Annual Industrial Capabilities Report

to

Congress

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Office of Under Secretary of Defense
Acquisition, Technology & Logistics
Industrial Policy

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Annual Report Requirements

Section 2504 of Title 10, United States Code, requires that the Secretary of Defense submit an annual report to the Committee on Armed Services of the Senate and the Committee on Armed Services of the House of Representatives, by March 1st of each year. The report is to include:

> "(1) A description of the departmental guidance prepared pursuant to section 2506 of this Title.
>
> (2) A description of the methods and analyses being undertaken by the Department of Defense alone or in cooperation with other Federal agencies, to identify and address concerns regarding technological and industrial capabilities of the national technology and industrial base.
>
> (3) A description of the assessments prepared pursuant to section 2505 of this Title and other analyses used in developing the budget submission of the Department of Defense for the next fiscal year.
>
> (4) Identification of each program designed to sustain specific essential technological and industrial capabilities and processes of the national technology and industrial base."

This report contains the required information.

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1. National Security Industrial Policy

1.1 Industrial Vision: "Ideal" Industry Characteristics

The Department desires that the industrial base on which it draws be reliable, cost-effective, and sufficient to meet strategic objectives. However, an infinitely robust industrial base is not the ultimate objective of the Department of Defense. Rather, reliable, cost-effective, and sufficient industrial capabilities are a means to the ultimate objective of the Department of Defense: the development, production, and support of defense materiel necessary to provide for the nation's defense.

A "reliable" industrial base is one in which suppliers ship contracted products and services on time. Additionally, reliable firms are viable for the long-term. These firms have a stable or expanding business base, earn fair operating margins for owners, and invest in internal research and development, capital equipment, and their workforce such that long-term viability, innovation, and competitiveness is likely. Reliable firms deliver products with integrity that satisfy Department expectations in every respect (free of device tampering, counterfeiting, etc). Finally, a reliable industrial base is one that facilitates innovation by both larger and smaller subsystem providers; allows smaller, subsystem firms to meaningfully compete against larger, vertically-integrated firms; and encourages new firms, commercial competitors, and reliable global suppliers to enter the defense marketplace and compete for defense-related business.

A "cost-effective" industrial base is one in which suppliers deliver contracted products and services at or below cost targets. A cost-effective industrial base is a competitive industrial base with at least two viable innovative suppliers with strong design teams in mature market areas and a greater number in areas where demand is high and innovation is critical to meet future warfighting, stability operations, and/or humanitarian assistance needs. In addition to the absolute number of suppliers in a given product area, another characteristic of a competitive and cost-effective industrial base is the extent to which suppliers participate in non-defense (dual-use) U.S. markets and export products overseas.

A "sufficient" industrial base is one in which suppliers deliver contracted products and services that meet Department performance requirements. Suppliers with sufficient industrial capabilities are flexible and react positively and quickly to changing DoD requirements and priorities, particularly during times of conflict—indicative of the adaptability of both production lines and technology. They effectively manage their way through requirements peaks and valleys while maintaining the ability to hire, train, and retain the specialized skills required to meet these dynamic requirements. They also have technology or technology development programs planned and/or in place to meet current and projected DoD needs.

1.2 Industrial Strategy: The Department of Defense Creates Market Forces

The industrial strategy of the Department of Defense is to rely on market forces to the maximum extent practicable to create, shape, and sustain those industrial and technological capabilities needed to provide for the nation's defense. The Department will intervene in the marketplace only when absolutely necessary to create and/or sustain competition, innovation, and/or essential industrial capabilities.

The Department spends about as much on defense as the rest of the world spends, combined. Therefore, it is not surprising that the Department creates market forces—most frequently within "defense-dominant" market segments—through its budget, acquisition, and logistics processes. DoD research, development, acquisition, and logistics policies, analyses, and decisions guide and influence industry in four fundamental ways. First, DoD evaluations and assessments of industry segments or specific industry-related issues help identify future budgetary and programmatic issues and inform policy-making and requirements generation. Second, DoD defense system acquisition strategies and decisions shape the technological and programmatic focus of industry. Third, the Department incorporates industrial base-related policies into its acquisition regulations to protect national security, promote competition and innovation, and, in certain specific cases, preserve critical defense industrial and technological capabilities. Finally, decisions made on mergers and acquisitions involving defense firms directly shape the structure of the industry. Each of these levers is discussed in more detail below.

1.2.1. DoD evaluations and assessments of industry segments or specific industry-related issues help identify future budgetary and programmatic issues and inform policy-making and requirements generation.

The Department recognizes that program cost, schedule, and technical performance are and remain the ultimate metrics that characterize defense industrial base performance. However, to better understand the effects of its policy and program decisions on industry, and the extent to which industry decisions limit or expand DoD options, the Department has established baseline criteria by which it evaluates the extent to which the industry supporting defense exhibits the most important desired attributes (that is, reliability, cost-effectiveness, and sufficiency). These industry metrics include funding levels and funding stability in defense market segments, contractor financial and economic performance, segment competitiveness, known/reported problem areas, and on an ad hoc basis, key contractor workforce capabilities necessary for successful programs. Industry segment-level baseline assessments (aircraft; command, control, communications, and computers (C4); ground vehicles; missiles; services; ships; and space) are summarized in Section 4 of this report. Several of the conclusions are highlighted in the discussion that follows.

2007 marked two "firsts" for the Department that are worthy of particular note. The Department conducted the first characterization of the services sector and the

industrial base that supports this sector. The Department is outsourcing more and more here to fore government-performed functions such as research and engineering; professional, administrative and management services; and facilities-related services. In fact, services and RDT&E spending outstrips hardware as the largest DoD spending category. Based on the Department's initial assessment, while there has been a clear improvement in the use of competitive contracting procedures in service procurements over the past decade, this good news appears somewhat offset by an increased number of competitions in which only one offer is received. This is an indication of a potentially non-competitive environment and correlates with anecdotal information that the Department sometimes has difficulty attracting competitive bidders—a problem not unique to the services sector. The Department has developed an industry outreach and communication strategy for both current and potential defense suppliers to better understand and address barriers to entry into the defense enterprise. A more detailed discussion of this effort can be found in Section 1.2.2. While the Department's processes and procedures for services acquisitions are still evolving, the Department's emphasis is to ensure that it acquires services in a manner that encourages competition and innovation.

Another "first" for the Department in 2007 was the development of defense-specific, segment-level financial and economic indices. As long as the Department relies on private industry to provide its products and services, profits, return on capital, investments, and shareholder returns are also important to the Department because they drive corporate behavior and influence the incentives to which industry responds. The Department has long monitored the long-term financial stability of key firms, as well as considered how DoD policies may affect the firms' financial stability. In 2007, the Department monitored representative individual corporate divisions for each major industry segment (aircraft parts and components, water craft, ground vehicles, C4ISR, space systems, and munitions) and developed weighted (based on sales) indices for each segment. While metrics at the segment level are somewhat limited (based on Securities and Exchange Commission requirements), the Department has identified a profitability metric (return on assets) and viability metrics (capital expenditures both as an absolute value and as a percentage of operating profit) which are used to track trends across time within a company division, compare various companies within a given segment to the segment index, and compare various segment indices to each other and the industry average. These comparisons will serve as early indicators of potential systemic, segment-wide issues, as well as company-specific issues that may need to be addressed by the Department.

Summary Segment Assessment

Stable, robust DoD funding helps determine the extent to which the industrial base has the desired attributes of reliability, cost-effectiveness, and sufficiency. Funding distributions across individual market segments can serve as early indicators of upcoming funding peaks/valleys and uneven company allotments can indicate potential problems.

For instance, research, development, test, and evaluation (RDT&E) funding for major defense acquisition programs (MDAPs) within the aircraft segment is steadily decreasing across the Future Years Defense Program (FYDP). The primary driver is the reduction of F-35 RDT&E funding as the program transitions from the System Development & Demonstration (SDD) phase into production. To date, the Department has not announced plans for a 6th generation fighter (successor to the F-22A). Also contributing to this downturn is the Department's increased use of short-term vertical lift development programs which utilize non-developmental item airframes (for example, VH-71, CSAR-X, LUH). On the other hand, aircraft procurement funding will remain relatively level over the next ten years. While Lockheed Martin and Sikorsky have current programs that will remain in production into the next 20 years, Boeing's future participation in the fighter/attack and transport segments is more problematic. A C-17 program shutdown, coupled with the end of F/A-18E/F production in Fiscal Year (FY) 2011, may leave the industrial infrastructure at Long Beach, CA, and St. Louis, MO, with insufficient business to continue in place. The fixed wing industrial base may consolidate as military programs reduce over time. Suppliers not associated with future production programs (for example, suppliers not participating in the F-35) will be impacted the most.

Likewise, RDT&E funding for missile sector MDAPs show a roughly 50 percent decline for strategic and tactical missiles and smart munitions segments from FY07-13. Currently, there is only one major missile program being competed—the Joint Air-to-Ground Missile (JAGM)—severely limiting opportunities for the missile industrial base to maintain robust design teams. At the same time, strategic missile procurement funding is also declining as the few remaining strategic missile programs—Minuteman III Guidance and Propulsion Replacement programs—come to an end. Trident (D5) is the only remaining strategic missile procurement program. Congress has expressed an interest in this defense-unique segment and has directed the Air Force to provide an industrial base assessment in 2008.

The ground vehicle sector is highly dependent on supplemental funding supporting the Global War on Terrorism (GWOT). The Department has maintained, and in some cases increased, the rate of overhaul and repair of the vehicles currently in Iraq and Afghanistan. Due in particular to several years of added supplemental funding and the Future Combat System (which accounts for almost 40 percent of the Army's RDT&E budget), the ground vehicle prime contractors are profitable. As a result, they are currently able to meet financial obligations, are generally consistent in providing value to shareholders, and are investing back into their businesses via independent research and development (IRAD) and capital expenditures. Once the supplemental funding ceases, this could be a much more gloomy assessment and is an area that warrants close monitoring.

Cost growth is a challenge facing the Department in many industry sectors and many individual programs. However, past cost growth in the space segment indicative of systemic issues of immature technology and low budget estimates in space vehicle program procurement have been corrected with a "back to basics" incremental

approach to space system acquisition. Block build plans have been implemented for all new space acquisition programs.

Within the shipbuilding sector, there is very little first-tier shipbuilding capacity devoted to commercial business. This places an increased overhead burden on Navy and Coast Guard shipbuilding programs which, in turn, can afford fewer and fewer ships as costs continue to rise at a rate well above inflation. In fact, U.S. commercial shipbuilding accounts for less than one percent of world commercial shipbuilding output and 80 percent of this output comes from the mid-tier sector.

Significant excess plant capacity also drives up overhead costs. The Department sponsored the Institute for Defense Analyses (IDA) to conduct a study of the cost structure of the major shipyards to discover evidence of rationalization following the period of consolidation between 1995 and 2002. Rationalization refers to the reduction of infrastructure that has become redundant as a result of lower demand. Typically, the costs associated with this infrastructure are fixed costs. In the aggregate, the shipbuilding segment has been profitably sustained by the U.S. Navy in its present state. It makes little business sense for the industry to rationalize when its return rate exceeds the cost of capital. However, in spite of the apparent barriers to rationalization, the shipyards are very sensitive to their operating costs, particularly labor hours, and are pushing to get cost out of their products. But, despite efforts to improve their operations, these efforts to date have not resulted in absolute cost savings. Rather, it appears as though these efforts have at best enabled them to maintain their cost structure in the face of falling demand.

Workforce concerns are evident in certain defense sectors. Workforce issues remain in the shipbuilding sector well after hurricanes Katrina and Rita shocked shipbuilding production on the Gulf Coast. Northrop Grumman and mid-tier shipbuilders have been able to rebound, although workforce flux, and lingering absenteeism on the Gulf Coast persist as a result of post-hurricane rebuilding that is exacerbating existing workforce constraints due to aging and attrition. In addition, shipbuilding capacity in the mid-tier shipyards is limited by skilled workforce constraints—not by facilities.

In 2007, the Department, via the Defense Contract Management Agency's Industrial Analysis Center (DCMA's IAC), defined, and assessed key contractor workforce capabilities associated with software development for specific defense applications. The IAC defined attributes and criteria to meet those desired attributes in the areas of education, training, experience, quantity, and stability of contractors' computer software staff. The company surveys and site visits were consistent with the Software Industrial Base Study; the Department is using software engineers with university degrees in a variety of technical disciplines.

