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REPORT

OF THE

DEFENSE SCIENCE BOARD

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AUG 2 5 1993
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TASK FORCE

ON

DEFENSE ACQUISITION REFORM

JULY 1993

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Office of the Under Secretary of Defense for Acquisition
Washington, D.C. 20301-3140

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

DEFENSE SCIENCE
BOARD

July 16, 1993

MEMORANDUM FOR UNDERSECRETARY OF DEFENSE (ACQUISITION)

SUBJECT: Report of the Defense Science Board (DSB) Task Force on Defense Acquisition Reform

I am pleased to forward the final report of the DSB study on Defense Acquisition Reform, which was chaired by Dr. Bob Hermann. The study was conducted at your request for recommendations regarding the way we acquire adequate defense capabilities, with state-of-the-art technologies and industrial processes, at affordable prices, in the quantities needed.

In developing its conclusions and recommendations, the Task Force determined that its primary thrust needed to be the identification of those measures which would reconnect and integrate defense acquisition with the commercial workplace from which it has been drifting apart at a steady rate. The issues then become:

- The major barriers to use of commercial practices, facilities, and equipment
- The primary sources of excessive costs in the current acquisition process
- The lack of flexibility, reality, and affordability in the current program definition ("requirements") process
- The need to ensure "public trust" while implementing improvements.

Regarding these priority issues, the Task Force recommends:

- Adoption of commercial practices to the maximum extent possible, while assuring the mixture of tools available to the DoD and the commercial marketplace to protect public trust
- A closer linking of the systems requirements process to the operational plans and objectives of the Unified Commands as well as the cost constraints of the long-term budgetary process

To ensure success in these efforts, additional recommendations include:

- Development and submission annually to Congress of a DoD multi-year plan for shifting to commercial practices, facilities, and equipment
- Establishment of a standing oversight group of respected individuals from outside the government to monitor and report annually on the progress of the initiative
- Establishment of a comprehensive education, training, and outreach program, for both DoD and industry, to allow for better understanding of the concepts and mechanics of the program
- A time-phased approach to establishment of and implementation of the initiative which will allow for learning and developing trust in the initiative.

I fully concur with the findings of the Task Force, recommend that you review Dr. Hermann's letter and the Executive Summary, and forward the report to the Secretary of Defense.

DTIC QUALITY INSPECTED 3

Paul G. Kaminski
Chairman

St-A per telecon, Ms. Evans, OUSC for Acquisi
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OFFICE OF THE SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301-3140

DEFENSE SCIENCE
BOARD

June 30, 1993

MEMORANDUM FOR CHAIRMAN, DEFENSE SCIENCE BOARD

SUBJECT: Report of the Defense Science Board (DSB) Task Force on Defense Acquisition Reform

Attached is the final report of the DSB Study on Defense Acquisition Reform. The Terms of Reference asked for the Task Force to define a scope and method for proceeding with a comprehensive modification to the process by which DoD acquires goods and services and to specifically:

- Review the Section 800 study and other relevant studies for immediately actionable items and contributions for a comprehensive program
- Compile a comprehensive list of examples which can be used to convey the nature of the issues involved to the administration, the Congress, and the general public
- Recommend a method for proceeding with a radical change to the current process and perform a preliminary review of the impact of the requirements process on the acquisition system and on an approach for change to that process.

The Task Force reviewed these issues and determined that its primary thrust needed to be recommended measures to reconnect and integrate defense acquisition with the commercial workplace from which it is drifting apart at a steady rate. Implementation of these measures will yield not only substantial savings in acquisition time and costs, but more important, further U.S. economic growth by enabling the dual commercial and military use of technologies, resources, and processes.

In addressing this thrust, we investigated:

- The major barriers to use of commercial practices, facilities, and equipment
- The primary sources of excessive costs in the current acquisition process
- The lack of flexibility, reality, and affordability in the current program definition ("requirements") process.

Our priority recommendations involve moving DoD contracting activities more toward commercial practices while still protecting the public trust, and more closely linking the weapon system requirements process to the operational plans and objectives of the Unified Commands. In addition, and to ensure successful adoption of this initiative and these measures, we recommend:

- Development and submission annually to Congress of a DoD multi-year plan for shifting to commercial practices, facilities and equipment
- Establishment of a standing oversight group of respected individuals from outside the government to monitor and report annually on the progress of the initiative
- Establishment of a comprehensive education, training, and outreach program for both DoD and industry to allow for better understanding of the concepts and mechanics of the program
- A time-phased approach to establishment of and implementation of the initiative which will allow for learning and developing trust in the initiative.

We believe that implementation of our recommendations will provide a sound basis for evolving a new process for acquiring adequate defense capabilities, with state-of-the-art technologies and industrial processes, at affordable prices, in the quantities needed.

Robert J. Hermann
Chairman

Attachment

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

I. The Imperative for Reform

The most important and urgent imperative for defense acquisition reform is the need to integrate major parts of the defense industrial base with the commercial industrial base. This is required to meet several objectives:

- To give DoD access to those technologies, products, and processes which are dominated by the commercial market place. Electronics, software, computer systems, telecommunications, and flexible manufacturing are example areas where commercial technology is far more advanced than military technology.

- To broaden the industrial base upon which the department depends. The current, essentially dedicated and thus isolated, base is eroding, is not attracting capital, is losing technology leadership, is not using the most advanced industrial practices, nor is it capable of the required surge capability for crisis response.

- To become more efficient--save money. Inefficiencies exist in all three segments of the acquisition process: program definition, program execution, and the defense industrial base. Acquisition emphasizing commercial practices will enable DoD to stretch its available resources significantly.

  - How much money can be saved is not subject to precise calculation. The Task Force has examined many case studies and has reached the judgment that efficiencies in the order of tens of billions per year could be achieved after four or five years of determined reform.

- Finally, greater integration of the industrial base will make the large R&D and production resources of the DoD more readily available to the U.S. economy overall; to foster economic growth and industrial competitiveness.

II. Elements of a Solution

A. Adopting Commercial Practices

Adopting commercial practices requires profound changes and difficult choices. It means:

- DoD must move away from the current cost-based acquisition system and increase the use of practices which will encourage commercial entities to serve the defense market (areas impacted involve unique government procurement, accounting and auditing practices).

- Commercial functional specifications must be applied. DoD unique product and process specifications must not be imposed which inhibit the delivery of defense products and services by commercial sources.

- Data and intellectual property rights must be treated in a manner consistent with commercial practice.

B. Maintaining the Public Trust

Monitoring costs as the way to determine a fair price is deeply imbedded in the current acquisition process and viewed by many as a major element in protecting the public interest. Moving away from cost-based acquisition raises questions about how to maintain the public trust while using commercial practices.

We believe the public protection offered by the current system is not a very high standard. It encourages the supplier to increase the cost of goods because that is one of the few ways available to increase profit over the long run. It discourages a supplier from investing in more efficient production processes. It creates an immense regime of contention between the government and its suppliers around which large numbers of government auditors, accountants, and other overseers scrimmage with an equally large number of supplier personnel. The result is a constant flow of charges and counter charges about false claims, unallowable costs, pricing deficiencies, and a host of other opportunities for differences which we believe can safely be avoided. It is very clear that the effect of this is not public trust.

There are a number of tools available to DoD in the commercial market place that can do a better job of protecting the public trust:

- Emphasis on the broad use of competition.
- A formal, collective, and accountable judgment of fair price using market surveys.
- Better understanding of value through greater involvement of users in the program definition process.
- Track record of past performance of contractors.
- Use of the general regulatory environment governing the conduct of commercial business, including commercial accounting and auditing.

C. The "Requirements" Process - Flexibility Needed

One of the most important elements of this new approach is flexibility in the process that determines what DoD needs to acquire. The commercial market place depends heavily on competition not only between competitors for identical items, but among functionally similar items and alternative courses of action. This requires that the program definition process be more closely linked to an understanding of the objectives and plans of the military user and thus a better sense of the value of the alternatives and their affordability.

