Design
NSF	National Science Foundation
NRC	National Research Council
OASD	Office of the Assistant Secretary of Defense
OASD (AP&PI)	Office of the Assistant Secretary of Defense for Acquisition Policy and Program Integration

OASD(P&L)	Office of the Assistant Secretary of Defense for Production and Logistics
OASN	Office of the Assistant Secretary of the Navy
O&M	operations and maintenance
OMB	Office of Management and Budget
OSD	Office of the Secretary of Defense
OTA	Office of Technology Assessment
PDUSD(A)	Principal Deputy Undersecretary of Defense for Acquisition
PEO	Program Element Office
PM	program manager
PROCAS	Process Oriented Contract Administration System
RIF	reduction in force
RDT&E	research, development, testing, and evaluation
SAE	Service Acquisition Executive
SASC	Senate Armed Services Committee
S&T	science and technology
TASC	The Analytic Sciences Corporation
TINA	Truth in Negotiation Act
USA	United States Army
USAF	United States Air Force
USN	United States Navy
USD(A)	Undersecretary of Defense for Acquisition
VCJCS	Vice-Chair, Joint Chiefs of Staff
WLMT	Wright Laboratory/Manufacturing Technology