The Department completed Phase II of the Software Industrial Base Study (SIBS) to assess the demand for software within the Department and the industrial base's ability to satisfy that demand. Although Phase I found shortfalls in the number of upper echelon software managers and architects, the number of software developers

appears adequate. Phase II, however, found shortfalls in the training of software developers. Software development jobs are being filled with staff lacking formal software engineering training.

The IAC is also leading an ongoing study (tri-sponsored by OUSD(AT&L), the Air Force, and the Navy) to determine if there is sufficient military design and development activity to sustain the core competencies required for the next generation of combat air vehicles. As discussed previously, there are currently no plans within the FYDP for a 6th generation military/combat aircraft—a follow-on to the F-22A. Now is the time to preserve that capability if there may be a need for the future.

Sector-Unique Concerns

Across several industry sectors, but particularly within the aircraft sector, the high demand for titanium is increasing both the cost and the production cycle time for DoD programs. As future aircraft, both military and commercial, use more titanium in their design, titanium suppliers face increased pressure to meet demand from the aircraft industry, as well as demand from other industries such as automotive, health, and industrial. The shortage of titanium, coupled with long lead times, has delayed the production of large forgings such as airframe bulkheads, landing gears, and engine components. However, proper use of the Defense Priorities and Allocations System (DPAS) could alleviate delivery delays. The regulatory framework for DPAS, contained at 15 C.F.R. 700, ensures that the Department receives priority in the market over commercial orders. DoD contractors ordering titanium or other materials can use DPAS-rated orders and include the required delivery date, not the availability date quoted by the material supplier.

Unmanned vehicles (UVs) represent a developing product segment within most industry sectors (e.g., aircraft, ground, undersea) and almost all contractors have shown some level of interest. Either by direct DoD program funding or through IRAD, contractors are developing various vehicle types to maintain a technological edge in their segment. These efforts will facilitate new developments such as collision avoidance and autonomy advances. Without operators, these unmanned systems can perform at higher thresholds and therefore require more demanding structural concepts and designs which may lead to new manufacturing processes and provide future growth opportunities. The Department is currently conducting a study of UV market forces to determine what changes, if any, to DoD industrial policy are needed to preserve access to this future defense cornerstone.

Defense-Unique/Surge/Mobilization

Although capabilities within the industrial base supporting defense generally are sufficient to meet current and projected DoD requirements, the Department has been faced with industry segment capacity concerns centered on difficulties associated with rapidly increasing production of “important” (based on unique evolving operational scenarios) items. There always have been certain low peacetime demand, defense-

unique, niche product areas where industrial capabilities are limited. These issues are even more striking when the Department endeavors to accelerate production of such an item. Problems (for example, bottlenecks) do not necessarily arise at the prime contractor level, but most often arise at the subtier supplier level. For the purpose of monitoring important subtier suppliers, the Department defines "important components" as any item that:

- Is produced by a single or sole source;
- Is used by three or more programs;
- Represents an obsolete, enabling, or emerging technology;
- Requires 12 months or more to manufacture; or
- Has limited surge production capability.

In defense-unique markets, there sometimes is little competition at the subsystem/component level. Accordingly, the Department must use many single/sole source suppliers—suppliers for which there may be minimal innovation incentive. Further, defense-unique industry segments may not be sufficiently profitable and suppliers within those segments may have an insufficient business case to justify continuing in the market. The missile/precision-guided munition (PGM) sector is a particularly apt example of a sector in which the Department is the sole customer—there is no commercial market. Therefore, many missile components qualify as "important components." Examples include thermal batteries, tactical missile rocket motors, jet engines, inertial measurement units, military-specific global positioning system (GPS) receivers, seekers, fuzes, and warheads. Since production rates of certain PGMs likely would have to be increased significantly to fight a new conflict, many of these "important components" represent bottlenecks in the missile/PGM supplier base. In many cases, there is either limited excess production capacity to support production acceleration or if there is reserve capacity available, the time required to accelerate production to maximize facilitized rates exceeds 12 months. For example, due to increased PGM complexity, the Department may not be able to ramp-up production of standoff tactical missiles—likely to be the PGMs of choice for the next conflict—as quickly as it accelerated Joint Direct Attack Munition (JDAM) and Laser-Guided Bomb (LGB) kit production for Operations Enduring Freedom and Iraqi Freedom.

"Important" sub-tier suppliers in the space sector include nickel-hydrogen and lithium ion batteries, traveling wave tubes (TWTs), space qualified solar cells, control moment gyros and radiation hardened circuits, and precision space bearings. The risk of a demand gap for RS-68 rocket engines in the next three years also is an issue to be monitored. These components qualify as "important" because they are used on multiple programs, they are long lead items to manufacture, and few suppliers exist. In addition, the commercial market size is small and research investment is relatively low for these technologies. Defense Production Act Title III programs have been implemented to improve the domestic manufacturing performance for TWTs and long-life lithium ion batteries.

1.2.2. DoD defense system acquisition strategies and decisions shape the technological and programmatic focus of industry.

The Department structures programs and acquisition strategies to promote competition and innovation by requiring its program managers and executives to consider and facilitate competitive environments when structuring acquisition strategies for both R&D and procurement programs and services. Considerations and tools used to maintain competition in sourcing include: 1) avoid teaming arrangements that dissuade new entrants or result in a long-term reduction in the number of competitors, 2) employ competitive prototyping, 3) use of R&D funds to maintain alternative supplier design team(s), 4) downselect to two suppliers versus a winner-take-all approach, 5) build in periodic system upgrade competitions, 6) allow foreign suppliers to compete, and if best value, win, 7) where volume permits, license additional suppliers to utilize technology or enter into "build to print" contracts, and 8) seek commercial entrants and use streamlined commercial contracting practices.

The Department strives to use the levers available to encourage positive industry performance for specific programs and for overall positive industry performance on cost and cost reduction. To that end, the Department commissioned an assessment by the Institute for Defense Analyses (IDA) to assess the way in which profit (as a result of DoD profit policies) influences contractor decisions and performance. IDA's study clearly showed that the profits of major U.S. defense contractors are above the levels required to keep them in the defense industrial base. However, although earlier IDA studies have shown some correlation between the capital-to-labor share ratio (a measure of direct financial incentives to control costs) and favorable contractor cost outcomes, there did not seem to be a strong correlation between contract type and contract outcome. For example, the data did not show that firm fixed-price contracts exhibited better cost performance than cost-plus contracts. The Department is still assessing these initial results; however, they seem to suggest that it is not effectively incentivizing the industry performance that it desires.

In another effort to improve DoD acquisition practices, the Department has developed an industry outreach and communication strategy to improve communications within the defense industry community, to achieve greater transparency and to socialize and communicate the Department's acquisition transformation initiatives. This strategy is accomplished through regularly held events such as "Industry Days" and functional and executive roundtable events. The strategy includes hosting an ongoing series of meetings with traditional and non-traditional DoD suppliers to examine barriers to participation in the DoD enterprise and to enhance collaboration. Outreach opportunities also include informal roundtables held in conjunction with defense industry conferences. During these sessions Department and industry representatives engage in problem-solving dialogue regarding policies and programs affecting industry and defense relationships, and challenges to meeting the needs of the warfighter. Among identified industry concerns are the lack of an Other Transaction Authority (OTA) for production contracts, explicit permission to subcontract

OTA, need for a definition of non-traditional suppliers, and the impact of export controls on companies' willingness to make research results available to DoD.

2008 events include an executive-level roundtable with niche area suppliers and small businesses and a second roundtable event with larger, non-traditional defense suppliers. These discussions will focus on identifying opportunities for the Department to become a more attractive customer. Areas of discussion will include: opportunity awareness, work specification, contract size, oversight, billing practices, general government contracting requirements, and other barriers to entry. The Department is also planning a CEO-level forum as a follow-on to the successful "AT&L Industry Day" hosted last year by the Deputy Secretary, the Under Secretary of Defense (AT&L) and the Vice Chairman of the Joint Chiefs of Staff.

1.2.3. The Department incorporates industrial base-related policies into its acquisition regulations to protect national security, promote competition and innovation, and, in certain specific cases, preserve critical defense industrial and technological capabilities.

When the Department faces shortcomings in the industrial base, it has the necessary authorities, responsibilities, and resources to address these shortcomings and promote innovation and competition. Specifically, the Department can:

- Directly fund innovation in its science and technology accounts, and encourage industry to do the same via their independent research and development accounts.
- Induce innovation by employing acquisition strategies that encourage competition at all levels of contract performance.
- Use contract provisions to preclude the ability of contractors to favor in-house capabilities or long-term teammate products over more innovative solutions available elsewhere.
- Block exclusive contractor teaming arrangements that effectively reduce the number of suppliers in a given market, especially if the teammates are dominant in a particular market sector.

The Department also can, and does, formally establish restrictions within the Defense Federal Acquisition Regulation Supplement (DFARS) on the use of foreign products for certain defense applications, when necessary to ensure the survival of domestic suppliers required to sustain military readiness. These DFARS foreign product restrictions are imposed by administrative action (that is by a DoD policy decision, not by statute). Currently, the Department has administratively-imposed DFARS foreign product restrictions for periscope tube forgings, ring forgings for bull gears, and ship propulsion shaft forgings.

Finally, the Department has the framework and guidelines in place (via DoD 5000.60-H) for evaluating, on a case-by-case basis, the need for Government action to preserve industrial capabilities vital to national security. The Department encourages its suppliers to use good vendor management procedures and authorities to address

routine program and item management problems. Before taking action, the Department must verify the warfighting utility of the industrial capability, that the industrial capability is unique and at risk, that there are no acceptable alternatives, and that the proposed action is the most cost- and mission-effective. These criteria deliberately set a high standard for intervention into the industrial base in order to ensure that limited DoD resources are not expended unnecessarily.

1.2.4. Decisions made on mergers and acquisitions involving defense firms directly shape the structure of the industry.

The interests of the Department are usually best served by maintaining competitive markets for required products and services. The presence of a sufficient number of capable suppliers in core defense markets fosters both competition and the innovation vital to meeting DoD's future warfighting requirements. It is Department policy to oppose business combinations that severely reduce or eliminate competition or that may create unfair competition. Consolidation through mergers and acquisitions has dramatically increased within the defense industrial base in the past few years, leading to concerns that further consolidation may affect the competitive landscape that supports innovation and cost-effective procurements. The Department has begun reviewing current merger and acquisition decision criteria and is poised to modify it if necessary.

In some cases, the expected benefits of previous consolidations, such as cost savings from infrastructure rationalizations, have also lagged. The Department commissioned an IDA study to examine the extent of infrastructure rationalization within the shipbuilding sector and update previous work focused on the aircraft and missile industry sectors. Initial results indicate that although the shipbuilding and aircraft industries have not rationalized facilities, the missile industry has done so with some success. IDA is still evaluating why this is the case but have observed that under DoD's current payment structure, firms have disincentives to reduce infrastructure. The Department created mechanisms to reduce these disincentives during the 1990s, but subsequent policy changes have limited their application. When the results of the IDA study are finalized, they will be used to recommend new incentives or mitigate existing disincentives to reduce facility and overhead costs.

1.3 Industrial Challenge: Civil-Military Integration

Civil-military integration (CMI) is the integrating principle for the Department's industrial policies toward and cooperation with industry. CMI is the process of facilitating the acquisition of commercial or commercially-derived items by, in part, merging the defense industrial base and the larger commercial industrial base through the use of common technologies, processes, labor, equipment, material, and facilities to meet both defense and commercial needs. It encompasses, to the maximum extent feasible, designing system and component specifications to commercial standards, buying commercial items directly, leveraging commercial industry whenever possible

and creating defense-unique industrial capabilities and products only when absolutely necessary.

Promoting procurement of commercial items is not a new initiative. It is a reemphasis of standing—but not fully implemented—Congressional and Department policy. The preferred DoD acquisition method is the procurement of commercial items. 10 U.S.C. 2377 mandates that the Department procure commercial items to the "maximum extent practicable." DoD Directive 5000.1 (E1.1.18.1) states that the procurement or modification of commercially available products, services, and technologies, from domestic or international sources, is the preferred acquisition strategy and is to be considered before any other alternative.

In the last two decades, the Department increasingly has utilized commercial items and services because they contain the most current and advanced technology available, allow development costs to be amortized over the broader commercial business base, and are available from numerous competitive suppliers. Commercial items are embedded in many defense-unique applications including some of the Department's most highly advanced systems. The Department, in most cases, is not the predominant buyer for commercial products and has limited leverage in these markets. There is often little incentive for commercial companies to modify their procedures to meet the peculiar requirements of the government, particularly if these changes would impact the firm's competitiveness. Accordingly, the Department must leverage commercial technologies, products, and processes to its benefit whenever possible. To do this, the Department promotes civil-military integration to the maximum extent possible by mitigating or eliminating legislative or regulatory practices that create barriers to entry, especially at the lower tiers; and by discouraging the creation of defense-unique industrial capabilities and the use of defense-unique products except where absolutely necessary.