- This means giving the Unified Commanders (the Users) and the CJCS/Joint Staff a more powerful role in the acquisition process--and more access to technical resources to fulfill that role.

- The activities of the CJCS/Joint Staff must be integrated with those of the Under Secretary of Defense (Acquisition) (USD(A)) and the acquisition community.

- A direct relationship must be established between the acquiring Service/Agency and the user CINC to permit a more effective dialogue over how the functional needs are to be met and at what cost.

- These needs must be linked to the long-term budget process to assure affordability.

III. Recommendations - How to Begin

The Task Force believes that DoD should begin on two fronts:

First, take several steps already defined by prior policy decisions and studies:

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 supporting 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. This can be done without legislation.

c. Support the Section 800 panel's recommendations to make permanent the current $500,000 threshold for submission of cost or pricing data.

In parallel, begin to introduce commercial practices in key industrial sectors:

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. We recommend information systems, electronics, and jet engines as broad candidate areas. Within these sectors carve out limited segments of these industrial sectors as pilot initiatives that involve entire plants:

   a. We recommend the electronics and jet engine industries as candidates for pilot segments.

   b. Begin immediately to bring the private and public participants in these industries together to evolve the correct practices for each.

5. Select two major Unified Commands (recommend LANTCOM be considered as one) and increase their military systems capabilities for technology insertion and requirements definition.

6. Prepare the first of a series of Annual Plans for "commercialization" by 1 Jan 1994, 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.

REPORT

REPORT

1. Introduction - The Context for Reform in the '90s

The profound changes in the world that have taken place since the fall of the Berlin Wall require no elaboration here. What is required is recognition that these developments have radically altered the landscape against which the issue of defense acquisition reform must be considered.

Previous studies, including Defense Science Board work, the Packard Commission, and the Defense Management Review of the last administration all addressed acquisition reform in a context of a stable or growing defense market. The end of the cold war released profound forces for change:

- It reduced the need for large military forces and changed the kinds of forces required--a process that will continue through the decade;

- The resulting defense spending cuts will reduce by at least half the amount spent for modernization compared to the last decade and further shrink the dedicated defense industrial base;

- There is now a higher political priority for the national requirement for economic growth and competitiveness.

Other economic and technological forces, already at work before the cold war ended, have been accelerated:

- The pace of change and proliferation of technology is increasingly driven by commercial markets. Commercial industry is increasingly the dominant factor in several modern technologies and products that are militarily important.

- The focus and intensity of investment in new industrial techniques in manufacturing, process development, and product design in most commercial industries is far ahead of dedicated defense system producers.

    - Unlike the situation in past years, commercial products are often more advanced in performance, cheaper to buy and own, and higher in quality and durability. It will become increasingly difficult to create effective military forces without access to commercial technology, products, and processes.

- The commercial marketplace and industrial base are becoming global in scope. It is no longer possible for any company or any country to be independently capable in all the capabilities needed to industrially compete.

    - Most successful products are produced by more than one firm, in more than one country, and have content from many nations. This is true today for military systems as well, and will become more so.

Many military systems have become incredibly expensive to buy, own, and operate, and take a decade and a half to field. Previous studies focused primarily on the need to streamline the acquisition process to shorten developmental lead times and to save money. Their recommendations are consistent with ours, and should clearly be implemented. However, they are insufficient for the current environment.

- The primary thrust of this Task Force report is to recommend measures to reconnect and integrate defense acquisition with the commercial workplace from which it is drifting apart at a steady rate. These reforms will yield substantial savings in time and money, but are not merely a matter of efficiency--they are an imperative to keep up with a radically changed world.

- Without fundamental reform, DoD will be unable to afford the weapons, equipment, and services it needs to provide for our national security. Moreover, they will seriously lag the technology of the commercial sector and possible future adversaries.

2. The Problems We are Trying to Solve

First, we need to broaden the industrial base upon which DoD depends. The dedicated defense industrial base is shrinking and will continue to shrink as defense spending declines:

- It is not attracting sufficient capital, is becoming the source of fewer technology advances, and is not using the most advanced industrial practices;

- It is increasingly isolated from the commercial industrial base and falling behind technologically. Barriers to integration will grow higher with time;

- Furthermore, surge capacity to respond to unanticipated crises is limited and may soon be non-existent in some sectors.

Second, defense needs effective access to important technologies, products, and processes that are (or soon will be) dominated by the commercial market place.

- Electronics, software, computer systems, telecommunications, and flexible manufacturing systems are prime examples of areas where the commercial sector has clear technological leadership.

- These markets are global--commercial firms sell and partner worldwide. DoD must balance its traditional desire to restrict dependence on foreign suppliers with its need to connect with the commercial market place where important technology is being created.

    - There is opportunity here: increased international collaboration can serve to make future forces more interoperable when US forces work with a coalition, an added bonus.

Third, defense acquisition must be made more efficient:

- The breadth of the commercial market place provides the opportunity to greatly reduce costs of weapons and equipment;
- Defense unique procurement requirements impose additional cost and timeliness burdens on government suppliers;
- Maintenance of organic infrastructure (e.g. labs, depots, and arsenals) drives up overhead costs, and often locks in obsolescent industrial practices.

These problems cannot be solved with current defense acquisition practices. DoD must remove the barriers that inhibit commercial practices in its acquisition process and often force industries to maintain separate, dedicated, and more expensive entities solely to meet the unique defense requirements while walling off their commercial entities from doing business with DoD.

The Task Force adopted the following statement of objectives for reform:

DoD must create a system for acquisition which can:

- *Acquire defense capabilities with state of the art technologies and industrial processes at affordable prices in the quantities needed; and*
- *Strengthen the US industrial base.*

To do this it must:

- *Increase reliance on the civilian industrial base and reduce its reliance on a shrinking and isolated defense industrial base; and*
- *Reduce the cost and inefficiency of the current acquisition process.*

3. Major Offending Processes in the Current System - Barriers to Commercial Practice

The Task Force identified those aspects of the current process which are most responsible for the barriers between the defense and commercial industrial base and result in separate plants and organizations being created. It is noted that although much burdensome legislation and many restrictive regulations have been revised or rescinded, the Task Force judgment is that the changes are not always being pursued in spirit or in reality.

The most important single intrusive element of the current process is the cost-based contracting system. It triggers many problems:

- Imposition of an array of unique reporting and oversight systems which are incompatible with commercially competitive enterprises.
- Negotiation of prices based on costs, using detailed cost or pricing data, rather than prices based on value to the government.
- The requirement to provide and certify cost or pricing data.
- Unique cost accounting systems.
- Excessive controversy and litigation over relatively minor costs which are "unallowable" or illegal with little management attention on whether the major costs of a system are reasonably beneficial.

The second major barrier is the systematic imposition of a host of systematically applied product and process specifications, which are different from those used in the commercial market place, and which prohibit the integration of design, manufacturing, and support between the defense and commercial businesses.

A third limitation is the blanket imposition of government wide and DoD unique procurement requirements in the contracting process. These include:

- International sourcing restrictions. We believe reduction of restricted sourcing will result in DoD investment creating competitive advantage for dual use industries and thus a greater return to the US economy as a whole. As for the perceived risk of foreign dependence, we believe that we are already very interdependent with other nations for our security at the many levels of materials, technology, industrial capabilities, forces, and diplomatic relationships.
- The blanket imposition of socio-economic requirements in the contracting process which are not accepted in commercial practice. This does not mean that these goals cannot be addressed, but it does mean that they must be tailored to the situation and balanced with the need to achieve commercial integration. The Task Force recognizes that the defense acquisition system must reflect a balance between efficiency and larger national goals; therefore,

it recommends that where socio-economic legislation and regulations have been adopted for the defense sector only, they should be rescinded; where they apply to industry across-the-board, they should be retained.

