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A Defense Industrial Base Strategy: A Program Manager's Perspective

Lieutenant Colonel
John W. Holly
U.S. Army

Faculty Research Advisor
Colonel Richard Altieri, USA

The Industrial College of the Armed Forces
National Defense University
Fort McNair, Washington, D.C. 20319-6000

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This research paper proposes a strategy to ensure that a viable and responsive defense industrial base remains at the turn of the century. While many believe that legislative reforms are the essence of an industrial base strategy, the necessary radical reforms are unrealistic. Thus, this strategy advocates an aggressive leadership role by the Department of Defense to create an environment where the defense industry can survive, even with vastly reduced budgets.

The specific strategy possesses four pillars. First, DoD must actively shape the future base by focusing on 21st Century needs by pursuing sole source procurements when necessary, making long term commitments to suppliers and industry and continuing legitimate best value acquisitions. Second, it supports leveraging initiatives in the commercial sector including flexible manufacturing, active risk management and preservation of multi-disciplinary design teams. Third, a recognition that you can't have everything is mandated. Lower priority program cancellations and aggressive support for international sales are recommended. Finally, Congress and Industry must also support necessary initiatives. Industry must continue to increase quality, lower costs and exploit dual-use technologies. Congress must honor termination requests, reduce excessive oversight, and appropriate discrete funding support.

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TABLE OF CONTENTS

Chapter 1 Introduction

"There is no explicit market mechanism which assures defense companies will always act in a manner which protects our national security interests." [1]

Stephen K. Conver
Former Assistant Secretary of the Army for
Research, Development, & Acquisition

The defense budget is shrinking. By 1996, available procurement funding will decline 52% from the 1985 level.[2] Since 1990, budget authority has dropped 33% for aviation, 53% for shipbuilding and 74% for weapons and tracked combat vehicles.[3] Given these precipitous drops, the industrial base must adjust to a radically different environment. How it adjusts will directly impact on the ability of American combat forces to meet emerging threats.

Thesis

The Defense Industrial Base is an essential element of military power. It must continue to provide our armed forces with weapons and supporting systems that will guarantee success in future conflicts. It will adjust to declining defense budgets, but on the basis of market forces, not national security needs. While some believe that legislative initiatives can solve this problem, radical congressional reforms are unrealistic. Hence, the executive branch must assume the leadership role to create an environment where national security interests

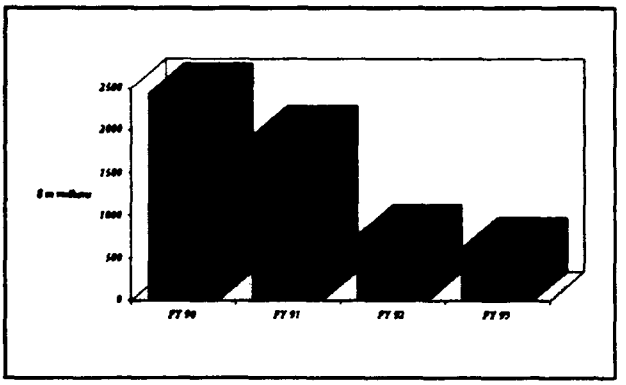

Figure 1-1 Budget Authority for Weapons and Tracked Combat Vehicles (WTCV)

converge with industry initiatives. This can be accomplished through a strategy that ensures a viable defense industrial base will exist in the 21st Century. This strategy must: (1) strive to create a healthy business atmosphere where a defense industry can survive, even with vastly reduced budgets; (2) identify and track critical producers of defense unique products; and (3) plan to actively support critical suppliers when they are threatened.

The Problem

Much has been said and written about the imminent demise of the American Defense Industrial Base. Lost capabilities, excessive lead-times, and unqualified workers in high technology jobs are cited as symptoms of our decaying base. Advocates of a strong defense base cite the collapse of weakened companies and the migration of suppliers of unique military products into the civilian sector as further indicators of a weakened base; while predicting dire consequences the next time the defense industry must mobilize.

If the situation is as extreme as many believe (and it is), then why aren't we doing something to reverse this trend? The answer thus far, is a survival of the fittest response--totally market oriented and noninterventionist. Given a free market economy, the deserving (some say lucky) defense firms will survive and the others will perish. However, this approach is based on a false premise. While we would like to believe that we have a totally free market in the defense industry, we do not. The US government is the sole customer for all domestic purchases, and must approve all international sales. The government interferes with the free market by exercising significant statutory and regulatory powers. It establishes profit rate policies that minimize profit potential, unique standards, and rigorous administrative and

accounting requirements which often conflict with the best commercial practices. Clearly, the government controls the industry. Yet we continue to debate the need for an *Industrial Policy*, when we have one by default. However, this ad hoc approach is neither focused, nor tailored to ensure the existence of a viable defense industrial base capable of quickly responding to new and emerging threats with high quality, technologically superior weapon systems. Continuation of this approach risks losing important national capabilities as the defense industry adjusts to the downsizing of the military.

The Solution

The solution ***is not*** a comprehensive industrial policy that retains the capability and capacity that exists today. Rather, the solution ***is*** an effective strategy to shape the future Defense Industrial Base. It must recognize the realities of today's environment, avoid indiscriminate intervention, focus on making the best use of available funds, and aggressively manage program costs. It must exploit the best practices of today's more competitive American industry and intercede only when a mission-decisive, critical node of the defense industry faces extinction. This proposed strategy embodies initiatives in four broad areas.

*1. **Actively Shape the Outcome***

- Focus on 21st Century needs, and manage the draw-down of current capabilities.
- Identify critical nodes where only a single domestic supplier/producer exists.
- Accept sole source procurements to preserve some critical nodes.
- Make a long term commitment. Pursue total life cycle associations for new systems, to include maintenance support down to General Support level.
- Focus on subcontractors.
- Use upcoming source selections to shape the restructuring. Publish program budgets, then seek the ***best value*** for the money.
- Rethink relationships with sole source suppliers to provide incentives for behavior representative of competitive markets.