1.3.1. Leverage globalization benefits and commercial markets while minimizing risks

While many of the industrial segments important to defense procurements are primarily commercial in nature and exist within a global marketplace, the vast preponderance of prime contractors supporting DoD programs are located in the United States. In FY06, the Department awarded contracts to foreign suppliers for defense articles and components totaling approximately $1.9B, less than one percent of all DoD contracts; and only about 2.4 percent of all DoD contracts for defense articles and components. Further, these statistics are virtually identical to those for FY05, thus there does not appear to be an increasing trend in the use of foreign suppliers—at least at the prime contractor level. (FY07 contract information will be available later this year.)

The Department does not, and cannot, drive global commercial markets. In certain markets—such as in microcircuits and related electronic devices—there is an increasing dominance by global commercial markets, and current commercial product development strategies and supply-chain management practices may not, for DoD purposes, adequately prevent electronic device tampering, counterfeiting, and reverse

engineering, nor do they always adequately meet DoD-unique performance and maintainability requirements. In the microcircuit market, as well as other markets, the Department is employing new strategies to leverage the benefits of globalization while minimizing the risks. In the early days of the semiconductor industry, the military market was a large fraction of overall sales and helped to drive technology. Today, the U.S. military portion of microcircuits sales is approximately one percent of the world market and less than nine percent of the U.S. market ($3.6B out of $40.7B). With the increased growth of consumer markets, DoD's ability to control and influence the electronics sector has diminished. The Department is in the process of developing a trusted integrated circuits strategy and policy that is comprehensive, viable, cost-effective, realistic, and in the long term ensures the supply of trusted integrated circuits for defense applications. This policy will include multi-layered defense-in-depth as a practical strategy that involves people, technology, and operations; anonymity in commercial off-the-shelf integrated circuits procurement; trusted suppliers, brokers, and products; design information hiding; anti-tamper technology; failure detection and forensics; damage mitigation; and chip signature authentication. The Office of the Deputy Under Secretary of Defense for Industrial Policy (ODUSD(IP)) is working with other DoD elements and industry associations (i.e., the Government Electronics and Information Association (GEIA) and the Aerospace Industries Association (AIA)) on an approach that encompasses both the emerging trends in the commercial industry and the requirements of future defense and aerospace programs.

Even if the Department could afford to rely only on domestic sources, it would not want to. The United States does not own all the good ideas, nor make all the best products. Many of them come to us from our allies and trading partners. As a case in point, the Department's highest priority program, the Mine Resistant Ambush Protected (MRAP) vehicle, uses many ideas and products from around the world that enabled the Department to rapidly develop, build, and field these vehicles for U.S. soldiers and marines. The V-shaped hull was originally developed and refined in South Africa. This concept is employed along with armor designed in Israel, robust axles developed in Europe, and electronic devices manufactured in Asia. And, just as companies from outside the United States have helped to improve the MRAP vehicle design, so too, the commercial sector provides the manufacturing capacity to enable building them. Steel, engines, transmissions, tires, and many other components are being produced in a very short period by leveraging the capacity of commercial industry. The MRAP program is DoD's most important acquisition priority because it is saving lives. It would not be possible to field it as quickly without the innovative technologies and the quality products from the global and commercial marketplace.

1.3.2. Facilitate use of commercial products and commercial practices/Develop an overarching civil-military integration policy

During World War II and the Cold War, the Department used a defense-unique industrial base that was almost completely separated from the larger commercial world. That meant that the Department had to pay for all the overhead costs of maintaining this unique industrial base, and that it had to drive innovation within it. The Department has historically been the genesis and the driver of many technologies that turned into global

commercial businesses. Many advances in microelectronics, satellite communications, GPS, aerospace, and materials such as titanium and composites, were the result of DoD research and development funding and activities. These advances were created for a military purpose, but private industry recognized their potential for commercial application, and they were successfully adapted and commercialized. The technological dynamic was to "spin-off" defense technology to the private sector. This model is still important and still used in technology areas were there is little or no commercial interest.

Now, however, the Department is benefiting from advances in technology that are being driven by the commercial market. And when the commercial market drives technology, it does so on a scale and timeline that the Department could never match. The cutting-edge work in many areas of critical importance to the Department, such as in computer and communications technology, is being done in the private sector. Now, there exists a dynamic where commercial industry drives the innovation and pays for the research and development, and the Department is able to pick and choose from the best technology and "spin-on" or militarize it to meet unique military needs, at a fraction of the time and cost it would take if the Department tried to develop the technology itself.

But, the Department does not, and cannot, drive global commercial markets. Instead of hoping that global commercial markets will adapt to the Department, the Department must adapt its practices to be more of a conventional customer wherever possible. The Department's industry outreach and communication strategy (discussed in Section 1.2.2.) is making great strides toward, first, examining and, second, eliminating the barriers that prohibit full participation by these global commercial suppliers in DoD programs.

1.3.3. Understand and mitigate unintended consequences of domestic source restrictions

A natural tension exists between domestic preference requirements and the need for DoD to acquire the best available supplies and services to satisfy warfighting requirements. The Department is exploring the flexibilities Congress has provided to address this tension. As an example, 10 U.S.C §2533b requires the purchase of compliant specialty metals. Section 804 of the National Defense Authorization Act for Fiscal Year 2008, Pub. L 110-181, adds a new exemption for most commercial off the shelf items, expands the exception for electronic components, contains a new civil-military integration exception for commercial derivative military articles and fasteners, a new de minimis exception, and adds a new, albeit cumbersome authority for a national security waiver. The national security exception requires the noncompliant supplier to become compliant which could be impossible for a commercial supplier. While this new language gives the Department some added flexibility, any restriction of DoD procurements to domestic sources can adversely affect efforts to promote full and open competition, international cooperation in defense programs, and the use of world class sources. The Department generally opposes statutory domestic preference proposals that precludes or impede its ability to procure world class products and capabilities on a

"best value" basis or when it impairs effective Defense cooperation with friends and allies.

Also in 2007, the Strategic Materials Protection Board held its first meeting and conducted an initial national security analysis with the following preliminary recommendations:

- Develop criteria that would be used to identify "strategic materials critical to national security,"
- Compile an initial list of such strategic materials,
- Develop a proposal as to how the Department should monitor and ensure continued secure access to these strategic materials,
- Propose strategies to the President to ensure domestic availability of these strategic materials, as appropriate, and
- Recommend other strategies to the President to strengthen the industrial base with respect to these strategic materials, as appropriate.

1.3.4. Employ rational export control policies

Any discussion of defense procurements within the context of globalization must take into account the reality of export controls. Comprehensive export control laws and regulations are designed to limit unauthorized and illicit export of sensitive equipment, materials, or technology. Consequently, export control restrictions figure prominently in international defense trade, and can impact the health and functioning of the defense industrial base. In particular, the large backlogs and long processing times for processing export control cases have become a serious issue for defense-related trade. More fundamentally, export controls threaten to disrupt U.S. industry's supply chain and technology development strategies, choking off promising market expansions and diversification opportunities. These qualitative factors—unreliability in supply, diversion of business investment funds to export control compliance, restricted access to foreign talent, and barriers to developing a foothold in emerging markets—while hard to assess, could soon be reflected not only in lost sales but also in the overall competitiveness of leading-edge U.S. industries. It is critical that the Department can access globalized markets via rational export control policies which promote expeditious trade and exchange of information while respecting the legitimate requirements of national security. Streamlined export control policies would not only help to promote cooperation with U.S. friends and allies, but could also help to sustain and preserve the defense industrial base.

Against this backdrop, the U.S. – United Kingdom (UK) and U.S.-Australia (AUS) Defense Trade and Cooperation Treaties signed by President Bush and his counterparts in June and September 2007, respectively, will also expand the Department's ability to rapidly obtain defense equipment and services from companies in these countries approved by the participating governments once the Treaties are fully implemented. The Treaties will establish a streamlined export control environment for export and import of United States Munitions List items developed, produced, or

supported by approved companies in these countries in response to either individual or joint U.S. – U.K./AUS defense and security requirements. In view of the significant amount of defense trade between the U.S. and these nations, we strongly believe these Treaties will result in more timely delivery of warfighting capability to U.S., British, and Australian military and security forces by enabling the Department's acquisition workforce – and their counterparts in the U.K. and Australia – to take advantage of the skills and expertise resident among their Treaty-approved companies. Senate ratification of the Treaties is pending. The Department remains hopeful that Senate ratification, as well as required changes to U.S. Government regulations and policies needed for Treaty implementation, will be accomplished by the end of 2008.

1.3.5. Continue acquisition reform

In 2007, USD(AT&L) directed the Military Departments, Defense Agencies, and Combatant Commands to "formulate all pending and future programs with acquisition strategies and funding that provide for two or more competing teams producing prototypes through Milestone B." Milestone B is the start of the system development and demonstration (SDD) phase of a winning proposal. The policy memo further clarifies that "during SDD, large teams should be producing detailed manufacturing designs—not solving myriad technical issues." This increased emphasis on competition and prototyping would reduce technical risks, validate system designs, and evaluate manufacturing processes. In total, this approach will also reduce time to fielding.

In addition to the anticipated benefits of lower cost and more timely product delivery, the new competitive prototyping policy could lead to a number of secondary benefits. For example, the practice would exercise and develop the interplay between government and industry management teams. In addition, an increased emphasis on prototyping would help develop and enhance systems engineering skills, retain critical engineering skills throughout the government and the industrial base, and attract young talent to the field of science and engineering.

As previously discussed, IDA's profit study appears to conclude that the Department's profit policies are not effectively incentivizing the industry performance that it desires. IDA summarized that given the relative profitability of defense firms, and the evidence that profit policy has the potential to be used to effectively influence contractor behavior and performance, the time is ripe to explore the use of more aggressive profit policy measures. The Department will continue efforts to refine profit policies and reward desired contractor behavior through higher profits.

The structural, cultural, and process improvements mentioned above, as well as others, are enabling the Department to better research, determine, cost, and buy the products it needs. By working more effectively with industry, the Department is gaining innovation, reliability, adaptability, and agility. The Department of Defense is finding better ways to partner with industry, leverage strong small business contributions, expand the competitiveness of the defense acquisition environment, stimulate commercial creativity to develop effective solutions to defense requirements, and

encourage industry to provide ever better products and personnel to support the defense mission.

2. New DoD Policy

On 19 September 2007, the Acting Under Secretary of Defense (Acquisition, Technology, and Logistics) published policy directing that the Military Services and Defense Agencies increase their attention to competition and prototyping to reduce costs and speed the development of pending and future weapons programs. They are to formulate pending and future programs with acquisition strategies and funding that provide for two or more competing teams producing prototypes.

The Military Departments, Agencies and Combatant Commands are required to fund the prototyping in a program's early phases (by Milestone B) as they select designs for future systems. Milestone B is the start of system design and development (SDD), after having selected a winning proposal. The policy memo points out that “During SDD, large teams should be producing detailed manufacturing designs – not solving myriad technical issues."

The primary benefits include reduced technical risk, validated designs and improved cost estimates. Also, the policy ensures that manufacturing processes are evaluated and requirements are refined before production. Further, the defense industrial base benefits from competition and innovation. Ancillary benefits include exercising & developing government and industry management teams, developing, enhancing, exercising, and retaining critical engineering skills in the government and industrial base, and attracting and inspiring a new generation of creative students, scientists, and engineers encouraged to pursue technical careers.

DUSD(A&T) has requested DoD supplier feedback to foster and speed effective implementation of the policy. To that end, OSD will hold government and industry roundtable discussions to capitalize on industry prototyping experience and gather lessons learned. The roundtables will seek feedback from managers with current and past experience in major prototyping initiatives. OSD will then develop the detailed business practices associated with competitive prototyping policy to ensure that the benefits of the policy are fully realized and program outcomes substantially improved.

Specialty Metals Legislation

Section 804 of the National Defense Authorization Act for Fiscal Year 2008, Pub. L. 110-181, contains certain provisions that are beneficial to the Department and, in fact, includes provisions similar to those proposed by the Department in the past—i.e., a civil-military integration exception, a de minimis exception, and a COTS exception. The Director, Defense Procurement and Acquisition Policy, OUSD(AT&L), provided implementation guidance on the new specialty metals restriction in a Class Deviation of January 29, 2008 (DAR 2008-O0002). Portions of this implementation guidance are outlined below.