The fourth barrier is the unique DoD demand for data rights beyond normal commercial practice that results in separate processes being developed for DoD and commercial work.

Finally, the Task Force recognized as a barrier the lack of flexibility in the execution of the military requirements and program definition process with respect to cost, functional capability, and specifications. This is a major issue that must be addressed if the acquisition process is to be fundamentally reformed--we discuss it in section 5.

4. The Efficiency Issue - Where the Costs Are

The Task Force identified three broad sources of excessive cost in the current acquisition process. They are:

- Inefficiencies in "Program Definition". This encompasses the whole iterative process from mission need and/or technological opportunity through the program/budget process to the evaluation and specification of the desired performance, cost, and quantity of the new or improved system.

- Inefficiencies in Program Execution. This includes the complete acquisition process, beginning with the desired design through development, production, and support.

- Inefficiencies in the Defense Industrial Base. This covers such things as redundant and unnecessary excess capacity maintained solely for crisis surge needs, and procurement of equipment solely to maintain the domestic defense industrial base in critical sectors.

These categories will be discussed in turn, with examples and estimates of the potential efficiencies that might be achieved through reform. A more complete treatment is provided in Appendix C.

A. Inefficiencies in the "Program Definition" Area.

"Program definition" is the process that begins with the definition of a military mission need (a military "requirement") by a user and proceeds through the development cycle ultimately resulting in a specific program to produce a new system.

The Task Force found that there are significant cost inefficiencies that originate in the program definition process. There are two root problems:

- Inadequate consideration of both cost **and** value; and

- Program instabilities resulting from both budget and "requirements" changes during the life of the program.

The major causes are:

- Specifying a specific weapon system need, instead of a mission need.
- Not bringing resource constraints into the program definition at an early stage.
- Assuming "this will be the last new system for the next two decades", and including all new (often unproven) technology at the start of full-scale development, and adding new requirements to this same system over time.
- Not considering production and support needs and costs when specifying the system.
- Not fully and effectively making production price a key element of the specification for the system (along with performance) per the 5000 series regulations.
- Overspecifying the exact performance and the details of the design, as well as the production and support to be utilized--thus eliminating the flexibility needed to make cost savings in the execution phase.
- Frequent perturbations introduced into a program's life by the Congressional annual budget process.

Because of its centrality to the overall acquisition system, we further discuss reform of the program definition process in section 5.

B. Inefficiencies in Program Execution.

There are a number of primary elements which impose inefficiencies in the current acquisition system.

First, unique government procurement procedures frequently result in the creation of separate company organizations and units.

Second, unique government specifications, processes, and practices compound the problem and often require the creation of separate development and production activities.

Examples include: prescribed use of milspec parts, special materials handling procedures, quality control and testing mandates, and associated record keeping.

- Studies suggest these can add from 20% to more than 50% to the cost of the product compared to best commercial practices.

- The separation of facilities for similar work (between military and civilian equipment) is a major cost driver to the DoD, since it must pay for the large overhead of its facilities across a very small volume of production.

Third, there are a large number of government people who monitor and audit industrial activities for compliance to government-unique requirements with at least as large a set of private sector people needed to deal with this force of government overseers.

Fourth, there is another large government program management and supervision chain with matching commitment by industry.

- Estimates of the number of people engaged in the acquisition process range from a low of 100,000 to a high of 500,000 depending on definition. Using a conservative estimate of 150,000 government employees, we believe a 30% reduction is feasible which could save $4B annually in DoD personnel costs and accrue significant dollar savings from similar contractor personnel reductions.

- Studies suggest that government program management and oversight personnel significantly outnumber their commercial counterparts (performing similar functions for commercial purchasers at the same facilities).

Fifth, there is the extension of time. A very large source of unnecessary costs is the systematic imposition of process and management practices which lengthen contract activity and result in the inefficient use of all contract resources not just those involved in oversight.

Four case studies illustrate how these five barriers combine to increase costs and impose limits on the value of products DoD buys using unique practices:

- The Motorola developed STU-III Secure Telephone. In the '80s, Motorola was selected to build the STU-III secure communications terminal on the basis of development of a dual use commercial product. The development took 3 years compared to an estimated 7-11 year "normal" DoD cycle, and cost an estimated one-tenth a DoD milspec item.

- The Westinghouse developed Modular Avionics Radar (MODAR). This sophisticated pulse doppler radar was developed for airborne windshear detection on the C-130 and A-300 Airbus aircraft. The radar uses all commercial parts; however, it is built in facilities primarily used for supporting DoD requirements. Comparison with the APG-66 Radar, developed for use in the F-16, indicates a 50% reduction in development time and a 60% cost reduction for MODAR: savings attributed to waivers from typical milspecs.

- Frequency Agile Signal Simulation (FASS). FASS is a Hewlett-Packard developed capability to simulate a wide range of complex signals which can be used in electronic warfare. Using commercial off the shelf components, the system is estimated to cost only 20% of less agile but comparable DoD milspec systems.

- The Allison 250-C-30R Army helicopter engine. The Army selected the Allison FAA certified commercial engine for a helicopter program. Procurement as an off the shelf item with minimum modifications eliminated 5-8 years development time and cost. The Army obtained seven engines for less than $2M compared to an estimated $200M development cost for a milspec engine.

Our examination of case studies suggests a broad range of potential savings in the program execution area:

- Many more commercial items (e.g. electronics, software, spare parts) could be procured if barriers to their procurement were removed.

  - Savings range from 3% to at least 20%

- A significant share of defense-unique items (meeting different defense requirements) but requiring a production process similar to commercial products and using commercial parts, can be built in dual use plants (e.g. transport aircraft, jet engines, communication satellites, electronics and software). We call these "commercial like" items.

  - Savings range from 10% to at least 25%

- There are some defense unique platforms and equipment which will be built in unique facilities (e.g. missiles, nuclear submarines); however even here significant efficiency gains are possible from greater use of commercial practices, since the overwhelming majority of the subsystems for these weapons will fall into the "commercial-like" or commercial categories discussed above.

  - Savings range from 10% to at least 15%

The Task Force compiled (and is continuing to compile) case studies that illustrate the impact of barriers to commercial integration. These are attached in Appendix D.

C. Inefficiencies in the Defense Industrial Base.

DoD maintains a very large government laboratory, depot, and arsenal base. This is costly both because of the maintenance of dual industrial capacity with industry, and because of the unique requirements they apply to the acquisition process.

- Billions of dollars of potential cost savings are possible here.

  - One case study illustrates the link between the current depot system and the acquisition process. In the late 1970s, the Air Force bought the CFM 56 jet engine for the KC-135 using commercial/FAA practices instead of milspecs. Over the years, as commercial use of the engine increased, the manufacturer incorporated technical improvements . However, the Air Force depots refused to accept the changes, because they would make obsolete their investment in in-house maintenance capability. Today the Air Force is buying an engine built on a separate line and is denied the "spin-on" of commercially derived technical improvements.

  - Added acquisition paperwork requirements because of the need for documentation for government in-house depot maintenance and support.

  - There are significant costs of an excess industrial base being maintained solely for potential future surge needs which would not be required if surge demands could be satisfied through reliance on the commercial industrial base.

  - There are significant costs (billions) being spent to buy weapons to "maintain the defense industrial base"; an integrated base could be maintained with commercial purchases and available when defense needs reoccur.

  - About $17B annually (FY 94) are spent on government depots, production facilities and R&D facilities. If 25% of this could be eliminated through increased use of the commercial industrial base, there are potential savings of $4B annually.

D. Conclusions on Costs.

The Task Force concludes from many case studies and their own experience that there are significant cost efficiencies to be had through reform of the acquisition process. How broadly these case study results could be achieved and how much money can be saved or better used is not something that can be calculated with precision (overall estimates are made in Appendix C).