- Tailor the application of all standards and specifications to uniquely fit the project.
- Promote opportunities to procure commercial products that meet requisite performance levels.

2. Leverage Initiatives in the commercial sector

- Employ best commercial practices where common sense and statutes permit.
- Revise cost accounting standards to align with acceptable industry practices.
- Support flexible manufacturing initiatives.
- Manage risk, don't seek to avoid it.
- Construct and preserve integrated, multi-disciplinary design teams.

3. Recognize that You can not have everything

- Develop a balanced strategy that includes system upgrades and leading edge technology developments.
- Actively pursue international sales opportunities.
- Construct realistic budget projections and be willing to cancel programs.
- Correct regulatory impediments to downsizing and consolidating the defense industry.

4. Recognize DoD can not do it alone

Industry

- Find a niche and develop unparalleled expertise.
- Reduce overhead and excess capacity.
- Emphasize increased quality, lower costs and reduced time to market.
- Assist in identification and management of critical nodes.
- Identify and exploit dual use technologies.
- Assess Military Standards and Specifications objectively. Implement appropriately tailored standards in both government and commercial operations.

Congress

- Honor DoD requests for program terminations.
- Reduce excessive oversight and micro-management.
- Appropriate necessary funds to support an aggressive system and manufacturing technology program, using extensive prototyping to fully develop concepts.

The defense business and operational environments have changed. Consequently, the business practices and acquisition approaches must also change to fit the new environment.

Chapter 2 Setting the Stage

"The health of the defense industrial base is vital to U.S. national security and is key to implementation of the regional defense strategy" [4]
1993 DoD Report to the President and the Congress

The Defense Industrial Base is a key element of national power that supports our National Military Strategy. Ironically, smaller force structures create an increased dependency on the defense industry for reconstitution in times of crisis. In the near term, reconstitution should not pose a major problem. Sufficient materiel stocks, facilities and skilled workers are still available. They could be marshalled together to respond in a crisis. However, as the military continues to down-size, time will begin to take its toll as facilities become obsolete, workers migrate into other fields and new technologies emerge but are not pursued due to funding shortfalls. These facts make the mid to long term strategy for the defense industrial base a problem that if not addressed today will undermine the future American ability to project and use military forces in a credible manner.

Current and Projected Environment

The defense industrial base is contracting. Since 1982, 310 defense firms have been acquired or merged. Further, twenty-six of these acquisitions were valued in excess of $200M, representing mergers of Prime contractors.[5] However, this major restructuring as a result of declining defense budgets is not a uniquely recent phenomena. It has occurred after every war, and just as predictably, has been poorly managed each time.

While the major acquisitions such as Martin Marietta's purchase of General Electric Aerospace receive the most attention, of greater importance and interest is the dynamic and subtle realignment occurring in the subcontractor tier. If the current DoD policy of letting *free market forces* determine the future of the defense industry continues, many sub-tier companies will exit the defense market--potentially creating shortfalls or voids in critical areas. For example, in a recent *Harvard Business Review* article, industry consultant Jerrold T. Lundquist predicts that only five or six avionics companies will compete for defense contracts in 1997, down from sixteen today.[6] In the combat vehicle sector, a network of 18,000 large and small firms is recognizing that future production requirements will support only a single prime contractor with a greatly scaled down operation.[7]

As production runs cease, company owned tooling and equipment will be evaluated for alternative functions or disposal. Since most companies attempt to minimize nonproductive assets in order to increase the assets-to-earnings ratio, it is reasonable to assume that private sector tooling will be reoriented or liquidated shortly after production ceases. Without existing production contracts, surge capability for critical combat systems will vanish. Consequently, spare parts, repair and replacement kits for damaged equipment, and essential materials will become critical items if not stockpiled in advance for crisis situations. Further, critical technical skills will be lost, while other unskilled employees will join the ranks of the unemployed. The release of the unskilled workers will exacerbate an already dismal regional economic and unemployment situation in areas such as Michigan, Pennsylvania, and Southern California. Skilled workers will migrate to other jobs, robbing defense contractors of unique technical competencies. These skilled workers range from certified ballistic welders to those

trained to operate and repair specialized, numerically controlled machinery. Ironically, these highly skilled workers will easily transition, exploiting their technical competence in the civilian sector. The net result will be that highly skilled work centers and the integrated design teams that understand the manufacturing and engineering processes will disband and be lost, dramatically undermining future research and development.

In an effort to ensure long term security, many corporations are establishing in-house capabilities through the acquisition of specialty firms. The subcontractors not absorbed by a larger Prime contractor will find business opportunities increasingly scarce because the Primes will accomplish a greater share of the work in-house. A recent example of this trend is evident in the Loral Corporation's team structure that successfully competed for an Army instrumented test/training range system shown in Figure 2-1. With the notable exception of Magnavox supplying Global Positioning System receivers, all of the major subassemblies are produced exclusively within the Loral corporate structure.

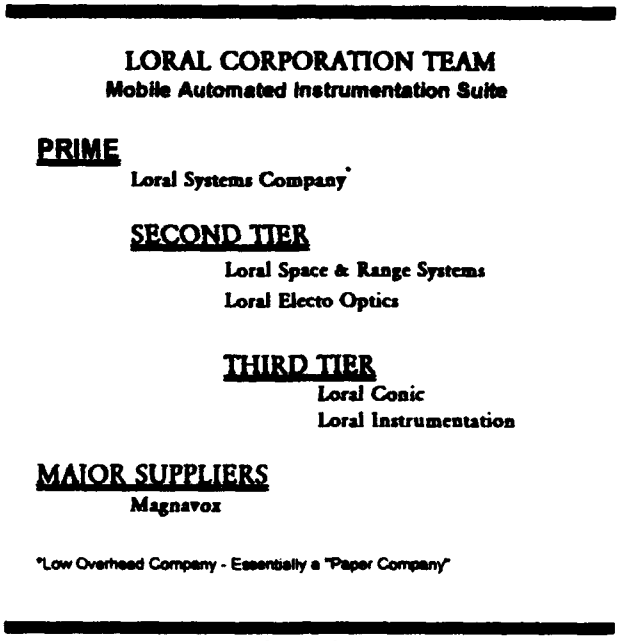

Figure 2-1

Strategy Development

The government response to this bleak outlook for the defense industry must be deliberate and carefully planned. Crucial to this process are: a vision of the desired end-state, clearly

defined success criteria, and the identity of core capabilities and critical, military-unique suppliers.