Section 804 adds a new statutory exemption for most COTS items, but excludes high performance magnets, castings, forgings, and fasteners, unless the magnets, castings, forgings, or fasteners are incorporated in COTS items. This COTS exception does not apply to contracts or subcontracts for the acquisition of specialty metals, including mill products, such as bar, billet, slab, wire, plate, and sheet that have not been incorporated in end items, subsystems, assemblies, or components. However, specialty metal supply contracts issued by COTS producers are not subcontracts for the purposes of this exception.

The new law expands the exception for electronic components to cover all electronic components, and is no longer limited to commercially available electronic components.

Further, Section 804 adds a new de minimis exception. The Department may accept delivery of an item containing specialty metals that are not melted or produced in the United States if the total weight of noncompliant metals in the item that are not already exempt under other exceptions (other than the exception for military commercial derivative items) does not exceed two percent of the total weight of all specialty metals in the end item. This de minimis exception does not apply to specialty metal in high performance magnets.

A new exception for commercial derivative military articles allows contractors to certify that the contractor or its subcontractors have entered into agreements to purchase a specified amount of domestically melted or produced specialty metal, in the required form, for use during the period of the contract performance in the production of the commercial derivative military article and the related commercial article. The Department expects that these certifications will be based on the contractor's or subcontractor's good faith estimates.

Finally, Section 804 adds a new national security waiver. USD(AT&L) may approve a written determination to accept noncompliant materials if he determines that acceptance of such items is necessary to the national security of the United States. The contractor or subcontractor responsible for the noncompliance must develop and implement an effective plan to ensure future compliance if it is determined that the contractor noncompliance was willful or knowing, the contractor could be subject to suspension or debarment.

Joint Industrial Base Working Group

Throughout history, the performance of the defense industrial base has played a significant role in assuring U.S. national security. The Department of Defense desires that the industrial base on which it draws be reliable, cost-effective, and sufficient to meet national strategic objectives. To support this objective, the Deputy Under Secretary of Defense for Industrial Policy (DUSD-IP) chartered the Joint Industrial Base Working Group (JIBWG) to establish a DoD-wide vehicle to exchange

information and collaborate on issues associated with the defense industrial base and to coordinate and manage limited DoD industrial analysis resources to minimize redundancy. The JIBWG is a government forum convened to provide the Under Secretary of Defense for Acquisition, Technology and Logistics (AT&L) and senior Department decision makers with accurate and timely industrial capability information and analysis to assure the Department can achieve its strategic objectives. The JIBWG is used to provide access to information, develop consistent analytical approaches to common issues, and conduct industrial capability assessments (ICAs) on high value challenges to the DoD.

The JIBWG is chartered under the direction of the Deputy Under Secretary of Defense for Industrial Policy and the Defense Contract Management Agency's (DCMA) Industrial Analysis Center (IAC) is designated as the Executive Agent. The Director, Industrial Analysis Center, Chairs meetings and designates an Executive Secretary. Core member organizations are DUSD IP, Joint Staff, Army, Navy, Air Force, Marines, Defense Contract Management Agency, Missile Defense Agency, and Defense Logistics Agency. Each Core member organization provides a permanent Working Group representative and alternate. Personnel selected to serve on the Working Group are knowledgeable of industrial base capabilities and readiness policies, processes, practices and initiatives and have authority to represent their organizations. Core members keep the Chair and other core member organizations appraised of relevant activities and plans within their organization. The JIBWG meet on a semiannual basis.

Topics addressed at the 2007 JIBWG meetings included the Mine Resistant Armor Protected (MRAP) Industrial Capability Assessment, Specialty Metals, Air Force Industrial Base Assessment Program, Army Materiel Command's Lean Six Sigma Process Optimization Integrated Industrial Base Analysis Process, Defense Critical Infrastructure Program (DCIP), Defense Industrial Base Critical Asset List (DIB CAL) and Lithium Batteries.

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3. Defense Mergers and Acquisitions

3.1 Introduction

Robust, credible competition is vital to providing the Department of Defense with high quality, affordable, and innovative products. It is the Department's policy to oppose business combinations that reduce or eliminate competition and are not in its ultimate best interest. The Department is becoming concerned about the loss of competition caused by significant industry consolidation over the last decade; and the pace of such consolidation shows no signs of slackening. Increasingly, the Department finds itself evaluating proposed mergers, acquisitions, and teaming arrangements that create horizontal capabilities, overlaps, problematic vertical supply arrangements, and potential conflicts of interest. The Department considers a transaction's potential benefits compared to the potential harm caused by a transaction's reduction of competition. However, it is not clear that benefits the Department expected from past transactions have materialized. The Department is evaluating its options to address continued consolidation and the uncertainties of the competitive environment.

The Department believes that the competitive pressure of the marketplace is the best vehicle to shape an industrial environment that supports the defense strategy. Therefore, the Department of Defense takes action to intervene in the marketplace only when necessary to maintain appropriate competition and develop and/or preserve industrial and technological capabilities essential to defense that the marketplace, left unattended, would not. The Department evaluates each proposed transaction on its particular merits in the context of the individual market and the changing dynamics of that market.

The Department must establish, maintain, and strengthen industrial relationships that ensure that the future defense industrial base is both healthy and vital. In doing so, the Department maintains focus on the need to encourage competitive forces for innovation while acknowledging the need of companies to scale up or combine with other firms to create new industrial capabilities essential for future warfare. Additionally, however, the Department also wants to ensure that the competitive, innovative, and cutting-edge technical support found in small and mid-sized firms is not compromised by large firms acquiring such small firms.

The Department reviews several kinds of business combinations involving defense suppliers: (1) proposed mergers or acquisitions filed under the Hart-Scott-Rodino Antitrust Improvement Act of 1976 (generally, transactions valued at more than $63.1M); (2) other collaborations among competitors (joint ventures, mergers and acquisitions) of special interest to the Department that do not meet the Hart-Scott-Rodino Act filing threshold; and (3) proposed acquisitions of U.S. defense contractors by non-U.S. firms for which filings have been made pursuant to the Exon-Florio Amendment to the Omnibus Trade and Competitiveness Act of 1988.

3.2 Merger and Acquisition Reviews

The Federal Trade Commission and the Department of Justice (the "Antitrust Agencies") have the statutory responsibility for determining the likely effects of a defense industry merger on the performance and dynamics of a particular market; and whether a proposed merger should be challenged on the grounds that it may violate antitrust laws. As the primary customer impacted by defense business combinations, DoD's views are particularly significant because of its special insight into a proposed merger's impact on innovation, competition, national security, and the defense industrial base. Accordingly, the Department actively works with the Antitrust Agencies.

DoD reviews are structured to identify impacts on national security and on defense industrial capabilities; evaluate the potential for loss of competition for current and future DoD programs, contracts and subcontracts, and for future technologies of interest to the Department; and address any other factors resulting from the proposed combination that may adversely affect the satisfactory completion of current or future DoD programs or operations.

In 2007 the Department reviewed more than the 54 transactions shown in the following table (some potential transactions were not made public). The Department selectively identifies transactions for review and thus the table does not encompass all mergers and acquisitions involving companies that do business with the Department. Of those cleared by the Antitrust Agencies, one required intervention by the antitrust agencies. In several cases, the Department requested certain behavioral agreements to protect continued competition outside of the antitrust mitigation process. The Department requested remedies for a limited number of transactions:

- General Electric and Smiths' formation of a joint venture could have resulted in a monopoly for explosives trace detection. The Department worked with the FTC to require a divestiture. The transaction dissolved.
- Northrop Grumman's acquisition of Essex could have harmed competition on the Joint High Power Solid State Laser through a vertical integration relationship. The Department requested the company establish firewalls so it could continue to provide non-discriminatory support to a Northrop Grumman competitor.
- Allan Vanguard's acquisition of MED-ENG could have resulted in technology transfer to un-safeguarded Counter-IED jammers. The Department requested the company establish firewalls and other safeguards.
- BAE's acquisition of Armor Holdings could have harmed competition on the Joint Light Tactical Vehicle. The Department requested firewalls so the company could continue to provide non-discriminatory support to a BAE competitor.
- Alliant Techsystems' acquisition of Swales could have harmed small satellite competitors through its' vertical integration relationship. The Department requested the company to agree to be a merchant supplier of heat pipes to Alliant Techsystems' competitors.

DEFENSE MERGER AND ACQUISITION REVIEWS – 2007			
Acquirer	**Acquired Company**	**Value ($M)***	**Disposition**
Alcoa	Alcan	$33,000	No Objection
Allan Vanguard	MED-ENG	$621	Firewall
Alliant Techsystems	Swales	$100	Merchant Supply Agreement
Apex	Telenor	$400	No Objection
AstraZeneca	MedImmune	$15,200	No Objection
BAE	MTC Technologies	$450	In Process
BAE	Armor Holdings	$4,532	Merchant Supply Agreement
BAE & GD	Abrams/Bradley Collaboration		In Process
BC Partners	Intelsat	$16,000	No Objection
CACI	Wexford Group International		No Objection
CapRock Communications	Arrowhead Global Solutions		No Objection
Carlyle	Sequa	$2,700	No Objection
Carlyle	ARINC		No Objection
Carlyle & Onex	GM's Allison Transmission	$5,575	No Objection
Cobham	BAE's Surveillance and Attack business unit	$240	In Process
CommScope	Andrew	$2,600	No Objection
Day Zimmerman	SOC-SMG		No Objection
Donaldson	Aerospace Filtration Systems	$39	No Objection
Doncasters	FastenTech	$492	No Objection
Dover	Pole-Zero		No Objection
Eaton	AT Holdings	$695	No Objection
ExpresScripts	Caremark		No Objection
Flextronics International	Solectron	$3,600	No Objection
Fugro N.V.	EARTHDATA International / Horizons		No Objection
GE	Smiths Aerospace	$4,800	No Objection
GE & Smiths	Smiths-GE Chemical Detection	$1,000	Blocked
GKN	Teleflex		No Objection
Highland Crusader Offshore	Consolidated-PAC		No Objection
Honeywell	Dimensions International	$230	No Objection
ITT	EDO	$1,700	No Objection
J.F. Lehman & Co.	BAE Systems' Inertial Products Division	$140	No Objection
Kratos	Haverstick	$90	No Objection

DEFENSE MERGER AND ACQUISITION REVIEWS – 2007 (CONTINUED)			
Acquirer	**Acquired Company**	**Value ($M)***	**Disposition**
L-3 Communications	Global Communication Solutions	$148	No Objection
ManTech International	SRS Technologies	$195	No Objection
McDermott International	Marine Mechanical Corp	$75	No Objection
Meggitt plc	K&F Industries	$1,800	No Objection
Microwave Materials Group	ARC Technologies		No Objection
Nammo	Talley	$99	No Objection
NG and SAIC	AMSEC		No Objection
Northrop Grumman	Scaled Composites		No Objection
Northrop Grumman	Essex	$580	Merchant Supply Agreement
Oak Hill Capital Partners	Firth Rixson	$1,960	No Objection
Onex and Goldman Sachs	Raytheon Aircraft Co.	$3,300	No Objection
Oracle	Hyperion	$3,300	No Objection
Precision Castparts	McWilliams Forge		No Objection
QinetiQ Group plc	ITS	$90	No Objection
QinetiQ Group plc	Analex	$173	No Objection
Raytheon	Oakley Networks		No Objection
Steel Partners	Point Blank Solutions		No Objection
Textron	United Industrial Corp.	$1,100	No Objection
URS	Washington Group International	$2,600	No Objection
Verizon	Cybertrust		No Objection

Notes: * Value based on publicly available information.
Source: ODUSD (IP)

3.3 Foreign Investment in the United States

The Exon-Florio Amendment to the Omnibus Trade and Competitiveness Act of 1988 established Section 721 in the Defense Production Act. This section authorizes the President to suspend or block foreign acquisitions, mergers, or takeovers of U.S.-located firms when they pose credible threats to national security that cannot be resolved through other provisions of law.[1] Implementation of the Exon-Florio

[1] Excepting the International Emergency Economic Powers Act.

Amendment is managed by the interagency Committee on Foreign Investment in the United States (CFIUS), chaired by the Department of the Treasury.

Under Exon-Florio, the President has 30 days from the time he is notified of a foreign acquisition to initiate an investigation of the transaction. During the first 30 days after formal notification, CFIUS members conduct a preliminary review to determine whether the transaction poses credible threats to national security and, if so, whether there are means to adequately mitigate those threats under various statutes or departmental regulations. By the 30th day, the CFIUS must either approve the transaction, with or without risk mitigation measures, or initiate an additional 45-day investigation. There are no other options under the law. Once CFIUS completes an investigation, it can send the case to the President with a recommendation for action or take certain actions itself as long as these do not involve the Presidential authorities of blocking or suspending a transaction.