- *It is the judgment of the Task Force that tens of billions of dollars per year in efficiencies are achievable.*
  - *It would take four or five years of determined reform to achieve these savings.*
  - *The Task Force strongly recommends against attempting to establish a specific savings target in advance. The reforms need to be pursued on their merits with the knowledge that savings will be identified and achieved as specific actions are implemented. But the real goal is to enable DoD to buy the goods and services it needs to provide for our security in an era of steadily declining defense budgets.*

5. "Requirements"/Program Definition Process - Another Barrier

The Task Force found a lack of flexibility in the way the program definition process actually works with respect to cost and capability, especially at the "front end" in the early stages of development of a new system. This often results in a rigid and detailed set of "how-to" specifications, performance characteristics, and schedule requirements, and leads to troubled programs. To move towards integration with commercial industry will require more flexibility. The key to this change is an understanding of the way military "requirements" are meshed with the program definition process.

The current "requirements" process is executed primarily by the Services. The Services, in their roles of "organize, train, and equip", provide the forces to be used by the CINCs in combat. It is important to remember, however, that all combat is conducted by the Joint Commands (CINCs); the Services provide the resources.

Since the mission of the Services included "equipping" the forces, it is current practice for them to state requirements for weapons systems they deem necessary to support their functions. The CINCs provide their needs to the Services, but the Services retain the requirements function for new weapon systems.

This process has created an environment of competition among the Services and often a different priority of resource allocation than the CINCs might recommend. Further, it provides the opportunity for some unnecessary duplication of efforts by the Services and often a loss of opportunity to engage in mutually supportive efforts. Clearly, in today's austere environment, such an operation needs to be changed.

The Services do have the requirement to support the combat mission and must work closely with the CINCs who are responsible for conducting combat operations and, therefore, should be a lead player in the development of "requirements". The Services must retain a role in the requirements function because most of the personnel resources in the technical fields are in the Services. The CINCs today have very few such resources. However, the cogent analysis necessary to properly state requirements for new or modified weapons systems makes access to such talent a must.

Goldwater-Nichols changed the roles of the principal military leadership. The roles of the CINCs and the Chairman JCS (CJCS) were enhanced to emphasize their warfighting roles. The roles of the Chiefs of the Services were focused on the "organize, train, and equip" function. It is necessary now to enhance the role of the CJCS and the CINCs in the front end of the "equipping" mission.

A revised DoD requirements process should include the following:

- An enhanced role for the CJCS and the CINCs in the requirements process.
- Providing the Joint Staff with an improved capability to permit the Chairman and the JCS to prioritize requirements.
- Requiring the appropriate offices of OSD to provide fiscal input to the Joint Staff which can be used in the resource constrained requirement's prioritization, and program definition process.
- Ensuring that a system is established which more closely integrates the Joint Staff's requirements activities with the Under Secretary of Defense (Acquisition) (USD(A)).
- Integrating the CJCS requirements into the Service acquisition process in such a way as to ensure that priorities of CINCs are represented.
- Establishing a direct relationship between the acquiring Service/developing Agency and the CINC who established the requirement to ensure that the functional needs of the CINC are properly understood and to permit greater flexibility in the early stages of the program definition process where the potential for value/price trade-offs is greatest.
- Ensuring that sufficient flexibility is built into the process to permit constant reassessment by the CINCs, the CJCS, and the Services to verify the needs, and to understand the technical and resource implications.

6. Elements of a Solution - Recommendations to Remove the Barriers

Integrating defense acquisition with commercial practices means making profound changes and difficult choices but the Task Force sees no other way to respond to the future industrial and security environment. It means:

A. DOD should commit now to an evolutionary approach to a fundamentally new system.

- Move activity away from the current DoD-unique cost-based acquisition system.
- Increase the use of commercial and commercial-like practices.
  - Commercial practices are those practices which will permit the participation of commercial entities in the creation of defense capabilities.
  - This implies no systematically applied unique accounting practices, specifications, procurement requirements, reporting systems, and management practices would be required beyond those normally practiced in US industry.
  - Data and intellectual property rights must be treated in a manner consistent with commercial practice.
- Target to achieve 99% of contracts and 50% of contract dollars to be of a commercial character by the end of 1996.

B. SecDef should secure authority from the Congress to apply commercial practices when, in his judgment and in accordance with a multi-year plan submitted to Congress, it is in the public interest to do so.

- Submit the first Annual Plan for the shift to commercial practices by 1 January 1994.

  The plan should address the following:

  - A concept for reform in each of the broad areas discussed in section 4: program definition, program execution, and defense industrial base.
  - Within each broad area, addressing of the specific barriers addressed in this section, and broad strategies for reform in each.
  - Identification of the means for reform (e.g. new DoD regulations, new legislation, budget authority, organizational changes, education, etc.)
  - For each area and means, a time-phased set of targets.
  - Feedback and tracking system(s) to provide confidence in the achievement of the targets (including manpower reduction).

C. Begin immediately using currently available DoD authority in each of the areas of high payoff:

- Commercial products.

- Where the commercial industrial base is strongest and most important to defense.

- Where competition is available to produce a fair and reasonable price.

D. Protect the public trust in the use of public resources by applying a mixture of tools available to the department and already existing in the commercial market place:

- Because the monitoring of cost as the basis for determining a fair price is so deeply imbedded in the DoD acquisition process and viewed by so many as a major element in protecting the public interest, moving away from cost based contracting must necessarily raise questions about how to maintain the public trust in DoD contracting using commercial practices. The Task Force views this as a crucial issue which must and can be solved.

  - We believe the public protection offered by the current system is not a very high standard. It encourages the supplier to increase the cost of goods because that is one of the few ways available to increase profit over the long run. It discourages a supplier from investing in more efficient production processes. It creates an immense regime of contention between the government and its suppliers around which large numbers of government auditors, accountants, and other overseers scrimmage with an equally large number of supplier personnel. The result is a constant flow of charges and counter charges about false claims, unallowable costs, pricing deficiencies, and a host of other opportunities for differences which we believe can safely be avoided. It is very clear that the effect of this is not public trust.

- We believe that even after monitoring cost is removed as a contractual entitlement, there remain several strong and effective tools available to the government:

  - Continued emphasis on the broad use of competition:

    -- Between firms to a common performance specification.

    -- Between firms for functionally similar capabilities.

  - Competition between alternative government courses of action to achieve equivalent or relatively valued military utility.

  - A formal, collective and accountable judgment of fair price using market surveys of similar products.

  - Track record of meeting cost, schedule, and performance expectations.

-- Past performance should be a major criterion for future business.

- Use of the general regulatory environment governing the conduct of commercial business.

  -- Including commercial accounting and audit practices.

  -- Use of Suspension and Debarment for contractors who mislead the government or fail to live up to appropriate ethical standards, demonstrate a lack of business integrity or honesty, or willfully fail to perform a government contract.

E. Structure the process to favor commercial practices and specifications unless specifically waived.

- Commercial specifications must become the norm, not the exception.

- DoD unique product and process specifications must not be imposed such that defense products cannot be delivered from commercial entities.

F. Reduce government oversight personnel in parallel with policy and procedural changes:

- By program.

- By contract.

- By organization.

- By industrial site.

- Set up a formal manpower reduction tracking system and create time phased targets as part of the Annual Plan recommended on pg. 12.

G. Modify the process of establishing requirements for military equipment.

- The CINCs should be provided with a sufficient requirements definition and technology integration capability to permit them to become more proficient in the "up front" aspects of developing requirements.

  - An example of what resources might be needed could be evolved by reviewing the technical capability provided the Special Operations Command. (Other CINCs do not need the total programming and budgeting functions that CINCSOC requires because of his Program 11 responsibilities.)

- The Joint Staff should be strengthened to provide the CJCS with the ability to develop guidelines, consolidate requirements from the CINCs, and

develop priorities for review by the CJCS with advice from the Service Chiefs. These requirements would be stated in performance characteristics and not in specific technical details.