Success Criteria

A successful strategy must meet five critical tests:

- *Simple and understandable.* A complex, cumbersome strategy is doomed to failure in an arena that is frequently controlled by bureaucratic inertia.
- *Enhances Security.* The strategy must directly support national security objectives.
- *Implemented in Time to Make a Difference.* Without timely action, many pieces of the Defense Industrial Base will disappear. The window of opportunity to design and implement a strategy is limited--with too slow of a response, DoD could end up with a strategy, without any players.
- *Recognize political and real world limitations.* A utopian strategy is doomed to failure. We must accept revolutionary ideas, but seek changes only where reasonable and prudent. Realistic constraints must temper the zeal to act, otherwise the debate will continue, but the policy will founder.
- *The policy must integrate with and support the DoD Scientific and Technology Thrust Areas.*

Vision

The future Defense Industrial Base must be capable of producing existing designs, or quickly converting new designs into potent systems. It must be efficient, productive, and flexible. The focus must be *tomorrow's* needs, not yesterday's or today's demands.

Critical Nodes

The government must identify essential core capabilities, concurrently assessing which have already been lost or threatened. The companies which possess these unique capabilities then

constitute the set of critical nodes. These critical nodes principally reside in the subcontractor population, but some critical system integration skills might force a select group of prime contractors into this category. Some nodes will be self-sufficient and require only careful monitoring; others will require special attention to preserve. The following examples show the impact that critical suppliers of militarily unique materials can have on national security.

PEPCON-Kerr McGee Example

On May 8, 1988, a fire ravaged the Henderson, Nevada plant of Pacific Engineering and Production (PEPCON) -- leaving the United States with a single domestic supplier of Ammonium Perchlorate.[8] The remaining supplier, Kerr McGee Chemical Company, could not produce sufficient quantities of this chemical to meet the demand generated by *forty-five* separate DoD programs plus the NASA Space Shuttle. The criticality of this particular commodity forced the government to expand the existing Kerr McGee operation to offset the shortfall in production, and to rebuild the PEPCON facility. Government loan guarantees allowed PEPCON to rebuild, while the capital cost of the expansion and rebuilding was generated by adding a surcharge to the price of each pound of ammonium perchlorate sold. Further, the government had to prioritize between competing rocket and missile programs to ensure that the oxidizer was allocated to the most sensitive national security programs.

AVTEX Example

Five months later, the United States was faced with yet another example of a critical node when AVTEX Fibers of Front Royal, Virginia, announced they would terminate production--a scenario increasingly representative of today's environment. AVTEX was a sixth tier

subcontractor and the only domestic supplier of long-fiber rayon, a material essential to the fabrication of carbon-phenolic blankets used to line rocket motor nozzles, reentry vehicle heat shields and seals for extremely high temperature applications. The government immediately stepped in with financial assistance to restart production until a new source was created and qualified. As a sixth-tier subcontractor, AVTEX did not demand the visibility commensurate with its status as the sole supplier of a critical item. DoD must continuously monitor and observe the progress and health of critical domestic nodes through a data base reporting system and on-site observations of program managers.

Lesson

Frequently, critical nodes are not discovered until a catastrophic event occurs. We need to prevent these types of surprises.

Foreign Dependency

A critical foreign node creates a distinct vulnerability, but is not necessarily bad if we have common strategic interests, secure supply lines, very strong ties, and a willingness to rely on the good auspices of a foreign government. Precedents exist in intelligence sharing, cooperative research and development programs and co-production of weapon systems. A foreign critical node could prove to be acceptable, but only if carefully selected and judiciously monitored. If we do accept a foreign source for a critical node, then a formal agreement between governments is necessary, similar to our mobilization agreements with Canada. Such an agreement should not only guarantee supply, but also require active support for an endangered critical node until an alternate source is identified and qualified. If foreign dependency is not acceptable, then we must seek to develop a resident domestic capability.

Chapter 3 Strategy

"It is an unfortunate fact that we can only secure peace by preparing for war." [1]

John F. Kennedy

The military is rapidly down-sizing and the defense industry is shrinking even faster. The strategic challenge is how to minimize the adverse impacts that will inevitably occur as our military capability shrinks. Without an aggressive industrial strategy, capability voids and an undesirable set of suppliers could be the end result. The following four part strategy meets the success criteria identified in the preceding chapter and supports the national security imperatives essential to ensure a viable defense industrial base exists at the turn of the century.

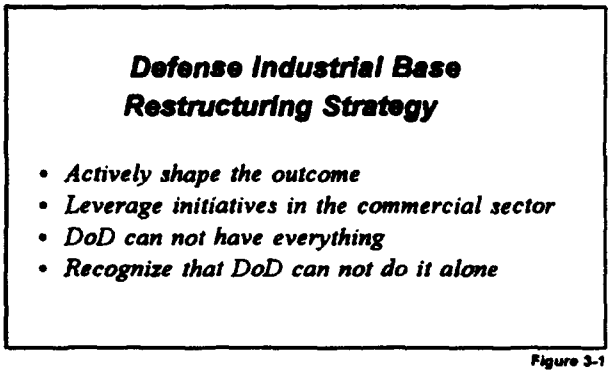

Figure 3-1

1. Actively Shape the Outcome

The Department of Defense must develop a strategy that actively shapes the *future* defense industrial base. This strategy should complement the procurement opportunities identified by Secretary Aspin, and exploit the inherent advantages of the free enterprise system. It should

directly intervene only in extreme situations. It must focus on supporting private industry's restructuring initiatives, while accepting the responsibility to pursue sole source procurements to preserve critical industrial capabilities when necessary. Failure to do this will result in an industrial base that is founded exclusively on profit margins and short term economic goals, not national security needs.