Amendments enacted in 2007 in the Foreign Investment and National Security Act of 2007 (FINSA) require appointment of a lead agency for each case, mandatory investigation for cases involving critical infrastructure or foreign government control (unless waivers are signed by certain senior officials of Treasury and the lead agency), extensive annual reports to Congress, certifications by senior officials of Treasury and lead agency that no unresolved national security issues exist, as well as authority for CFIUS to reopen a closed CFIUS case under certain highly unusual conditions.

The Department of Defense is a member of the Interagency Committee. As a CFIUS member, the Department evaluates the national security aspects of proposed foreign acquisitions of U.S. defense contractors and other U.S. firms indirectly impacting national defense. In assessing foreign acquisitions, the Department's principal objectives are to: (1) protect the reliability of supply of goods and services to the Department; (2) minimize the risks of unauthorized transfer of classified information and export-controlled military and dual-use technologies; and (3) assure there is congruence of strategic interests between the acquiring firm and the DoD. Simultaneously, the Department recognizes that foreign direct investment in the Untied States, including the defense sector, generally is beneficial to the U.S. economy and the nation's defense. Foreign-owned firms located in the United States employ U.S. citizens, pay U.S. taxes, and are subject to U.S. law.

To assist in achieving these objectives, the Department determines in each case whether the firm being acquired possesses critical defense technology or is otherwise important to the defense industrial and technology base. The intelligence community also prepares for CFIUS a threat assessment of the acquiring firm and country which evaluates among other things: (1) their compliance with U.S. and international export control laws and other international regimes which regulate proliferation of weapons of mass destruction; (2) their potential reliability as suppliers to the defense industrial base; and (3) their support in fighting international terrorism.

Given the statutory constraints of the Exon-Florio Amendment, the Department cannot publicly discuss specific reviews. However, under FINSA summary information

is provided to the Congress in annual reports by the Treasury Department as chair of CFIUS.

During 2007, a review of the 147 CFIUS cases filed indicates that [14 cases] 9.5 percent of the transactions involved U.S. firms deemed to possess critical technologies and [25 cases] 17 percent involved U.S. firms that were determined to be otherwise important to the defense industrial base. In these 39 cases, the Department, acting under its own industrial security regulations that apply to firms with classified contracts, remedied concerns about foreign ownership, control, and influence by imposing risk mitigation measures on the acquiring firms. In twelve other transactions, CFIUS member agencies negotiated risk mitigation agreements unrelated to the industrial security regulations. In six cases, a 45-day investigation was initiated to supplement the initial 30-day review. The total dollar value of all 2006 CFIUS transactions was $189B.

4. Industrial and Technological Capabilities Assessments

Methods and Analyses

The U.S. defense industrial base and the global defense market provide the industrial and technological capabilities which support the needs of the warfighter for capable and reliable weapon systems. The Department periodically conducts analyses/assessments to identify and evaluate those industrial and technological capabilities needed to meet current and future defense requirements. It then uses the results of these analyses/assessments to make informed budget, technology investment, acquisition, and logistics decisions.

"DoD-wide" industrial assessments evaluate and address changes in key system, subsystem, component, and/or material providers that supply many programs, and affect competition, innovation, and product availability. DoD Components conduct their own assessments when: (1) there is an indication that industrial or technological capabilities associated with an industrial sector, subsector, or commodity important to a single DoD Component could be lost; or (2) it is necessary to provide industrial capabilities information to help make specific programmatic decisions. These assessments generally are conducted, reviewed, and acted upon internally within the DoD Components. Additionally, the Defense Contract Management Agency supports DoD-wide and DoD Component industrial assessments by utilizing its broad knowledge across industrial sectors and its on-site presence in many contractor industrial facilities.

4.1 DoD-Wide

Munitions Industry Capability and Surge Analysis (February 2007)

DCMA IAC has a Memorandum of Agreement with the Joint Staff (J-4) to analyze industry's capacity and capability to surge for 43 Munitions Programs and their Variants on an annual basis for over seven years. DCMA has provided annual updates to the Joint Staff (J-4) to support contingency planning and preparation of munitions reports to the Chairman of the Joint Chiefs of Staff. The Deputy Under Secretary of Defense for Industrial Policy (DUSD-IP) utilizes these reports for prioritize demand for industrial resources. The study includes prime and critical subcontractor production capabilities, manufacturing capacity and lead times, current and surge production rates with limiting factors, vertical, and horizontal, Department of Defense (DoD) Budget requests, market business base, and predictive analysis.

History indicates accelerated production of certain Precision Guided Missiles (PGM), missiles, and rockets may be required to successfully prosecute future conflicts. However, due to added complexity, certain Standoff Tactical Missiles cannot be accelerated as quickly as kitted systems such as the Joint Direct Attack Munitions

(JDAM) and Paveway II programs. Bottlenecks remain in the supplier base with limited excess production capacity available to support acceleration of key components that can exceed 12 months to reach maximum facilitated rates to support complex subsystems (e.g. Guidance Systems, Rocket Motors, Gas Turbines etc.). The munitions industrial base faces a number of significant challenges in the near-term with numerous single-point qualified sources of supply, a growing dependence on foreign suppliers at the subsystem level, disruptive fluctuations in demand, shrinkage, and aging of stockpiles, and declining R&D capability.

Software Industrial Base Study: Phase II (July 2007)

This two-phase study was sponsored by the Office of the Secretary of Defense to address the demand for DoD software and the industrial base's ability to satisfy that demand.

Although Phase I found shortfalls in the number of upper echelon software managers and architects, the number of software developers overall appears adequate. Phase II, however, found shortfalls in the training of software developers. Software development jobs are being filled with staff lacking formal software engineering training. The demand for software developers is outpacing the number of university degrees granted by a ratio of 2 to 1. As a result, jobs are being filled with staff that are not formally trained in computer science or computer engineering.

The study also found that the number of university students majoring in computer science and computer engineering is cyclical, and that we are currently in the midst of an extended downward trend.

The study recommended requiring DoD contracts specify that trained software engineers develop that DoD software, and to work with academia to define a set of standards for software engineering.

Strategic Materials Protection Board (September 2007)

Section 843 of Public Law 109-364 directed the Secretary of Defense to establish a Strategic Materials Protection Board (SMPB) composed of representatives of the Secretary of Defense, the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)), the Under Secretary of Defense for Intelligence (USD(I)), and the Secretaries of the Army, Navy, and Air Force. The SMPB is to meet at least once every two years. Following each meeting, the SMPB is directed to submit a report to Congress containing the results of the meeting and such recommendations as the Board determines appropriate. In addition, the SMPB must publish in the Federal Register at least once every two years recommendations regarding materials critical to national security, including a list of specialty metals, if any, recommended for addition to, or removal from, the definition of "specialty metal" at 10 USC 2533b.

By memorandum dated May 4, 2007, the Secretary of Defense delegated to the USD(AT&L) responsibility to chair the Board. On May 22, 2007, the USD(AT&L) delegated to the Deputy Under Secretary of Defense for Industrial Policy responsibility to act as the Board's Executive Secretary.

The USD(AT&L) chaired the first meeting of the SMPB on July 17, 2007. The SMPB agreed:

- that the term "materials critical to national security" would be taken to mean "strategic materials critical to national security" and would include those specialty metals listed in 10 U.S.C. 2533b, and any other materials that the Board chose to so designate;

- that the Board should initially focus its efforts on determining the need to take action to ensure a long term domestic supply of specialty metals as designated in 10 U.S.C. 2533b;

- to adopt certain Terms of Reference to shape its deliberations; and

- to direct the Board's Executive Secretary to conduct an initial analysis of national security issues associated with strategic materials; and to report the results of that analysis at the next SMPB meeting.

Foreign Sources of Supply: Assessment of the United States Defense Industrial Base (November 2007)

Section 812 of the National Defense Authorization Act for Fiscal Year 2004 (Public Law 108-136) directed the Secretary of Defense to establish a program to assess the degree to which the United States is dependent on foreign sources of supply; and the capabilities of the United States defense industrial base to produce military systems necessary to support the national security objectives set forth in section 2501 of Title 10, United States Code. In meeting the requirements of Section 812, the Department is to use existing data for the assessment program. The Department is to submit to the Congress an annual report on the assessment program covering the preceding year.

The November 2007 report was based on three separate assessments that collectively provide visibility into the extent and impact of foreign suppliers: (1) an assessment of FY06 DoD prime contracts valued at over $25,000 for defense items and components, (2) a March 2007 DoD report to Congress providing information on total

DoD purchases from foreign entities,[2] and (3) an April 2007 assessment of total DoD purchases of supplies manufactured outside the United States.[3]

The report concluded that the Department employs foreign contractors and subcontractors judiciously, and in a manner consistent with national security requirements. In FY06, the Department awarded contracts to foreign suppliers for defense articles and components totaling approximately $1.9B, less than one percent of all DoD contracts; and about 2.4 percent of all DoD contracts for defense articles and components. The report is posted on the ODUSD(IP) website (http://www.acq.osd.mil/ip).

4.2 Army

Government Owned Contractor Operated (GOCO) Modernization (June 2007)

An updated modernization plan was established for GOCO facilities. Using a data call and follow-on prioritization process, the plant Administrative Contracting Officer (ACO) staff, in concert with the facility operating contractors, submitted the needs of each GOCO facility to an integrated process team (IPT) consisting of Joint Munitions Command (JMC) and Program Executive Officer (PEO) Ammunition associates. The IPT used lean six sigma prioritization to establish a Production Base Support (PBS) list which formed the basis for the FY09-14 PBS budget estimate submission. Headquarters, Department of the Army continues to provide needed fiscal support to address critical modernization needs at GOCO facilities. Recent PBS investments include the award of contracts to:

1. Design a new Nitric Acid Concentrator/Sulfuric Acid Concentrator at Radford Army Ammunition Plant (AAP).
2. Upgrade the coal fired steam plants at Radford and Holston AAPs to improve environmental compliance and energy management.
3. Complete nitrocellulose (NC) dewatering capability at Radford AAP to support small caliber ammunition supplies.
4. Complete 7.62mm ammunition production capabilities to provide statistical process controls for primer manufacture and case inspection capabilities at Lake City AAP.
5. Complete the waste incinerator design at Lake City AAP.
6. Complete design, fabrication, and installation of a fluid energy mill at Holston AAP to support Insensitive Munitions explosive manufacture.
7. Complete rehabilitation of the high tonnage Erie I press system at Scranton AAP.

[2] The Department of Defense Fiscal Year 2006 Report on Purchases from Foreign Entities can be found at http://www.acq.osd.mil/dpap/policy/congress/pdf/CongressionalReportonFY2006DoDPurchasesfromForeignEntities.pdf

[3] The Department of Defense Fiscal Year 2006 Report on Purchased of Supplies Manufactured Outside the United States can be found at http://www.acq.osd.mil/dpap/policy/congress/pdf/CongressionalReportonDoDProductsManufacturedOutsidetheU.S.pdf

8. Initiate rehabilitation of the Bliss III press system at Scranton AAP.
9. Upgrade coal fired steam plant at Iowa AAP.
10. Install explosive loading equipment for insensitive munitions flex line at Iowa AAP.
11. Complete select upgrades to the sanitary wastewater treatment facility at Milan AAP.
12. Recapitalization of the White Phosphorus munitions filling facility at Pine Bluff Arsenal, completed and scheduled to become operational December 2008.

Information Technology Industrial Base (IB) Sector Study (June 2007)

During 2007, Army examined the capability of the Information Technology (IT) Sector base (private and organic) to develop, manufacture, and support legacy and future weapon systems. In general, IT systems in the Army rely on Commercial-Off-The-Shelf (COTS) hardware. Where there are military unique IT systems filling critical mission needs, even these systems make use of commercial technologies for underlying implementation. Critical technologies, such as encryption devices, are developed specifically for the military and government by contractors. Overall, the U.S. and available foreign technology firms are fiscally healthy and will continue to provide cutting edge supplies and services for military missions for the foreseeable future.