- The USD(A) and the Director PA&E should participate in the program definition/requirements development process with the Joint Staff. PA&E should provide analyses and possible alternative solutions to the Joint Staff in order to best meet requirements within resource constraints. The USD(A) should develop a system which permits review by the SecDef and the CJCS of the identified mission needs in relation to the expected resources available. The CJCS and SecDef would establish priorities in directing the Services to acquire needed systems.

- The acquisition process within the Services should permit continuing dialogue with the user CINCs in the development of the equipment, systems, or technology.

  - A process should be developed among OSD/JCS/Services to review with the CINCs the continuing need for stated requirements/mission needs. A process to permit canceling or changing such needs is essential given the changing demands of the world environment.

- The Services would continue to perform their "organize, train, and equip" role. The basic change would be in the increased role that the CINCs have in determining "how to" equip the forces which they are charged with commanding in combat; and in the increased emphasis on resource constraints in the weapons' definition phase.

  - The above changes are a continuation of the process begun by Goldwater-Nichols. Such changes should provide the basis to better evaluate competing Service capabilities in an era in which unnecessary duplication is not affordable, and integrated operations are becoming the norm.

H. Establish a standing Review Group of respected individuals drawn from outside the government to monitor and report annually on the progress of this initiative to both the executive and legislative branches of government and to industry.

I. Establish a comprehensive education, training, communications, and outreach program for government, industry, and the public.

- Achievement of fundamental reform will require a major commitment by senior defense leadership.

  - They must personally encourage, support, reward, and promote those who aggressively work to achieve good results; and discourage those who continue to follow past practices.

7. How to Begin

The Task Force believes that DoD should begin on two fronts.

First, take several steps already defined by prior policy decisions and studies:

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 supporting 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. This can be done without legislation.

   c. Support the Section 800 panel's recommendation to make permanent the current $500,000 threshold for submission of cost or pricing data.

In parallel, begin to introduce commercial practices in key industrial sectors:

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. We recommend information systems, electronics, and jet engines as broad candidate areas. Within these sectors carve out limited segments of these industrial sectors as pilot initiatives that involve entire plants.

a. We recommend the electronics and jet engine industries as pilot segments.

b. Begin immediately to bring the private and public participants in these industries together to evolve the correct practices for each.

5. Select two major Unified Commands (recommend LANTCOM be considered as one) and increase their technical military systems capabilities to develop evolutionary force plans and flexible needs statements with some sense of resource implications.

6. Prepare the first of a series of Annual Plans for "commercialization" by 1 Jan 1994, that lays out in detail goals, action steps, time schedules, and responsible parties.

   - Focus both on things that can be done now, and studies that must begin now in order to implement reforms in subsequent years.

   - Include "output" measures of successful achievement.

   - Include a manpower reduction tracking system (encompassing oversight as well as laboratories, depots, and arsenals).

7. Establish a standing outside Review Group.

8. Establish a comprehensive education, training, communications, and outreach program for government, industry, and the public.

   - Start with those involved in the pilot initiatives.

APPENDICES

Appendix A
Terms of Reference

THE UNDER SECRETARY OF DEFENSE
WASHINGTON, DC 20301

APR 15 1993

ACQUISITION

MEMORANDUM FOR CHAIRMAN, DEFENSE SCIENCE BOARD

SUBJECT: Terms of Reference--Defense Science Task Force on Defense Acquisition Reform (Phase I)

You are requested to form a Defense Science Board (DSB) Task Force to undertake a three month study to define the scope and method for proceeding with a comprehensive modification to the process by which the Department of Defense acquires goods and services. The Task Force should:

1. Review the Section 800 study results for both immediately actionable items and contributions to a comprehensive program.

2. Review the data collected in the 1990 USD(A) initiative on "Streamlining the Defense Acquisition Process," and other relevant studies to assure the best possible numerical estimate of the absolute and relative costs of the current process.

3. Collect a comprehensive list of historical examples which can be used to convey the nature of the issues involved to the Administration, the Congress, and the general public.

4. Recommend a method for proceeding with a radical change to the current process.

5. Perform a preliminary review of the impact of the current military requirements process on the acquisition system and recommend an approach for change which will be consistent with #4 above.

The Under Secretary of Defense (Acquisition) will sponsor this Task Force. Dr. Robert J. Hermann will serve as Chairman of the Task Force. Mr. Jay F. Dutcher of the Office of the Director, Acquisition Policy and Program Integration will serve as Executive Secretary. Mr. John V. Ello will be the Defense Science Board Secretariat representative. The office of AP&PI will provide funding and other support as may be necessary. It is not anticipated that this Task Force 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. The report should be completed by July 1, 1993.

John M. Deutch

Appendix B
Task Force Membership List

APPENDIX B

DEFENSE SCIENCE BOARD
TASK FORCE
ON
DEFENSE AQUISITION REFORM

Membership

Dr. Robert Hermann, Chairman
Dr. Anthony Bronzo
Mr. Robert Cattoi
Mr. George Donovan
Adm Leon Edney, USN (Ret)
Mr. Robert Everett
Mr. Robert Fuhrman
Dr. Jacques Gansler
Mrs. Joan Habermann
Dr. George Heilmeier
Ms. Wendy Kirby
Gen Edward Meyer, USA (Ret)
Mr. Ralph Nash
Mr. Philip Odeen
Gen Bernard Randolph, USAF (Ret)

Executive Secretary

Mr. Jay Dutcher

DSB Secretariat

Mr. John Ello

Advisors/Support

Mr. Thomas Christie
Mr. Gene Porter
Ms. Colleen Preston
Ms. Eleanor Spector
Mr. Rodney McDaniel
Mr. Ronald St. Martin
Mr. Edward Burke

Appendix C
Potential Increased Cost Effectiveness from Acquisition Reform

APPENDIX C

POTENTIAL COST EFFECTIVENESS FROM ACQUISITION REFORM

Methodology

Based on prior studies and management judgment, the DSB Subgroup on Cost Effectiveness categorized three broad areas of acquisition reform - program definition, program execution and the defense industrial base for potential efficiency gains for both industry and government. We used detailed FY92 acquisition data from DoD's data base to analyze which elements are amenable to the various forms of "commercialization" (e.g. buying commercial items, using commercial practices, commercial specifications, building military items in dual-use plants). We extrapolated the FY92 data to FY94 using budget data for both years, making the efficiency data more realistic by reflecting the deep cuts in DoD procurement funds. The Subgroup estimates for potential efficiency gains/cost savings in each of the three areas are based on examples of comparable commercial equipment, with comparable performance and capability.

Categories for Efficiency Gains

The following describes the Subgroup's three broad areas of efficiency gains:

- **Inefficiencies in Program Definition**—Program definition includes the iterative process from mission need and/or technological opportunity through the program, planning, and budgeting cycle. It includes the evaluation and specification of the desired performance, cost, quantity, etc. of the new or improved weapon system.

- **Inefficiencies In Program Execution**—Program execution includes the acquisition process, beginning with the desired design and continuing through development. production, and support.

- **Inefficiencies in the Defense Industrial Base**—The defense industrial base includes all suppliers of weapon systems, goods and service, and research. Inefficiencies would include redundant capacity maintained solely for surge requirements, and procurement of equipment solely to maintain the domestic defense industrial base in critical sectors.

Important Considerations

The changes described in the remainder of this appendix will take years to implement; dramatic efficiency gains cannot be anticipated for at least 5 years. These gains will depend on a concerted and successful effort to make the changes in the acquisition process described in the body of the report. However some gains will start immediately with the implementation of reform.