Secretary Aspin's Procurement Opportunities

- Selective Upgrades
- Selective low rate procurements
- Continued R&D of critical technologies (Rollover Plus)
- Silver Bullets (Highly capable system with significantly advanced technologies)

(Initially proposed during a speech to the American Defense Preparedness Association on 12 February 1992.)

Figure 3-2

21st Century Needs

History provides useful examples for comparing industrial capabilities and shaping an appropriate defense industrial base strategy. During the four years of World War II, the defense industry produced 88,000 main battle tanks. This capability could have been preserved at a significant cost to the taxpayers; however, it would have been of little use during the major modernization and build up of the 1980's. Additionally, the need and capability to produce such large quantities of defense materiel has diminished, but the technical complexity of weapons systems has radically increased--and will continue to escalate. World War II tanks did not have sophisticated digital fire control systems, laser range finders, special armor, integrated communications, and a 45 mph cross-country capability. Today's tanks do. Similarly, DoD should *not* be examining ways to retain the necessary manufacturing capabilities for the 1975 vintage F-15 air superiority fighter--it should focus on how to accelerate the manufacturing processes for the next generation fighter.

Focusing on the production of future systems is difficult. Technology is time-sensitive and rapidly evolving. Consequently, any strategy must be dynamic and continuously refined to ensure it remains current. Rapidly evolving technology is evident in predictions about current systems being fielded such as the Joint Tactical Information Data System (JTIDS). Future versions will likely replace many of the hardware components with software and firmware. If JTIDS is illustrative of the rate of technological advancement, preserving today's capability and capacity may only guarantee that we can produce obsolete equipment in the future. *Thus, our goal should be to shape the defense industrial base for the 21st Century, not protect what we have today, or had yesterday.*

Critical Nodes

As a direct result of the dramatic decline in budget authority identified in Chapter 1, the defense industry is rapidly shrinking--with several segments on the verge of vanishing. Some companies enjoy sufficient commercial demand to ensure that industrial capability will not be lost. However, other critical sectors do not possess the civilian demand to assure continued production capacity. The recent *Tracked Vehicle Industrial Sector Study* sponsored by ADPA found that "There is no commercial industry compatibility to maintain a [tracked vehicle] manufacturing base."[10] The M1 Abrams turbine engine is a classic example of this phenomena. The 1500 hp turbine engine has no commercial application, and a single producer. The production lead time necessary to build an engine is 520 days. Hence, if the Abrams line goes cold, and we fail to act, the net result will be the deterioration of a critical capability and a situation where replacement items and spare parts availability may become critical in crisis situations. However, the traditional internal combustion engine approaches to

automotive technology are approaching the upper limits for technological improvements. Breakthroughs in areas such as electric drives or natural gas turbines could prove to be the dominant approach for the future. Balancing future system requirements with current industrial capabilities is the crux of this strategy. An element essential for achieving this balance is the identification and tracking of critical capabilities.

Prime contractors maintain listings of preferred suppliers for goods they ordinarily require. These lists are usually automated. As a routine submission as part of a proposal, contractors should identify all suppliers and subcontractors. But what do you do with this information? A recent Office of Technology Assessment report[11] identified twelve separate models and databases existing within the government that are used to evaluate the defense industrial base. However, none provide more than a snapshot of a particular slice of defense industry, and most are not linked together. A DoD level data base could link the models, standardize the inputs and cross check to identify the unique nodes critical to defense industries. Authority to establish a permanent data collection capability for industrial base analysis was provided in the FY 93 DoD Authorization Act.[12] Once available, this database could provide important inputs to the Service Acquisition Executives. It could be used to ensure that we are not caught by surprise as exemplified in the AVTEX case, and to form the impetus to take action to preserve unique capabilities where necessary and appropriate.

Acquisition strategies prepared by program managers should identify critical nodes and pursue policies to either support them or mitigate their loss. But as the budget continuously reminds us, we cannot support every critical node. While all nodes should be identified and tracked,

only *mission decisive* nodes should be protected. These nodes must be essential to support peacetime forces or provide unique capabilities, in addition to providing rapid response during times of crisis. If the node cannot be decisive in a crisis environment, then it must be set aside and addressed as part of the reconstitution process. This relatively straight forward approach is complicated by the dynamic nature of the environment. During the next decade, critical nodes essential to reconstitute the defense industrial base of the early 1990's can be mobilized if needed during a crisis. However, by 2005, many of these nodes will be obsolete, mandating a continually shifting set of new critical nodes supportive of new technologies.

Examples of government support for critical nodes were previously cited in the AVTEX and PEPCON case studies. However, the traditional types of financial support, such as loan guarantees, are not sufficient to provide the incentives necessary to retain companies in the defense sector. Innovative approaches such as an aggressive prototyping program, sustaining rate production contracts,[13] and even sole source procurements represent some of the actions needed.

Source Selections

The direct result of Secretary Aspin's plan and budget constraints will be fewer programs, lower production quantities for remaining programs, and more upgrades. Given this situation, we will slowly begin to be tied to a few select contractors for the life of a system. This life cycle will be much longer due to the service life extension programs. Therefore, if we allow procurements to be decided discretely, without a view toward the long-term effects, we should anticipate voids in some critical defense sectors. So why not recognize the reality of the

situation and act to identify and support the best value long term sources for defense systems?

The single most effective tool available to DoD is the source selection process. It defines the winners and losers. With defense procurement budgets rapidly shrinking, the source selection process over the next two to four years will shape the future defense industry. Thus, these procurements cannot be treated using a business-as-usual approach--the winners will remain in the defense industry, while many losers will fold or seek new opportunities in the commercial sector. In many cases, we will be deciding on a single source for the future.