IT Industrial Base issues include:

1. Obsolescence and long delivery times in maintenance and rebuilding legacy IT equipment.
2. Concerns regarding extensive use of COTS IT equipment in harsh environments.
3. Significant increase in the risk of tin growths (“tin whiskers”) in electronic components that can cause short circuits (and resulting parts failure.) Tin whiskers are a relatively new phenomenon brought about by the use of new lead-free solders. The European Union has mandated the use of lead-free solder in most applications under their jurisdiction.
4. Significant foreign dependency for technology used in integrated circuit fabrication and SDRAM memory devices. Increased off-shoring and outsourcing in the semiconductor and software industries to China and India weakening the North American Defense Industrial Base.
5. Length of time for Army-wide standardization to Internet Protocol Version 6 (IPV6) process.
6. Assuring forward compatibility from IPv4 systems to IPv6 systems.

This study evaluated capability of commercial and organic sources to produce, maintain, and support active Army programs/equipment. It identified sources of supply for major programs and components of systems; accessed their financial health; identified deficiencies and issues with technologies or the industrial base such as

obsolescence, critical resource constraints, etc. and examined technology trends, and developments. Army reviewed earlier assessments and reports, results from surveys of the Army Communications-Electronics Life Cycle Management Command and Tobyhanna Army Depot, Internet research, Moody's Investor Services and Dunn and Bradstreet financial reports.

The IT sectors were divided into several sub-sectors for review and evaluation. These sub-sectors were Computers, Networking Equipment and Switches, Storage Devices and Media, Advanced Flat Panel Displays, Integrated Circuits, and Software and Information Assurance.

Resulting Recommendations included:

1. Continue to monitor the capabilities of the industrial base.
2. DoD level: take action to develop and preserve militarily critical technologies using Manufacturing Technology, Title III and other research and development programs.
3. Initiate proactive Diminishing Manufacturing Sources and Material Shortages plans for all programs. Program Managers should have funded DMSMS programs in place for assigned systems.
4. Form Weapon System Integrated Product Teams as early as possible in the system's life cycle and include representatives from the organic industrial base from the onset.

Joint Network Node – Network Technology Readiness Assessment (June 2007)

The Joint Network Node Network (JNN Network) is one of the systems that accomplish a portion of the Bridge to Future Networks Capabilities Production Document requirement. The JNN Network will be organic to the Modular Army and will provide a more capable system than today's Area Common User System. The JNN Network will enhance the current forces with technologies that ensure operational relevancy and interoperability with future capabilities.

The purpose of the assessment was to identify any technology used in the system that represented a level of risk that must be addressed prior to fielding the system. All key components, sub-assemblies, software, and all other subsystems were reviewed to determine if any were classified as a Critical Technology Element (CTE) by the Program Manager. This assessment was designed to determine if a CTE was evaluated at less than the Technology Readiness Level (TRL) objective established for the program, and, if so, recommend that a Technology Development Strategy be created for the subject component, software, and/or manufacturing technology in order to meet the objective.

Based on the extensive use of Non-Developmental Item/Commercial-Off-The-Shelf (COTS) hardware/software application and the established commercial

manufacturing capabilities, JNN program risk was assessed as low to moderate. Technological maturity is considered very low risk, as it is based on current technology. There are no developmental items or equipment other than integration hardware. Use of currently available and reliable COTS components has been proven to be fully suitable in those JNN Network systems already fielded. Program technical risk, once identified, will be managed by regression testing and close coordination with associated programs. It was determined that all of the components, sub-systems, software and manufacturing technology meet the criteria of a TRL of at least eight and that there are no CTE. It was further determined that there was no need to conduct a formal Technical Readiness Assessment based on a review of the system's present and projected hardware design.

Ammunition and Industrial Base Sourcing Study (July 2007)

An ammunition and industrial base sourcing study was initiated by the Joint Munitions and Lethality (JM&L) Life Cycle Management Command (LCMC) to further integrate acquisition and industrial base objectives into ammunition management. A methodology was established to assess ammunition requirements and compare them with industrial base capabilities and capacities. Cost models were developed to enable a better understanding of cost drivers, cost reduction opportunities, optimization opportunities and the identification of potentially excess infrastructure. Government and industry leaders were interviewed to get their perspective and ideas. Legal and policy issues were also evaluated during the course of the study and recommendations for changes will also be included in the final report.

Chemical Biological Defense Supplier Smart Book (November 2007)

The Chemical Biological Defense (CBD) Supplier Smart Book provides information about current and past producers in the Chemical Biological (CB) Industrial Base sector. The CBD Smart Book has been compiled to provide the Army acquisition community a better understanding of the capabilities of each supplier and visibility of Army materiel. The CBD Smart Book contains approximately 145 company profiles of firms considered to be manufacturers or distributors of CBD systems or critical components. Each company profile includes general company and contact information, CAGE Codes and DUNS numbers, a company overview, recent or significant company news, facts pertaining to any mergers or acquisitions, financial data (as of May 2007), contract award data, and a listing of past, current, and/or future Army materiel produced/distributed. The Smart Book is organized into CBD commodity areas including: Contamination Avoidance, Individual Protection, Collective Protection, and Decontamination. Data within the smart book was obtained by accessing both government and commercial electronic sources and databases. The Smart Book is designated "For Official Use Only" It will be available on-line or in hard copy as of December 2007.

Power Systems & Products Sector Industrial Base Assessment (December 2007)

The report examines the capability of the Power Systems and Products Sector base (private and organic) to develop, manufacture, and support legacy and future weapon systems. It identified sources of supply for major programs and components of systems; assesses their financial health; identifies deficiencies and issues (obsolescence, critical resource constraints, etc.); and examines technology trends and developments. Sources of information include defense industrial base assessments and reports, results from surveys of the Army Communications-Electronics Life Cycle Management Command and Tobyhanna Army Depot, Internet research, Moody's Investor Services and Dunn and Bradstreet financial reports. Sources of supplies for critical technology, capabilities and materials were reviewed to determine if domestic capabilities are sufficient to meet current and future needs and discusses developing technologies critical to maintaining U.S. military superiority.

The sector is divided into Man-portable power (batteries), advanced power systems (fuel cells and solar powered systems), and traditional mechanically driven power generation systems (generators).

The following issues were identified:

1. Growth in the hybrid powered motor vehicle industry on the price and availability of raw materials involved in the production of traditional alkaline and lithium compound batteries, especially those tailored for military unique applications.
2. Emerging battery chemistries will yield greater power in smaller form and lower weights. Will battery manufacturers compete with the hybrid vehicle manufacturers for key materials in order to implement the solutions in rate manufacturing?
3. Identified future requirements for tactical power generation for military ground forces and the technical improvements required to mechanically based power generation systems. Can new technology (ex: portable solar panels and or fuel cells) fill some or all of the need?

Implementation of Base Realignment and Closure Commission (BRAC) 2005 Decisions in Ammunition Industrial Base

Since the May 2005 BRAC announcements, there has been much activity to execute actions within the ammunition community. In total, there were 17 production functions/capabilities identified for relocation; some much more significant than others. Work/progress continues on each of these moves.

Accomplishments in 2007 include the following:

1. Business Case Analysis and Decision Papers were developed for the production function moves in determining the best path forward (cost and readiness)
2. Design and Equipment Scopes of Work were developed
3. Equipment was tagged at the Closing Installations in determining which equipment the Government needs to retain
4. BRAC dollars ($25M) received and obligated in Sep 2007 for establishing a Sensor Fused Weapons (SFW) capability at McAlester AAP and new equipment purchased for Cartridge Case move from Riverbank AAP to Rock Island Arsenal
5. Necessary budget actions have been taken to identify the resources needed to continue to support these actions

As progress continues with each of the above efforts, ongoing coordination is critical. Towards that end, joint integrated product teams have been formed with representatives from each of the Services as appropriate, to oversee all actions. Efforts will continue to complete all required actions in an orderly, timely, and cost effective manner, while ensuring the war fighter continues to get the support needed.

4.3 Navy

Broad Area Maritime Surveillance (BAMS) (February 2007)

NAVAIR (PMA-263) asked Defense Contract Management Agency, Industrial Analysis Center (DCMA IAC) to conduct an industrial capability assessment to support the Broad Area Maritime Surveillance (BAMS) Unmanned Aerial Vehicle (UAV) program. Five contractors that build medium to large UAV's were assessed for this study.

The study concluded that the industrial base is sufficient to support the BAMS production. All five (13 different sites) contractors assessed were rated either a Low or Moderate Industrial/Financial/Technology Risk. Each contractor's capacity utilization levels could support additional workload at this time and it is determined that this capacity will be available to support the future BAMS UAV workload.

Harpoon Missile Block III Upgrade Industrial Capability Assessment (May 2007)

The Navy tasked DCMA IAC to conduct an industrial capability assessment on the Harpoon Block III (H3) capability upgrade kit, which will be installed on existing Harpoon IC missiles. The assessment provided a baseline of industrial capabilities and financial stability of the industrial base supporting H3, identifying risks and potential alternate suppliers. The study supports the Navy's Milestone B Defense Acquisition Board (DAB) review. The assessment addressed the industrial base supporting H3

production, including the sole source original equipment prime integrator, three potential and alternate suppliers for the GCU Processor, the GPS and Data Link Antennas that were identified by the Prime and the H3 program office. Analysis of obsolescence versus leveraging off existing Commercial-Off-The-Shelf (COTS) technology will be used to optimize missile design. All contractors surveyed were found to be a Low Industrial/Technology Risk because the capability has been recently developed or currently exists on other missile systems and the industrial base supporting the H3 system has at least one reliable source currently providing these capabilities with potential alternative sources available, if required. The study recommended that all companies rated as Moderate Financial Risk be monitored on a periodic basis every six to 12 months to determine if any company's financial position deteriorates.

Ship Repair Industrial Base (June 2007)

The Conference Committee Report accompanying the John Warner Defense Authorization Act Fiscal Year 2007, H. Rept. 109-702, requested an assessment of the ship repair industrial base. Director, Fleet Readiness Division (OPNAV N43) in the Office of the Chief of Naval Operations conducted the assessment, and generated a report with focus on the health of the ship repair industrial base. Specifically, the report addresses ship repair requirements to support the National Military Strategy, and provides an evaluation of the repair industrial base's critical capabilities, capacity, competitive sourcing, geographical disposition, and other critical factors as measured against the determined requirements.

The report examines the Fleet shift from a rotational cycle to the Fleet Response Plan enhanced surge capability, which requires the maintenance community infrastructure to be flexible. One Shipyard, Multi-Ship Multi-Option, and the private sector provide the flexibility to provide operational and combat ready ships and weapon systems required by the Fleet. The current capacity and capability of the private sector ship repair industrial base are adequate to satisfy the national security interests of the United States. Force structure adjustments and ship-life cycle effects will result in declining out-year ship depot maintenance workload. The goal is to maintain a viable private sector ship repair industrial base while balancing public shipyard workload to comply with Title 10.

Expeditionary Fighting Vehicle Depot Source of Repair (October 2007)

In January 2002, the Direct Reporting Program Manager (DRPM) Expeditionary Fighting Vehicle (EFV) requested the DCMA IAC to participate in an Integrated Process Team (IPT) chartered to address depot level core capability and risk assessment for repair and overhaul of the EFV systems and sub-systems, in accordance with Title 10 U.S.C. 2464. The purpose of the tasking was to identify core capability and cost-effective sources of repair while mitigating risk to the EFV program.

In 2007, DCMA IAC was tasked to identify potential government and commercial facilities capable of performing depot level repairs to systems and components of the vehicle. IAC's analysis also included commercial item identification and financial information to support a best-value analysis. The tasking identified EFV turret components excluding the Mk44 gun and feed system (completed in FY02).

The EFV Turret components are comprised of mechanical, electrical, and optical components supported by several subcontractors. The electro/optical components are the most complex and comprise the forward-looking infrared (FLIR) system of the vehicle.

There is little commercial application for FLIR components with the exception of the Commanders Thermal Viewer (Camera). The electrical/optical manufacturers possess proprietary processes, equipment, and technology, which are not currently present in the depots and would be difficult to duplicate in the depots. The electro/optical industry is distributed in technology niches and is ever changing with emerging technologies, leading to obsolescence issues every few years. This capability is lacking at the depots and a large investment would be needed to perform these complex repairs on a component level. However, the turret mechanical components, gear boxes, and gear drives etc. are less subject to obsolescence than those from the electronic/optical industry. The depots maintain a good skill set and environment to overhaul and repair mechanical components. The mechanical industry environment is more typical of the current workloads at the depots rather than the more specialized electro/optical industry work. Developing new technologies causing obsolescence issues are common in the electronic/optical industry and Depot investment in test equipment and purchase of the Technical Data Package (TDP) and repair manuals may not be cost effective.

U.S. Microwave Tube Industrial Base (December 2007)

The U.S. Microwave Tube Industrial Base is a Department of Defense dominated third tier component supplier of critical technology devices for use in Radars, Electronic Warfare and Communications functions.