The desired result of the Subgroup's analysis was not to cut the DoD budget, but to enable DoD to buy more military capability for the reduced dollars planned for the rest of the 1990s. While the gains are expected to be significant, the percentages shown in this Appendix are applied to estimated FY94 acquisition numbers. If the overall budget declines in future years (as it has in FY93 and FY94), then the magnitude of the potential gains will be reduced, but the need to use resources efficiently will be even greater. Also there is significant overlap between and interaction among the three categories of potential efficiency gains; *the estimates cannot be added together.*

None the less, the potential gains in the three broad categories are significant and can be used as one measure of the value of proceeding with fundamental reform. The examples show that the time and effort to undertake acquisition reform is clearly worthwhile and, when complete, can result in efficiency gains of tens of billions of dollars annually. This means that the U.S. Defense capability will be far more robust and our National Security risks greatly reduced.

The remainder of this Appendix covers the specific inefficiencies in the three broad categories and gives the basis for the Subgroup's estimates.

Program Definition

Program definition includes the interactive process from mission need and/or technological opportunity through the program, planning, and budgeting cycle. It includes the evaluation and specification of the desired performance, cost quantity, etc. of the new or improved weapon system.

Causes of Inefficiencies

The causes of inefficiencies are spread throughout the program definition process. In the requirements phase, the current process tends to define a specific weapon system need, instead of the mission need. Resource constraints are not brought into the process at an early stage, and there is not enough interaction between price and capability as the program definition proceeds. This means that the production price is not a key element of the specification for a weapon system; performance is the key driver. The process fosters the assumption that "this will be the last new system for the next two decades" and thus encourages including new (often unproven) technology at the start of full-scale development, and adding new "requirements" to the system over time. The process also tends to over-specify the exact performance and the details of the design as well as the production and support to be utilized. This over-specification has two results, first it eliminates the flexibility needed to make trade offs in the execution phase and second it may increase the production and support costs (life cycle price often exceeds procurement price). Commercial practice is to be flexible in the definition of systems - to state the requirement in functional terms (e.g., train pilots to drop bombs) rather than in hardware terms (e.g., a training aircraft with specific characteristics). Also the costs of

alternatives (e.g., using two small aircraft rather than one jumbo aircraft) are regularly evaluated.

In the production planning phase of the program definition category, unrealistic quantity plans are often projected. This leads to a design for high rate production and resulting excess capacity. Also, optimism about the feasibility of building the weapon system without considering all the new "requirements" that tend to be added over time cause unrealistic budgeting for the program and are one cause of subsequent program funding instabilities. The commercial practice gives more attention to the potential down side (if the product doesn't sell) and tends to make improvements when they lower costs.

One other inefficiency is the government work force required to administer constantly changing programs and budgets, and the constantly changing requirements to fit these changing budgets.

Examples of Potential Gains

The following are example gains from flexible, commercial practices in program definition:

- Motorola STU-III. Motorola designed the STU-III secure telephone in conjunction with the National Security Agency for dual use. They did not use military specifications. The development time was 3 years, not the 7+ years for comparable DoD development. Estimates are that the price was 1/10 the price for a comparable DoD secure telephone. DoD bought the STU-III, with a manufacturing warranty and waiver for military specifications, data rights, and cost reporting.

- Command and Control Software. The BM/C3I staff of the Ballistic Missile Defense Organization used an open system, commercial off the shelf (COTS) approach and reused existing software to the maximum for its command/control application. They were able to reuse from 75 to 95 percent of the old software, and produce much of the remainder with CASE tools. This greatly shortened the development time and cut the cost of the software to about $1 per line of code compared to hundreds or even thousands of dollars per line using the traditional approach.

- Budget Instabilities. Estimates from the Packard Commission and the Air Force A3 study attribute significant costs (about 15 percent) to "budget and program instabilities".

- An example of planning for unrealistic production levels with an associated cost for unneeded facilities and tooling is the F-15 which was planned to have a production rate of 30 aircraft per month. The production facilities and tooling were sized accordingly. It is estimated that the actual rate of 15 aircraft per month added $2 billion to the cost of the system.

- Schedule Optimism. Overly optimistic or excessively concurrent schedules for systems (e.g., JAVELIN, ATAR, and ASPJ) result in disruption , cost growth, loss of credibility, and in some cases program cancellation.

Estimated Gains

On all new and modified systems, it would be appropriate to use a new program definition/requirements process. This would entail a broad mission requirement and early introduction of resource constraints, and would result in cutting development time and price of the system. The FY94 budget has $43 billion for weapons development and acquisition; this is the area most impacted by the current program definition process. (FY94 Acquisition funding included $35 billion for major and minor program procurement and $8.4 billion RDT&E (6.3b) funds for advanced development of systems). By shortening the development cycle and enabling COTS and commercial-like material to be used, 20 percent savings should be feasible - $9 billion.

Gains in the production planning and budgeting process are also possible. Based on the examples, some 15 percent could be gained from smoothing funding levels. If half of the weapons system procurements can achieve a smooth funding level, this represents a potential gain of $2.6 billion. In addition, estimated gains from other areas of program definition changes (such as evolutionary acquisition, price as a requirement, etc.) range well above 25 percent. If a fraction (say a quarter) of these gains can be realized, it represents a potential of $1.9 billion.

Program Definition Summary

As stated previously, these gains are not additive. However, the Cost Subgroup believes there is a potential gain from reforms in program definition in the magnitude of $6 to $10 billion annually (out of a $43 billion budget for weapon system funding).

Program Execution

Program execution includes the acquisition process, beginning with the desired design and continuing through development, production, and support.

Causes of Inefficiencies

There are two causes of inefficiencies—(1) unique processes/specifications and (2) excessive personnel associated with the complete process. The imposition of unique government processes and specifications often result in the development of unique components and systems rather than commercial standards. This practice often precludes the use of commercial items that are produced in greater quantity and at a lower price. This imposition of requirements and management practices tends to lengthen contract performance and causes the inefficient use of all contract resources. Government profit "guidelines" do not encourage contractors to reduce costs since profit is a percentage of cost. On

large contracts - especially follow on contracts - there is little reason to drive down costs since the government will likely reduce the profit accordingly. Furthermore, the imposition of unique accounting, specification, and oversight requirements often requires the creation of separate development and production facilities and activities. Finally, use of excessive and rigid requirements for formal competition and recompetition can disrupt orderly, long term buyer-seller relationships and result in work given to unqualified vendors.

The large number of government employees who monitor and audit industrial activities for compliance to government unique requirements is matched by at least as large a set of industry employees needed to deal with the government inspectors. In addition, the large government program management, engineering, and supervision chain entails a matching commitment by industry.

Examples of Gains

The following examples document potential savings from better use of commercial items and practices.

- Clothing. Military specification requirements forced a commercial glove manufacturer to set up a separate production line to produce gloves for the government. The price of the military version was $32 per pair; the nearly identical commercial version sells for $20.

- Construction. A survey by the American Consulting Engineers Council (ACEC) shows that social action clauses, business protective clauses, labor statute clauses, and other unique government purchasing requirements cause construction prices to be 5 to 17 percent higher for DoD projects that for comparable commercial construction projects.

- Integrated Circuits. In the integrated circuits arena, when DoD uses commercially developed and produced printed wiring assemblies the quality, reliability and performance are comparable, but the price is 30 percent lower. An additional case involved the Navy use of commercial integrated circuits for its new inertial navigation system (CAROUSEL). Costs of ICs ranged from 1/2 to 1/8 the price of military specification versions. The procurement cycle was much shorter and the capability and reliability at least equivalent. The producer (Rockwell/Collins) states that commercial ICs meet up to 50 percent of all DoD needs.

- Jet Engines. The Air Force agreed to the use of commercial jet engine casings. This reduced labor by 30 to 50 percent, production time by 70 percent, and prices by 50 percent.

- Computers. Digital Equipment Corporation developed a military version of their VAX computer. DoD waived 300 process specifications and permitted the use of COTS equipment. The result was a 20 to 30 percent price reduction.