An extremely powerful tool for shaping the defense industry is continuation of best value source selections as the basis for virtually ***all*** major development and manufacturing contracts. Program managers should include industrial base considerations, such as capital equipment modernization, into best value source selection criteria. A representative set of criteria is shown in Figure 3-3. Such an approach could yield additional long-term cost benefits in addition to assuring a healthy base. For example, Jacques Gansler in his book *Affording Defense*, cites the case of the F-14 Tomcat production line that had an average equipment age of 34 years old. A similar example is the A-10 close air support aircraft. Old moth-balled equipment was taken out of storage and used to construct the full rate production line. In both cases, the significant amounts of scrap and rework (approaching 70%) were directly attributable to outmoded machine tools. Hence, it is quite clear that investments in capital equipment modernization can drive the system costs down,

Figure 3-3

while buttressing the health of the defense industrial base.[14]

Focus on Sub-Tiers

The defense industrial base has three principle constituents: prime contractors, subcontractors and suppliers/vendors. Of the three, the vendor/supplier is the least threatened by the downsizing of the base. Commodities provided by vendors usually have great commonality with commercial sector requirements. Similar electronic components, for example a capacitor, can be found in both commercial and military applications. However, the subcontractors, and to a lesser extent the prime contractors, stand to lose the most during the ongoing reductions. According to a recent Office of Technology Assessment (OTA) report, subcontractors "have developed considerable expertise in critical technologies and survive by that expertise."[15] As noted in the previous chapter, the tendency for primes to absorb small critical subcontractors, retaining more work in-house, places a greater burden for survival on the remaining subcontractors. Now the subcontractor must directly compete against the prime, even though they have fewer resources and a smaller market base.

Subcontractors tend to focus exclusively on specific products. Consequently, their expertise is exploited by aggressively and quickly pushing technology in their relatively narrow product line. Further, they are not burdened with corporate bureaucracies, and do not compete with other elements of the same corporation for limited research and development funds. If the independent subcontractors are allowed to disappear, America will loose a vital capability.

Long Term Associations & Sole Source Procurements

Sole source procurements can work well. The Lockheed development and production of the U-2 and its successor, the SR-71, provide excellent examples of sole source procurements where both industry and government benefitted. Yet, many people rebel at the idea of allowing a sole source environment in some critical sectors of the industry. While it is difficult to argue against the benefits derived from competition, the fact is that you need at least two companies to compete. Further, a single viable contractor is a much stronger element of national power than two or more weak and fragile competitors attempting to survive in a resource constrained environment. Conceivably, by attempting to retain multiple competitors in the base, we could weaken all of them to the extent that none would survive. Thus, life-cycle, winner-take-all acquisition strategies, based on best value considerations, should be pursued in situations where future competitions are merely an effort to preserve competition, when it really does not exist.

A fundamental tenant of Total Quality Management is establishment of long term relationships between customers and producers. Yet, the Defense Department fails to follow this basic precept. The Competition in Contracting Act (CICA) is frequently cited as the principle barrier. Realistically, the risk-adverse culture of the acquisition community is the major reason. Instead of establishing long term relationships, DoD pursues multiple competitions, resulting in a more expensive life cycle from both a cost and manpower standpoint. For example, the initial procurement of the F-16 included not only the production, but also the initial spares package. Subsequent procurements competed the major spare components only to have the original equipment manufacturer win each of these

competitions. This somewhat typical evolution, when combined with the downsizing of the defense base, forces the question...Why not enter into a life-cycle relationship with a single contractor upon entry into Engineering and Manufacturing Development?

The counter argument to this approach focuses on the fact that competition reduces costs. While this assumption presents a compelling argument, it must be examined in the total context of a procurement. Embedded in most proposals are the costs for labor instability, the technical data package, data rights, and other costs in anticipation of future competitive procurements. Further, if the materials for the subsequent spares procurements are not included in the initial order, true economies of scale are not achieved. This combines with fluctuations in the labor force to result in an increase in the total cost throughout the life-cycle, to the point where it may exceed the total life cycle support cost provided by a single contractor.[16]

Due to budget constraints, future production buys will not contain sufficient funds to pursue leader-follower or qualification of second source production strategies. Consequently, we may end up with only a single prime contractor capable of producing a particular system. This is not always bad. For example, the total cost to establish an automated facility in Camden, Arkansas to produce the Multiple Launch Rocket System was $150 million.[17] When competition to create a second source was desired, three independent cost estimates (including one by GAO) estimated ***savings*** of $180 million to $209 million by retaining Vought as the ***sole source***.[18] Hence, we should consider life cycle acquisition strategies. They could include planned system technology insertions, block upgrades, and life cycle support to a

specified level of performance and operational readiness. This life cycle support would include not only the procurement of spares, but also the maintenance personnel necessary to accomplish repairs down to and including general support level.

The benefits of pursuing a long term commitment are many:

- Reduces potential for program instability--a major cost driver. To highlight this fact, Gansler estimates that labor costs on defense projects are 20% higher due to the turnover directly attributable to program instability.[19]

- Allows the contractor to execute materiel buys at the most economical price, pursue training programs to produce a quality conscious work force, and maintain a continuing production capability; thus keeping a quality production base warm, if not hot.

- Creates incentives for improved reliability and maintainability. Good business sense will motivate the contractor to continuously strive for improved system readiness since he is tasked with its support, while obviating the need to procure and maintain detailed technical data packages.

- Allows the contractor to make long term plans, including vendor supply decisions that could evolve into long term relationships, with an increased interest in monitoring critical nodes of the industry.

- Holds the contractor responsible for maintaining the necessary level of spares down to the general support level; potentially reducing the associated manpower and administrative costs to the government.

- Yields manpower savings for the uniformed forces by providing maintenance personnel down to the general support level.