Consolidation of the U.S. Industry has continued with acquisitions of niche market suppliers by the two dominate, broad Microwave Tube product line companies (Communication and Power Industries, Inc and L-3 Communications – Electron Devices Division) and the major supplier of high power broadband Traveling Wave Tubes (Teledyne Electronic Technologies).

Based on current planned system production and decommissioning schedules, DoD requirements for operational Microwave Tube assets to fulfill active deployed system requirements continue to increase through 2008 and then remain relatively flat through 2015.

U.S. Microwave Tube Industry sales continue to increase with growth in the emerging military communications business and the commercial medical and communications business while maintaining the military Radar and Electronic Warfare requirements.

In the World Market, Thales Electron Devices (Veilizy-Villacoublay, France) competes across the breadth of the U.S. Microwave Tube capability market, and in some technology areas, leads the world.

The U.S. Microwave Tube Industry continues to express concern that overly restrictive constraints on technology export limitations are inhibiting its ability to evenly compete in the world wide market.

Research and Development efforts continue at the previous levels via Microwave Tube Industry research and development, Small Business Innovative Research (SBIR) projects in supportive Industry/University organizations and Government laboratory efforts by the core Vacuum Electronics technical group at Naval Research Laboratory.

The ability of the U.S. Industry to support needed K-band traveling wave-tube amplifiers for satellite applications reached a critical stage in 2007. DoD support is being provided via a Title III (Industrial Mobilization) effort via the OSD Title III Office at Air Force Research Laboratory, Wright Patterson Air Force Base.

Under the leadership of the Naval Research Laboratory, planning is well underway for the April 2008, International Vacuum Electron Devices Symposium at Monterey, CA. Participants from around the world will gather to discuss the latest in Microwave Tubes operating capabilities, internal device technologies and supporting technologies.

For discussions of DoD operational applications/issues, Naval Surface Warfare Center, Crane Division sponsored the 2007 Microwave Tube Workshop at Naval Air Station, Whidbey Island. As the home of the Navy's EA-6B aircraft which uses the ALQ-99 Higher Power EW Jammer, the location served as an excellent environment for the interchange of issues and ideas by the over 150 representatives of Government Operational, Program Managers and Acquisition personnel and Industry Microwave Tube and Equipment Designers.

The current high level operational tempo of DoD forces continues to drive the spares market for repair and replacement Microwave Tubes. Increased cost and limited availability of specialty materials used in the construction of Microwave Tubes is becoming an issue of concern and will require monitoring to insure no impact on availability of affordable Microwave Tubes to the operational requirements.

4.4 Air Force

Armor and Structural Transformation: Steel to Titanium (February 2007)

This report, completed by Air Force Research Laboratory (Defense Production Act Title III Program), consolidates market research associated with current demand for and production of non-aerospace grade titanium. The report assesses companies having the capability to produce titanium sponge, melt, and alloy titanium, or mill/roll/extrude titanium for DoD applications other than aerospace. The report reviews current government involvement in technology development and applicable research by industry and academia.

This assessment supports investment planning within the Air Force and broader DoD research and development communities. Specifically, the study assessed whether or not substantial justification exists to warrant continued DoD investment in the development of a domestic capability for non-aerospace titanium. The report provides market research, technical information, and recommendations for scoping and initiating additional programs to address the needs of DoD customers.

Lithium Ion Battery for Space White Paper (March 2007)

Space and Missile Command (SMC) Los Angeles Air Force Base requested information from DCMA Industrial Analysis Center (IAC) concerning the Space Lithium Ion (Li-Ion) battery foreign and domestic industrial and technology base. Li-Ion is considered the best-adapted battery technology for military space based applications due to its various advantages over the two other space technologies: Nickel-Cadmium (Ni-Cd) and Nickel-Hydrogen (Ni-H2). The main advantage of Li-Ion is the weight reduction of the battery system due to higher specific energy. U.S. Air Force, Missile Defense Agency and other DoD and NASA technology initiatives are currently pursuing research through technology contract awards to better accommodate the need to predict and simulate the next generation of aerospace batteries. These initiatives will also allow U.S. battery producer's future application of domestic technology advances for Li-Ion batteries in lieu of current foreign technology dependency.

The study recommended further analysis be performed including a Li-Ion Industrial, Technology and Financial Capability Assessment (ITCA) of foreign and domestic suppliers. ITCA will include Technology Readiness Level (TRL) review of Li-Ion Battery Space application including time and cost associated with reaching TRL 6. International Traffic Arms Regulations (ITAR) will be addressed regarding emerging Li-Ion chemistry with foreign dependence, as well as current and planned Li-Ion R&D effort underway and potential for DoD application.

Beryllium Industrial Base Analysis (August 2007)

This report, completed by Air Force Research Laboratory (Defense Production Act Title III Program), consolidates information on current efforts to re-capitalize the domestic production base for beryllium. The report also evaluates current and planned demand in terms of military applications. Beryllium is an essential material for numerous defense systems and national security applications, including airborne and space precision electro-optical components and mechanical structures. The dimensional stability, stiffness-to-weight and other unique characteristics provide performance capabilities that currently cannot be obtained from other materials. The sole domestic beryllium production facility was closed in October 2000 for environmental and economic reasons, which left the National Defense Stockpile (NDS) as the only source of high-purity beryllium suitable for defense requirements. Efforts to developed suitable substitutes for beryllium have not been as successful as earlier predicted. As a result, a 2004 DoD report submitted to Congress recommended working with industry to re-establish a modern production capability.

Brush Wellman International (BWI) is the sole domestic manufacturer of beryllium. BWI is the only fully-integrated producer of beryllium, beryllium-containing alloys, and beryllia ceramic in the world. BWI is financially healthy and rated a low risk after having produced strong financial results over the last three years. The current NDS inventory of high purity beryllium will be exhausted by 2012 at current depletion rates. The only other source of beryllium is in Kazakhstan, which cannot provide the quality of material required for most DoD/DoE applications.

In November, 2005, preliminary engineering design for a new primary beryllium facility was initiated. Based on cost estimates developed during this effort, the Department of Defense programmed over $40M through FY10 to fund a Defense Production Act Title III project to re-establish domestic production of beryllium. The DoD funding for the new facility is supplemented by an industry cost share. Revised cost estimates that include site selection, environmental assessment, and an initial engineering design have increased by 40 percent. This increase can be attributed to higher construction material and energy costs. Final engineering design activities are scheduled to be completed in July 2008. The Department and industry are currently working to manage cost growth and identify additional funding. Current demand forecasts for beryllium show the requirement for the new production capacity is still valid.

This assessment supports investment planning within the Air Force and broader DoD research and development communities. Specifically, the study validated original justification for both the scope and costs associated with the development of a domestic capability for beryllium. The report provides market research, technical information, and recommendations for investment and acquisition decisions to address the needs of DoD customers.

Defense Industrial Base Assessment: U.S. Space Industry (August 2007)

This study, completed by SAF/US – National Security Space Office, assesses the health, competitiveness, and ability of the domestic industrial base to support national security space requirements. The study's goals were to evaluate the industrial, economic, and financial factors affecting the U.S. Space Industrial Base, and determine if U.S. export controls and licensing practices are impacting space prime contractors and second and third tier subcontractors. The Air Force led team was supported by the Department of Commerce (DOC), Bureau of Industry and Security (BIS). BIS developed, deployed, and verified data collection from a survey of over 300 space industry companies.

Total global and U.S. space sales increased 40 percent over the 2003-2006 period surveyed. Most of this increase occurred in the space services segment. Defense funding, domestic non-defense services and ground equipment dominate U.S. space industry sales. Over 70 percent of the companies surveyed are financially healthy. Two areas, commercial space services and launch systems materials, had the highest number of companies experiencing financial difficulties. Aggregate Research and Development (R&D) expenditures grew an average of eight percent per year since 2003, with the highest expenditures per sales in the lower tiers. The space related workforce has grown 22 percent over the last four years.

Export sales represent less than 10 percent of total U.S. space company revenues annually. Since 1999, the U.S. share of the global market for satellite manufacturing has decreased by nearly 20 percent. Segments of the U.S. space industry feel threatened competitively and see current export control policies as undermining their ability to compete for sales in foreign markets. Although less than one percent of ITAR license applications were denied from 2003–2006, the reported loss of foreign sales due to ITAR was $2.35B. Compliance costs grew 37 percent during the survey period with the burden of compliance significantly higher for firms in the lower tiers.

The U.S. space industry is healthy and very competitive domestically for both defense and commercial products and services; however, the global space market has changed significantly since 1999 when the U.S. Government made major modifications to its overall export control regulations for space-related products and services. The U.S. space industry now faces growing competition, primarily from European firms. Almost 60 percent of surveyed companies recommended actions to more frequently update U.S. export control lists to accurately reflect the global technology and the competitive environment. Industry also recommended that export control processes and staffing at the relevant agencies should be reviewed and adjusted to ensure that personnel/funding levels align with the number of applications processed. Moreover, restrictions regarding sales to U.S. allies should be periodically examined to reflect national security and economic considerations.

The assessment provided quantitative analysis for a set of recommendations prepared by the National Security Space Office for action within the Department of Defense and for recommended action by those Departments and Congress responsible for execution and oversight of export control processes. The report is available at www.acq.osd.mil/ott/natibo.

Production Capability and Capacity Assessment for Joint Tactical Radio System Single Channel Handheld Radios (September 2007)

The Industrial Analysis Center (IAC) was asked by the Air Force (AF), Joint Tactical Radio System (JTRS), Airborne Network Management Office (653 ELSG/KNJ) to perform a production capability and capacity assessment for Software-Defined handheld Radios (SDRs) and ancillary equipment. The radios studied are the AN/PRC-152(C) single channel, multiband Falcon® III Handheld Radio and the AN/PRC-148 JEM (JTRS Enhanced Multiband Inter/Intra Team Radio (MBITR)). Ancillary equipment includes the base station, vehicle adaptor, vehicle adaptor amplifier, repeater system, and tactical repeater. There are currently two contractors involved in the production of SDRs. Data on capacity, capabilities, and production rates of each manufacturer was collected via an industry survey and followed by site visits at both contractors' plants.

Based on an analysis of the data provided and the site visits, both companies can be assessed as an overall low risk. Both companies have demonstrated that they have the necessary means, in terms of manufacturing process capability, capacity, personnel resources, process controls, business support systems, and reliable supply chain and quality systems, with which to produce SDRs. Both contractors have enough open capacity to accommodate a large increase in production and both can increase production in the short-term by adding just labor. Significant increases in production for both companies, up to a maximum production rate, would require additional investment. The sole source supplier for both companies is also the maker of the encrypted chip. Both companies do not have an alternate source for this item.

The AN/PRC-152 recently became certified as compliant without waivers with the JTRS Software Communications Architecture (SCA) while the AN/PRC-148 JEM is certified for the JTRS SCA with waivers. The JEM was developed under a formal government program of record and, therefore, has gone through U.S. Government testing, evaluation, and certification. The AN/PRC-152 was designed, developed, and produced to military standards as a company internally funded product.

Annual 2007 Air Force Industrial Base Assessment (December 2007)

This report, provided by SAF/AQR, provides an assessment of trends and issues affecting the Air Force industrial base. It summarizes the findings of numerous Air Force, Department of Defense, and industry studies and highlights industrial base

issues that pose a risk to the Air Force's ability to acquire the systems and materials needed to carry out its mission.

The aerospace industry is categorized into four sectors consisting of relatively unique supply chains that support Air Force materiel requirements:

The ***Aircraft*** sector consists of an extensive network of suppliers, teaming relationships, and partnerships that are heavily integrated with the global commercial aircraft market. The overall outlook for the industry is positive primarily due to increased commercial aircraft orders and increases in U.S. defense spending. Challenges include foreign competition, foreign outsourcing, changing defense requirements and missions, declining research and development, an aging workforce, and infrastructure consolidation/modernization. Over the next 10 years multiple military aircraft production lines will go cold precipitating the need for a new round of consolidation in order to reduce infrastructure costs. Many of the issues faced by the military aircraft sector involve budgetary and re-capitalization trade-offs. Examples of these trade-offs include: continuing C-17 production or upgrading the C-5 fleet; maintaining two development teams for fighter engines; competing domestic and foreign aircraft designs; and determining the mix of manned versus unmanned systems. Other issues impacting this sector are the increased costs of strategic metals and energy due to increased global demand which translate directly to budget increases for both aircraft procurement and operations.