- Simulators. DoD procured a Hewlett Packard commercial Frequency Agile Signal Simulator in lieu of new development. The capability exceeded the military alternative at one-fifth the price.

- F-22 Electronics. Analysis of electronic component costs of the F-22 fighter proposed wide use of "best commercial practice" components in lieu of military specified components. Savings of 30 to 50 percent in components can be realized. These actions would cut the cost of the electronics suite of the F-22 ($1 billion) by 15 percent or $150 million.

- Westinghouse Modular Avionics Radar. DoD bought a variation on Westinghouse's commercial avionics radar for use on the C-130 and A-300. This equipment is comparable to the avionics radar on the F-16, but took five months to develop instead of twelve months. Its price is 60 percent less than the comparable DoD unique equipment. Even though military specifications were waived, the DoD has been pleased with the performance of the radar.

- Allison 250-C30R Helicopter Engine. The Army bought this FAA certified engine in lieu of the new development. Off the shelf procurement saved 5 to 8 years and an estimated $150 to $200 million in development costs. The commercial warranties have proven to be as good as, if not better, then military equivalents.

- Cost Accounting Standards. Because of the requirements for cost or pricing data, five of ten top semiconductor producers refuse DoD business. Since 1989, INTEL has spent $2 million modifying its accounting system to generate cost or pricing data. It is still unable to satisfy government requirements.

- Administrative Inefficiencies. A CSIS Survey of companies with both commercial and defense business segments indicates that they spend considerably more on administrative staff in their defense business compared to their commercial segments. While the data varied widely, there was a pattern that suggests commercial business spend 5 to 10 percent of sales on administrative costs compared to 20 to 30 percent for their defense segments. Another CSIS study reported that a major corporation's defense division had 10,000 more staff than its commercial division to administer half the business volume - the cost of the added employees alone was $750 million.

- Auditing Staff. Pratt and Whitney reports that it has 52 people assigned to handle government auditors' requests for accounting data. Their cost, plus that of the government auditors, is $13 million per year. General Electric experience is similar; they need two employees to handle the workload generated by each government auditor at a cost of $3 million per year.

Estimated Gains

The Subgroup made some assumptions about the magnitude of savings if DoD used commercial products and practices. We assumed that many more items (e.g., some electronics, software, spare parts) could be procured as commercial

items if the 800 Panel recommended changes are made. In addition, a significant share of defense unique items require a production process similar to commercial products, use commercial parts, and can be built in dual-use plants (e.g., transport aircraft, jet engines, communication satellites, electronics and software). We call these commercial-like items. Finally, we recognize that there are some defense-unique platforms and equipment (e.g., missiles, nuclear propulsion) which will be built in unique facilities. However, even here significant efficiency gains are possible by using more commercial practices; recognizing that the overwhelming majority of subsystems for these weapons will fall into the commercial-like or commercial categories. Based on these assumptions and FY94 budget data, we estimated annual efficiency improvements after a five year period. Table 1 shows this potential impact percent.

Another type of efficiency comes from using commercial standards and specifications in the design of weapon systems. The examples showed reduction in prices of 30 to 50 percent. If half of the weapon systems designs would take advantage of these efficiencies, gains of 15 percent of half the FY94 weapons budget should be possible - $2.6 billion. (Note that subsystems alone are about 50 percent of the weapon system costs; and additional gains in this category could also include unique system specifications - which are not in this number.)

Table 1.
Estimated Potential Annual Efficiency Improvements (After a 5-Year Period)

	Potential Impact (After 5 Years)		
Program Execution	FY94 Cost ($B)	% Difference	FY94 Gains ($B)
Commercial Items			
Food, clothing, fuel, etc.	3.7	3	0.1
Construction	8.2	8	0.6
Electronics & Software	3	20	0.6
Small Purchases	8	10	0.8
Subtotal	22.9		2.1
Commercial-like Items			
Systems (e.g., transport A/C, jet engines, vehicles, munitions)	7.8	20	1.6
Electronics & Software	7.7	25	1.9
Subsystems & Parts	21.5	25	5.4
Services	16.4	10	1.6
Maintenance & overhaul (excl. organic)	6.5	20	1.3
Subtotal	59.9		11.8
Defense Unique Platforms and Equipment			
Missiles and space	4.6	15	0.7
Ships	1.9	15	0.3
Military aircraft	7.3	15	1.1
Tanks & armor vehicles	0.6	10	0.1
Weapons & ammunition	0.8	10	0.1
Subtotal	15.2		2.3
Government Acq. Employ. approx. 150,000	15	25	3.7
TOTALS	113		19.9
Note: FY94 data extrapolated from FY92 procurement data based on budget data.			

Program Execution Summary

As stated previously, these gains are not additive. However, the Subgroup believes there is a potential overall increase in efficiency of approximately $20 billion annually in acquisition programs through improvements in program execution. As before, this assumes a $98 billion budget for acquisition of systems, services, and other goods (a 16% reduction from FY92 awards).

DEFENSE INDUSTRIAL BASE

The defense industrial base includes all suppliers of weapon systems, goods and services, and research to DoD. Inefficiencies include redundant capacity maintained solely for surge requirements, and procurement of equipment solely to maintain the domestic defense industrial base in critical sectors.

Causes of Inefficiencies

The DoD pays a price for maintaining a separate defense and commercial industrial base. This includes government and quasi-government laboratories, arsenals, depots, and support contractor activities. The acquisition strategy that drives the need for organic (government) depot maintenance and support adds to the price of a weapon system because it requires procurement of technical data, test equipment, etc. There are other government strategies that make the industrial base larger than it could be. There is a price to maintaining excess capacity solely for potential surge needs - the capacity would not be required if surge demands could be satisfied some other way and in many cases the need may no longer be valid given the new security situation. Finally, DoD pays a price for procuring weapons beyond those required; these weapons are built primarily to maintain the industrial base in areas of critical technologies. In many cases the maintenance of these critical skills could be achieved by other means.

Examples of Potential Gains

The following are examples of potential gains by more efficiently using the defense industrial base:

- Facilities - The price of facilities averages 7 percent of weapon system price. If half of the systems procured are produced in single use plants, (out of $43 billion) and if half of these could be shifted to dual-use lines, facility gains could total $1 billion.

- Operations Support - The government maintains public and quasi-public operations in the support area. This includes depots, arsenals, and research organizations/laboratories. The total of this support is approximately $17 billion annually. If 25 percent of this can be reduced (due to redundancy with the private sector), this represents a potential gain of $4 billion.

- Air Force CFM 56 Engine (RC-135) - The DoD procured a commercial engine for the RC-135. DoD decided to maintain the engine in Air Force depots. When the manufacturer upgraded the engine, the DoD decided not to accept upgrades because of the inability of the depot to maintain the upgrades. The DoD is now the only customer for the original engine; costs have increased due to the low volume and DoD has failed to benefit from product improvements.

Estimated Gains

When DoD decides to support weapons or equipment itself (i.e. organically) instead of using contractor support, the DoD must plan for and procure the testing and other support equipment. If 4 percent of the $35 billion (FY94 budget for major weapon systems) can be saved by changes in this area, this represents a potential gain of $1.4 billion.

In the FY92 budget, Congress added $8 billion for weapons procurements which it explicitly stated were for the purpose of "maintaining the defense industrial base." Some were programs not requested by the DoD and others were grossly inefficiently stretched out programs. As the budget shrinks and critical portions of the defense base are threatened with extinction, these costs may grow. If half of these needs could be satisfied by dual-use facilities, the potential gain could be in the range of $4 billion per year.

Defense Industrial Base Summary

The gains in this area have the fewest examples. However, the Subgroup believes that by eliminating inefficiencies in the defense industrial base, saving of around $5 to $10 billion annually should be possible.