The principal negative aspect of this approach is the basic issue of civilians on the battlefield. Operation Desert Storm proved that government and contractor civilian personnel could effectively operate in a combat theater. Rather than getting in the way, they enhanced operational performance. However, the increased reliance on a civilian contractor's employees must be judiciously balanced with combat readiness and the degree to which we will be forced to downsize personnel and units within the armed forces.

Finally, commercial industry has embraced the concept of preferred suppliers for years. This approach has resulted in higher quality products, lower materiel rejection rates, and decreased costs due to stable ordering quantities. All of this is positive. Currently, we are faced with single domestic suppliers in titanium extrusions, special ball bearings, image converter tubes, and optics coatings.[20] These subcontractors represent the growing trend likely to influence future competition and teaming arrangements. With the radical reductions facing the industry and the paucity of production contracts likely to be awarded, we will certainly end up with a single responsible source in many areas. Why not knowingly participate in selecting who that source will be by using best value criteria which employ Defense Industrial Base considerations?

2. Leverage Initiatives In The Commercial Sector

Numerous on-going initiatives in the commercial sector will benefit the restructuring of the defense industry

Commercial Items & Standards

Commercial products offer significant opportunities for cost savings and decreased production times. Virtually every recent examination of the defense sector supports using commercial items, where practical. Not only can savings be derived by using commercial components, commercial standards can also yield benefits. Government standards are a product of an era when American industry suffered from poor quality and poor performance. Times have changed and the government must also adapt. Unique government standards should be imposed only when necessary if a comparable commercial standard does not exist. In any case, standards should be precisely tailored for application to a specific program, not invoked in total.

Best Commercial Practices & Flexible Manufacturing

The manufacturing sector in American is undergoing a revolutionary change. New techniques such as lean production, flexible manufacturing, computer aided engineering/design with on-line simulation, and integrated product/process design teams provide opportunities to exploit new approaches better suited to the new environment. This trend implicitly acknowledges the commercial initiatives toward small and medium sized production runs, production of multiple products in the same facility, and using computer controlled equipment operated by highly skilled workers. Application of these flexible manufacturing techniques can be particularly effective at the subsystem level. Though costly as an initial investment, sub-tier companies could develop a much broader customer base, remaining stronger and more competitive for the defense base. As the commercial sector adapts to this changing environment, the government must encourage the transition and seek incentives to promote sensible initiatives

that support restructuring efforts.

Risk

The government should relook the way that it does business. Today's defense acquisition environment is dominated by a risk-avoidance mentality. Yet, today's programs are riskier than ever. State of the art weapons programs combine leading edge technology with a highly competitive market, ever sensitive to budget reductions. Risk is inherent in any defense contract; yet, we only seem content when introducing measures to eliminate *all* risk. Even Mr. Yockey's White Paper on Defense Acquisition states, "We will accept less risk in acquisition programs than we have in the past."[21] Rather than seeking to avoid risk, DoD should attempt to optimize or mitigate the inherent risk in development and production. We must seek opportunities to make the right decisions, not ensure that we never make a wrong one.

Design Teams

The commercial sector is beginning to profit from multi-disciplinary design teams. These teams integrate design engineers, manufacturing process engineers and production technicians. An example of an industry initiative in this area that tracks closely with low rate defense systems is the Chrysler Viper. This $55,000 high technology automobile is produced in small quantities to rigid tolerances. The design team was one-tenth the size of a normal design team and integrated engineers and technicians from all disciplines.[22] The team members that constructed all of the prototypes were integrated into the actual production line for the finished products. Examples such as this are directly applicable to defense systems.

However, of equal concern is the mechanism that provides industry the incentive to retain the design expertise and capability. In an effort to remain competitive, and in some cases survive, companies are reducing their staffs, including key system designers. This poses a particular threat to the long term ability to produce weapon systems to support future forces. A vigorous science and technology program coupled with an aggressive prototyping strategy can sustain a world class design capability. But a much more fundamental change is necessary. If the preservation of multi-disciplinary design teams is essential, then research and development must become profitable. Historically, companies have absorbed losses up to hundreds of millions of dollars in hopes of recouping the loss during high volume production runs. Now the environment is different. Production runs are no longer guaranteed. So profitable R&D efforts must become the norm. What is wrong with a 25% to 30% profit for developing one of Secretary Aspin's "Silver Bullets"? Higher profit rates and award fees must compensate and reward contractors.[23] Industry will pursue opportunities to profit, which in turn will ensure the survival of the talented design teams essential to our future security.

3. Recognize That We Can Not Have Everything

Fiscal constraints are unlikely to improve. Hence, realistically structured programs are a necessity. The few acquisitions that do proceed during the next decade must be carefully structured and aggressively used to shape the future. Though frequently overlooked, the Acquisition Category III and IV programs can also greatly influence the manner in which we proceed. Program managers who carefully craft the acquisition strategies for non-major systems can send a clear and dramatic signal to industry that DoD is serious about influencing

the shape of the defense industrial base, setting the stage for the major system acquisitions.

Balanced Strategy

A balanced approach that includes upgrades to existing systems while exploiting high payoff technologies by carrying them through engineering and manufacturing development and into production is essential. R&D is the essential element for fostering competition and improved performance. It is the single most important key to progress. As evident in the commercial world, it is what makes industries healthy. However, without the incentive of profitable future production contracts or profitable R&D opportunities, the technology base will slowly begin to atrophy. Hence, without production, there are few, if any, incentives for companies to remain in the industrial base. The government should pursue projects where benefits may be derived in operation and support costs or improved operational performance through block upgrades. These planned block upgrades can serve the dual purpose of modernizing the force without totally new programs and complement the desire to preserve vital elements of the industrial base by keeping production lines warm and supporting vital manufacturing capabilities.

While it is prudent to pursue product upgrades and research into emerging military technologies, we should not neglect the research and development into manufacturing processes and techniques. Only five percent of the FY 92 DoD science and technology budget was dedicated to manufacturing technology research. The Manufacturing Technology (MANTECH) program and the Industrial Modernization and Improvement Program (IMIP) provided opportunities for facility and equipment modernization. These programs should

focus on an increase in the integrated research and development of projects that combine system performance with new production technologies. What is needed is a revitalization of these programs, not a cancellation as happened to IMIP in October 1992.

International Sales

International sales must remain an instrument of foreign policy, but we should support the President's campaign statements and ensure that foreign policy accrues domestic economic benefits, in addition to contributing to international security. If American foreign policy does not support additional international sales of combat systems, attempts to preserve an industry based on foreign markets should be abandoned. However, if international sales do support national security objectives, then the government should aggressively support our domestic industry in their efforts to sell systems abroad. International sales provide an opportunity to amortize program costs across a broader production quantity. Additionally, they keep the production lines hot and critical nodes viable, as production opportunities decline. For example, during the five year period from 1992-1997, potential FMS sales for the M1 Abrams and the M2 Bradley total $30.27 billion[24]-- a healthy investment in our industrial base. If the Clinton administration is serious about deriving domestic benefit from foreign policy decisions, then this provides a unique opportunity.

Every effort should be made to streamline the lengthy and cumbersome administrative process associated with international sales. When appropriate, production contracts should contain an option for executing additional quantities in an export configuration. The existence of such a contract line will enable the contractor to expedite the ordering of materials, plan labor

requirements, and reduce the redundant acquisition efforts required by both industry and government in developing new contracts for international sales.

Budgets

The Clinton Administration is committed to reducing the deficit, while stimulating domestic economic growth, but the defense budget continues to be targeted as a source of funds to support other domestic social programs. Though we have planned for a declining share of the budget, it is certain that additional funding reductions will occur. As a result, R&D and procurement accounts must be judiciously managed. Every effort to control and reduce program costs through realistic program budgets (including management reserves), and rigid adherence to baselines will allow additional programs or increased quantities of new systems to be procured. However, these actions will not be sufficient, given the prospect that further funding decreases are likely. Hence, program cancellations must be seriously considered.

Programs must be prioritized. High pay-off programs, the so-called "silver bullet" procurements, must have acquisition strategies structured to accelerate their fielding, even at the expense of cancelling other programs. Trying to pursue too many programs with too little funding will dilute military capability by stretching schedules, and reviving the tendency to pursue the lowest cost, *not* best value alternative. The benefits of this approach may be seen in the lessons of the F-15 fighter program. Though the total production quantity remained constant at 729, stretch-outs and funding shortfalls due to across the board cuts, resulted in the total program cost increasing almost $2 billion with the delivery of the last aircraft two years later than originally scheduled. Clearly the F-15 program needed to be preserved, but

the original funding and schedule baselines should also have been maintained.

Impediments to Consolidation/Restructuring

In response to market forces, industry will consolidate and down-size. The government must support these actions by changing the many impediments that currently exist. The administration needs to relook the Federal Trade Commission approval criteria for consolidation efforts that leave DoD with a single source of supply. The recent controversy over the Olin Corporation - Alliant Tech Systems merger is a classic example of the government blocking a logical and beneficial consolidation attempt by the defense industry.

Cost accounting standards are another area requiring reform. Industry keeps two separate sets of books--one for Defense Contract Audit Agency and one for the Internal Revenue Service. Surely, this can and must be resolved. As cited by Office of Technology Assessment, these standards isolate the defense sector from the remainder of the economy and result in increased accounting costs.[25] Finally, the Section 800 Study report should be acted upon. While this study identified numerous congressional actions, it also identified outdated, inefficient and counter-productive regulations that should be revised or eliminated to recognize the new environment for defense procurement. This requires a paradigm break by beginning to interpret statutory requirements and their implementing regulations in other than the most restrictive manner.

4. Recognize that DoD can not do it alone

Both industry and Congress must recognize the influential roles they play in this process.

Industry

• As the industry consolidation continues, companies are concentrating in the areas where they have the advantages of a strong research and development base, and production capabilities. DoD should encourage companies to excel in selected areas and exploit their inherent competitive advantages, as opposed to being mediocre in many areas. Typical of the corporate strategies reinforcing this notion is a letter to the Loral Corporation stockholders, an excerpt of which is shown below.

> "Loral will not abandon its principal business of defense electronics...We have reshaped our operations to realistic prospects and are well-positioned in those industry segments that have the most likely prospects for continued growth. Further, we will continue to concentrate on tactical weapons and pre-planned product improvements, exploiting our large program incumbency and introducing technology initiatives through platform upgrades."

Figure 3-4 (Source: Loral 1992 Annual Report, page 2.)

• Overhead must be reduced. For example, the 1991 DARPA Summer Study on Intelligent Manufacturing predicted that a 10% reduction in overhead would produce a net savings of approximately $17 billion annually. A significant first step is the elimination of excess capacity. As cited in an Office of Technology Assessment study, "The capacity of the current [defense industrial base] exceeds foreseeable national security requirements."[26] As budgets fall, the number of programs and the quantities produced per program will also decline, mandating rigorously controlled program costs. Industry recognizes these facts and is acting; but, their actions must continue and they must be aggressive.

• Industry has much more current information about the health of critical subcontractors and can quickly take intelligent steps to assist where necessary. For example, as reported in the February 16, 1993, ***Wall Street Journal***, Boeing "ordered extra work for 250 subcontractors, mostly to ensure they will be around." The prime contractors will need to work with the government to ensure surprises are avoided and mission decisive critical nodes survive.

• While much can be criticized about DoD's use and application of unique standards, the defense industry should assess their utility in an objective manner. Certainly, the defense industrial base possesses much in common with the civilian sector; yet, there is a core of unique military products such as submarine propulsion, stealth, armor, large calibre armaments, and warheads that do not have a viable civilian counterpart. Further, the unique and extreme operational environments for military systems demand different and more stringent performance envelopes when compared to civilian systems. Hence, the bottom line is that military performance requirements are different, requiring more rigid standards and specifications. This should not, however, support the indiscriminate use of military standards and specifications when commercial products and standards adequately meet the necessary levels of performance.