CONCLUSIONS

Acquisition reform, although difficult to implement and requiring many years to reach full effect, has a potential for efficiency improvements of over 20 percent. Out of an impacted $113 billion per year of both industry and government costs, this represents a potential efficiency improvement of over $20 billion a year after a five year implementation period. Even if it cannot be fully realized - due to political or institutional resistance - the likely gains are surely worth the time and effort. The range of realizable efficiency improvements is clearly in the tens of billions per year.

The clear winner would be our national security. The nation could afford a much more robust defense establishment despite the deep and continuing reductions in defense spending expected through the rest of this decade.

Appendix D
Case Studies and Examples of the Current Process

APPENDIX D

CASE STUDIES AND EXAMPLES OF THE CURRENT PROCESS

In testimony presented to the Acquisition Law Advisory Panel (June 1992) and in statements before the House Armed Services Committee (July 1992), it was noted that defense related acquisition laws, restrictive regulations, overly detailed military specifications, and common procurement practices "typically add 30-50% to the costs of doing business with the Department of Defense" and at times impede the introduction of commercially developed technological innovations into defense related systems.

Time restrictions of the short term Defense Science Board Task Force on Defense Acquisition Reform precluded detailed examination and verification of the specific costs savings stated; however, it is evident that the defense procurement process operates at a far slower pace than its commercial counterpart (e.g., average time from DoD Military Need Statement to IOC ~ 16 years). The system allows for or imposes restrictions that are so unique and intrusive (e.g., cost and price accounting standards and data rights requirements) that many contractors have totally separated their government and commercial productions facilities and have thus inhibited the rapid advances being made in commercial research and development from easy exploitation and use in military systems.

The purpose of this Appendix is to provide examples of the present restrictive practices and the benefits to be gained by reducing those restrictions. Cost/time saving data is provided where documentation was available. In general, case study examples abound to illustrate the problems associated with the present process and the unique ways in which some of these problems are surmounted. They include:

The Westinghouse developed Modular Avionics Radar (MODAR)

- This sophisticated pulse doppler radar was developed for airborne windshear detection on the C-130 and A-300 Airbus aircraft. The radar uses all commercial parts; however, it is built in facilities primarily used for supporting DoD requirements. Comparison with the APG-66 Radar, developed for use in the F-16 for similar capabilities, indicates a 50% reduction in development time and a 60% cost reduction for the MODAR. The monetary and time savings have been attributed to the system being initially designed for both defense and commercial use and the granting of waivers from typical military specifications

The Motorola developed STU-III Secure Telephone

- Developed in conjunction with the National Security Agency, this system allowed for the use of innovative commercial parts and required a 3-year development time versus 7-11 years for DoD only comparables. Estimates are that the cost of development and production are less than 10% of the DoD only comparables; in great part because the regular industrial commercial

segments fully participated; cost reporting, data rights and mil-spec restrictions were waived; and the system was designed from the start for dual use.

The Mil-Vax Computer

- Developed by Raytheon and Digital Equipment Corporation, the system uses commercial off-the-shelf (COTS) components. A 20 to 30% cost savings has been estimated by use of this system; in addition, no IR&D payments were required from DoD and the system allows for no-cost integration of all improvements. DoD use of this computer system resulted from the waivers of over 300 product specifications normally associated with computer acquisition.

The Allison 250-C30R Army helicopter engine

- This FAA certified engine (in lieu of mil specs) differs from the commercial version only by an electronic fuel flow component (ESC). The engine was procured as an off-the-shelf item eliminating 5-8 years development time and cost, except for the ESC which required ~ 30 months to develop and certify.

- Compared to a military developed and qualified engine which the Army estimates would have cost ~ $200M, seven certified off the shelf commercial engines were procured for less than $2M. Commercial warranties have proven to be as good as - if not better - than military equivalents. In addition, the Army has been able to take advantage of several "commercial use" changes which provided extended life in the desert environment of the Gulf war.

- An advanced and more powerful 250-C30R engine is being procured for the OH-58 KIOWA derivative helicopter. The commercial engine is being modified with the contractor paying ~ half the costs. Further savings are expected by the Army if commercial maintenance manuals are used in lieu of military equivalents.

Another example of inefficiencies in DoD acquisition is taken from a non-major system program - shotgun ammunition. The leading manufacturer has the most efficient factory line in the world, using three machines - each of which produces 240 rounds per minute. Quality control is done automatically through statistical process control. For DoD, military process specification requirements prohibit the use of these machines for virtually identical shells. Military shotgun shells must be manufactured using antiquated processes involving about 12 machines, each manned, and producing fewer than 100 rounds per minute in total. The company supports DoD as a matter of principal, not profit, because its capital facilities, labor, and floor space could be more profitably dedicated to commercial products.

Jet Engine Casings

- GE casings have been built under military specifications to satisfy both commercial and military requirements. This dual use consumption has allowed for over 70% manufacturing time improvement and 30-50% cost reductions compared to casings designed and procured for strictly military use.

Use of Plastics in components

- A long standing DoD prohibition against plastic parts has been largely eliminated because of industry efforts to improve plastics reliability (reduced phosphorous content in glass passivation and reduced extractable halide content of molding epoxies). Use of improved plastics allows for a 60-70% savings over ceramic or metal packages.

Frequency Agile Signal Simulation (FASS)

- FASS is a Hewlett-Packard developed capability to simulate a wide range of complex signals (and switching) with potential use in radar and electronic warfare. Using commercial off-the-shelf components, the system is estimated to cost only 20% of less agile, but comparable DoD mil spec systems.

Integrated Circuits and Electronic Components

- Numerous Collins Avionics (Rockwell) developed communications/guidance systems and data links use strictly commercial specifications and standards for the DoD and industry users. Collins estimates that a 20-35% cost penalty would be incurred for these systems if they were only acquired by the DoD. Dual use has a payoff for both government and industry.

- Commercially developed and produced Printed Wiring Assemblies used in DoD systems have comparable quality, reliability, and performance to government designed assemblies and result in 30% cost savings.

- Imaging Software from COTS sources (e.g., Paragon Imaging) is used by several intelligence community components and in addition to cost savings, allows for the introduction (at no cost) of software refinements.

- Commercial Hardware (i.e., workstations) used by the intelligence community allows for the acquisition of these systems without the time consuming and ultimately costly development of military specifications and interface documents.

- Electronic components comprise anywhere from 30-60 percent of the cost of advanced weapon system; the higher number is more prevalent as DoD retrofits older platforms with modern avionics and weapon systems. Defense-unique electronic products are functionally equivalent and environmentally

identical to products built with "ruggedized" commercial components to commercial specifications. Cost savings from purchase of the commercial components range from 30-90% while the greater commercial volume would allow for process improvements that result in far greater reliability for both the commercial and military user.

The CFM 56 (GE) engine

- This jet engine was originally designed for use in the Boeing 707 and KC-135 tanker during the '70s. While the dual use concept worked to the benefit of both DoD and industry through the early '80s, the retirement of commercial 707's led to a situation where almost all procurement was for the KC135. Five modifications were made to the engine through the late '80s; however, engines incorporating these technological modifications were only used by commercial users; Air Force standards required that only the original engine could be maintained in Air Force depots. This restriction eventually led to separate production lines; a commercial one for modernized engines and a basic line for Air Force engines.

Tactical Missiles

- Two missiles of similar development difficulty were developed and produced by LTV in about the same time frame under essentially fixed priced contracts (including priced production options). One missile (ATACMS) was a DOD contract with all of the government requirements, oversight and testing; the other (the VT-1) was a contract with a French Company (Thomson) with looser requirements, minimal oversight and much less (but adequate) testing. Both programs resulted in very successful missiles over roughly the same time period (excluding the pre-development contract period which was much longer for the DOD program). However, total contractor development costs were more than two-to-one greater for the DOD program. When the government cost and estimated Thomson costs are included, it would appear to be between two-and-one-half and three-to-one. Comparison of production costs are difficult since the missiles are considerably different in size and application.