Congress

• Congress must refrain from relooking every program termination by DoD. History is replete with examples of Congress forcing the continuation of weapons and programs that have been terminated.[27] Members must recognize that DoD strives to generate a coherent plan and terminations are inevitable, given the budget.

• Congressional oversight is essential, yet excessive. The pressure to delve deeper into military programs will increase as the number of programs decreases. Estimated conservatively, a program manager spends nearly 20 percent of his time responding to Congress[28]. This percentage is likely to increase as the number of programs decrease and budgets get tighter. A program manager's focus must be program planning and execution. Diverting a PM's interest does not yield a positive benefit.

• Portions of the strategy that have been described in this paper require discrete funding. Congress must be willing to support the cost of continuing to support a strong and viable industrial base, albeit, significantly smaller and leaner (with less pork) than in the past. As Ross Perot cited during the 1992 election campaign, there are plenty of plans just waiting to be executed. However, execution requires forthcoming funding support from Congress.

Chapter 4 Conclusion

"Obsolete weapons do not deter." [31]
Margaret Thatcher

The United States must establish a Defense Industrial Base strategy. While this may appear to many as protectionism or unnecessary intervention by the government, the fact is that some intervention is necessary; but the government cannot fix all of the problems inherent in the defense industry. What it can do though, is create an environment that is supportive of competition where legitimate competition can be maintained, and ensure the survival of mission-decisive critical nodes. Modernization and continued research and development into weapon systems and manufacturing processes will allow companies to prosper and remain viable constituents of the industrial base.

The restructuring of the American defense industrial base must be a joint Industry-Congress-Department of Defense endeavor. Industry is proceeding independently in many areas to consolidate and compensate for reduced defense procurement budgets, but this cannot be done in isolation, without considering national security needs.

During the later half of the first decade of the 21st Century the armed forces of the United States will undergo a major modernization effort starting . It will orient on replacing the then aging fleet of tanks, ships, airplanes, and other systems fielded during the 1980's. If we suddenly discover that we have allowed the Defense Industrial Base to erode to an unacceptable state at that point in time, we will have failed to meet our responsibilities to guarantee America's defense.

ENDNOTES

1. "From the Acquisition Executive", ***Army Research, Development & Acquisition Bulletin***, Headquarters Department of the Army, September-October 1992, inside the back cover.

2. ***Redesigning Defense, Planning and Transition to the Future U.S. Defense Industrial Base***, Congress of the United States Office of Technology Assessment, Washington, D.C., July 1991, page 3. Dollar values represent the actual values submitted as a part of the President's Budget submitted to Congress in January of 1991 and January 1992.

3. Information derived from a comparison of the ***Defense 91 Almanac***, page 21, and the ***Defense 92 Almanac***, page 21, published by the Department of Defense. Dollar values represent the actual values submitted as a part of the President's Budget submitted to Congress in January of 1991 and January 1992.

4. ***1993 DoD Report to the President and Congress***, Department of Defense, page 56.

5. The basic information contained in Philip Finnegan's "US Girds for Wave of Mergers", **Defense News**, November 30,1992, pp 1 & 20, was updated to reflect recent activities within the industry.

6. Cited in "The Plowshare Problem", **Newsweek**, December 7, 1992, page 42.

7. An internal study completed by BMY predicts that by 1997, the United States will require the production of only 200 tracked vehicles annually--hardly sufficient to maintain the existing industrial capacity. Results of this study were briefed to the ICAF Combat Vehicle Industry Study during a trip to the BMY facility in York, PA on 12 March 1993.

8. This particular chemical is the oxidizer for the vast majority of solid-fuel rocket motors and conventional missiles.

9. ***The Military Quotation Book***, James Chalton, ed., St Martin's Press, New York, 1990, page 34.

10. Extracted from briefing slides generated by the U.S. Army Tank Automotive Command to summarize the results of the ***Tracked Vehicle Industrial Sector Study***. Specific briefing slide was entitled CONCLUSIONS.

11. ***Redesigning Defense***, OTA, July 1991, page 116.

12. Section 4217 of the FY 93 DoD Authorization Act (PL 102-484)

13. Sustaining rate is considered to be quantities smaller than low rate initial production, but sufficient for a contractor to produce miliary systems and make a profit.

14. Gansler, page 251.

15. ***Redesigning Defense***, Office of Technology Assessment, page 42.

16. Gansler, page 248.

17. The approximate distribution of funding was $50 million facilitized by the government, $50 million by the prime contractor, and $50 million by the pool of subcontractors.

18. ***MLRS Case Study***, Kennedy School of Government, Harvard University, Page 17.

19. Gansler discusses this phenomena on page 248.

20. Gansler, page 259.

21. Memorandum from the Under Secretary of Defense for Acquisition, Subject: Defense Acquisition, 20 May 1992.

22. ***Building Future Security***, Office of Technology Assessment, June 1992, page 68.

23. Cost type development contracts have a statutory limitation of 15 percent.

24. Potential FMS sales were revealed during a presentation by the Deputy PEO, Armored Systems Modernization to the ICAF Combat Vehicle Industry Study on 3 February 1993.

25. ***Redesigning Defense***, Office of Technology Assessment, page 66.

26. ***Building Future Security: Strategies for Restructuring the Defense Technology and Industrial Base***, Office of Technology Assessment, June 1992.

27. The Air Force tried to terminate the F-111 fighter/bomber program for four consecutive years, only to have Congress restore it each year.

28. And an additional 25 percent responding to inquires originating within DoD--(frequently to answer separate questions for Congress.

29. ***The Military Quotation Book***, James Chalton, ed., St Martin's Press, New York, 1990, page 24.

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