The ***Command, Control, Intelligence, Surveillance and Reconnaissance (C2ISR)*** sector is healthy, with an annual growth rate of about 9 percent. The domestic military industrial base heavily leverages commercial electronics/telecommunications design and production capabilities to support military C2ISR requirements. Sensor technologies continue to improve and industry growth is sustained across a range of applications including military and civilian space imaging, law enforcement/border surveillance, weapons targeting, and safety/environmental monitoring. One issue that cuts across the entire aerospace industry is the off-shore migration of the commercial semiconductor industry. Domestic share of the global market has declined significantly, and it is difficult to economically maintain state-of-the-art production facilities for secure integrated circuits that serve the Department of Defense exclusively. There is also a concern that as foreign design capabilities improve they will challenge U.S. technology leadership. Most of the capability to manufacture commodity items such as semiconductor packages, substrates, and flat panel display glass has moved off-shore. The number of sole source suppliers for military unique items such as radar components and traveling wave tubes (TWTs) has increased.

The ***Space*** sector consists of both manufacturing and launch/ground services segments. Both worldwide space revenues and U.S. government expenditures on space are forecast to grow significantly between 2007 and 2013. Commercial growth is occurring primarily in commercial space services while DoD budget increases are funding the replacement of aging satellite constellations performing a number of key missions (e.g., communications, navigation, surveillance & tracking). U.S. government

purchases of both payload and launch systems make up 80 percent of domestic manufacturing sales. While the prime contractors are generally healthy, lower tier suppliers are struggling due to insufficient demand, qualification requirements that limit the adoption of new technologies, aggressive foreign competition, or other factors. Insufficient demand has already resulted in single domestic sources of supply for a number of key components and materials. U.S. manufacturers in the space sector note that increased foreign competition combined with restrictive U.S. export control policies has limited their ability to expand sales to foreign customers. Of primary concern are at-risk sources for developing next-generation space qualified solar arrays, casting large solid rocket motors (and processing of energetic materials used in production), intercontinental ballistic missile (ICBM) guidance and reentry components, and maintaining state-of-the-art radiation hardened electronics fabrication facilities.

The ***Weapons – Air Launched Munitions*** sector is healthy, though strained by short-term demands on existing capacity to supply current military operations. Long-term projections show relatively flat DoD budgets. Consolidation is expected to continue in lower tiers as joint programs offer limited opportunities for the development of multiple vendors. Increased dependency on sole sources and foreign suppliers could cause bottlenecks affecting multiple production lines. New technologies (e.g., LADAR, GPS, hypersonic) while improving operational capabilities will continue to increase missile complexity and make it more difficult to accelerate production for surges in demand. Although current sole source manufacturers are financially healthy, development of alternate sources for solid rocket motor materials, thermal batteries, and fuzes is being investigated and in some cases implemented by DoD.

The ***Weapons – Directed Energy*** sector includes high energy lasers (HEL) and high power microwaves (HPM). There are currently no formal procurement programs in the Defense Budget, but there are three advanced technology efforts: the Airborne Laser, the Advanced Tactical Laser, and the Active Denial System. The emerging industrial base for directed energy weapons combines traditional defense firms, small high-technology start-ups, government laboratories, and universities. Large defense prime contractors, by engaging in the major technology development projects, are positioning themselves to compete for anticipated systems design and integration contracts. Production and deployment of HEL and HPM systems depend on significant technological advancements in several areas, including optics and optical coatings, materials, laser components (pumps, diodes), and power sources. All of these technologies need to be scaled up to handle high power and thermal management requirements. The HEL/HPM market is expected to grow significantly in the next 10 to 15 years as the technology matures, system characteristics are identified, and operational doctrine is developed.

An understanding of the underlying factors involved in industrial base risks affecting current procurement activities is necessary to enable solutions that provide for more than a short term remedy. The issues identified in the report fell primarily into two categories. The first category consists of those issues known to represent a risk to existing materiel requirements. In many cases, steps to mitigate the risks have already

been taken and a periodic review of progress is required. The second category is those issues that don't require immediate action, but do need to be understood and monitored. The level of risk tends to depend on future requirements that have yet to be defined.

This assessment supports multiple activities across the Air Force including investment planning within AFRL, acquisition strategy planning at AFMC Product Centers and policy development.

4.5 Defense Contract Management Agency (DCMA)

Mine Resistant Ambush Protected (MRAP) Vehicle Industrial Capability Assessment (April 2007)

The Deputy Under Secretary of Defense for Industrial Policy (DUSD-IP) requested the Defense Contract Management Agency's Industrial Analysis Center (DCMA-IAC) to perform an Industry Capability Assessment (ICA) on the US Marine Corps acquisition of approximately over 8,000 Mine Resistant Ambush Protected (MRAP) Vehicles. The purpose of the MRAP Vehicle ICA was to analyze the capacity and capability of nine potential Prime Contractors and approximately thirty critical subcontractors.

The ICA identified choke points and issues such as Prime Contractors ability to ramp-up production to produce over 900 vehicles in December 2007. The choke points included production capacity for tires, quenched and tempered armor steel plate, axles, and acquisition of bearings for transfer cases.

The results of the study were briefed to the Deputy Under Secretary of Defense for Industrial Policy and other OSD, USMC, ASN, USA and Joint Staff principals on April 30, 2007 at the Pentagon. On July 9, 2007, study results and updates were briefed to the Director, DCMA Ground Systems and Munitions Division and the Director, Tactical Wheeled Vehicles Chicago, and on July 10, 2007 were briefed at the DCMA Ground Systems and Munitions Division MRAP Vehicle Conference in Chicago, IL.

Helicopter Industry Manpower Skills Survey (May 2007)

DUSD-IP requested IAC to provide information concerning helicopter industry manpower skills focusing on the critical skills of engineering, program management and production, as well as the contractor plans and capability to meet future program needs. The survey was conducted in an unobtrusive manner for the contractor and utilized information available within DCMA. Overall, the information DCMA contracting professional's resident at Prime Integrator facilities concluded that engineering, program management and production skill sets are considered sufficient to support the

manpower requirements for DoD Helicopter Programs. Additionally, all companies have systems in place to project and meet manpower requirements.

Iraq Foreign Military Sales (FMS) Commodities Production Capability and Capacity Assessment (August 2007)

The Office of the Deputy Under Secretary of Defense for Industrial Policy (DUSD-IP) requested DCMA to conduct a concise assessment of 24 contractors and their commodities, and obtain industrial base information required to support a Task Force chartered by the Deputy Secretary of Defense to significantly improve the delivery of Iraqi Foreign Military Sales (FMS) equipment, material, and services. The purpose of the tasking was to determine if the defense contractors were giving the same priority to Iraqi FMS contracts as they were to US military contracts.

The Defense contractors assessed have no production bottlenecks from contract award to production delivery; there are no competing DoD requirements and their capabilities are sufficient to meet Iraqi FMS requirements. The Iraqi FMS contracts were treated the same as US military contracts. The information gathered was used by the Commodities Working Group of the Task Force to establish that the DoD industrial base is not the problem in acquiring and delivering material and services to the Iraqi government.

Mine Resistant Ambush Protected (MRAP) Vehicle Industrial Capability Assessment Update (September 2007)

The Deputy Under Secretary of Defense for Industrial Policy (DUSD-IP) requested on July 26, 2007 that IAC update the April 30, 2007 Mine Resistant Ambush Protected (MRAP) Vehicle Industrial Capability Assessment (ICA) and determine the production capabilities and capacities of the prime contractors and their key subcontractors.

The tasking was an outcome of Congressional testimony on the MRAP Vehicle program which cited DCMA's conclusion regarding industry's capacity to produce MRAP Vehicles. Areas assessed in the study included changes in prime contractor and key subcontractor production, manufacturing and integration capabilities and capacity, supplier impacts, updated information regarding the vendor base and possible new sources of supply, comparison of current progress against MRAP Vehicle goals and industry capacity to accelerate in support of the acquisition strategy, identification of barriers to on-time delivery of vehicles, and any other issues of particular relevance. The population included five Prime Contractors and approximately sixty-eight critical subcontractors.

The Updated Industrial Capability Assessment (ICA) was completed September 10, 2007. Summary level findings included that prime contractors and select critical

subcontractors were increasing their capabilities and acquiring increased capacity at an accelerated rate as compared with the April 2007 MRAP Vehicle ICA findings; however no single prime contractor could deliver 1,200-1,300 MRAP Vehicles during the month of December 2007. The study estimated that the December 2007 vehicle delivery range would be a likely 989 to an optimal 1,308 vehicles. New or existing MRAP vehicle production choke points identified included domestic quenched and tempered armor steel plate production capacity for all DoD programs, and the capacity and capability to support the MRAP program for tires, automotive assembly and chassis integration, capsules, and final vehicle assembly.

Additionally, the DUSD-IP tasking memorandum requested, in collaboration with the MRAP Vehicle Joint Program Office (JPO), that IAC provide monthly End-Of-Month (EOM) Key Subcontractor production information. IAC is working closely with DCMA Ground Systems and Munitions Division to continuously monitor select MRAP vehicle critical subcontractors' ability to support MRAP Vehicle production rates. The EOM production data is required during the first week of the following month until further notice. The EOM production data and analysis is delivered to DUSD-IP and MRAP Vehicle JPO PM, and DCMA Ground Systems and Munitions Division.

IAC briefed the results of the updated MRAP Vehicle Program Industrial Capability Assessment (ICA) to the Deputy Under Secretary of Defense for Industrial Policy (DUSD-IP) and other OSD, USMC, ASN, USA and Joint Staff principals.

Unmanned Ground Vehicle's (UGV's) (September 2007)

DCMA IAC was requested by Office of the Under Secretary of Defense (OUSD), Acquisition Technology & Logistics (AT&L), Land Warfare & Munitions (LW&M), Enterprise Director for Joint Ground Robotics to perform an Industrial Capability Assessment for various Unmanned Ground Vehicle (UGV)/Robotics programs. This analysis was used to assist the Enterprise Director for Joint Ground Robotics to acquire a better understanding of the short and long-term ability for contractors to support DoD UGV/Robotics production.

The study concluded that a limited number of the contractor's assessed have capacity utilization levels that could support minor additional workloads at this time and indications are that this capacity will be available to support future UGV workloads. All eighteen of the contractors assessed were rated either a Low or Moderate Industrial/Technology Risk. It must be noted that a large number of the contractors assessed subcontract most, if not all, of their work while they act as systems integrators or in an R&D capacity. This industry also utilizes nearly 100 percent Commercial-Off-The-Shelf (COTS) technology. The analysis also identified two high financial risk contractors that will continue to be monitored.

Aircraft Fuel Bladder Industrial Capabilities Assessment (December 2007)

The purpose of the study was to perform an Industrial Capability Assessment of the Aircraft Fuel Bladder Industry. Recent events within the industry are causing concerns in regards to meeting short and long-term requirements affecting a number of DoD aircraft programs. The objective of the study was to provide information, analysis, conclusions and recommendations that will support the acquisition strategy for fuel bladder cells.

Research concludes that there are two domestic providers of fixed wing and helicopter aircraft fuel bladders. Production in this industry is labor intensive utilizing minimal to no automation. Facilities, although upgraded, are antiquated and located in remote areas. It is a niche market with DoD and its weapon system prime integrators/manufacturers as primary customers. Fuel bladder manufacturing is not a lucrative business as it lacks incentives for return on capital investment. There is limited commercial application or demand for fuel bladders on commercial aircraft. Fuel bladders for DoD must be produced domestically or a waiver to the Berry Amendment is necessary in order to procure the fuel bladders overseas. The assessment concluded that both manufacturers possess the capability and capacity to support requirements and intend to remain in business within the US to support DoD short-term and long-term requirements.

It is recommended that the industry be closely monitored and that an Industrial Capability Assessment be performed in 2009 to ascertain changes to the state of the industry.

Software Industrial Capability Assessment (December 2007)

The Office of the Deputy Under Secretary of Defense for Industrial Policy tasked DCMA to define and assess contractor workforce software development capabilities for defense applications. The tasking was in support of the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD (AT&L)) Strategic Goal Implementation Plan to support national and defense objectives. The objective of Goal 5 of this plan is to ensure that reliable and cost-effective industrial capabilities are sufficient to meet strategic DoD objectives.

Twelve contractor sites supporting software requirements for Command, Control, Communication, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) programs were identified. IAC surveyed their software development workforce to determine experience and educational levels, as well as company processes and procedures in the development of software. The information and analysis was compiled to address concerns regarding industry’s software capability to program embedded software and legacy systems. IAC's role in the assessment was to research, compile, and interpret information, while working closely with DUSD-IP staff to determine any program risks requiring development of acquisition strategies/policies.

4.6 Defense Logistics Agency (DLA)

Lead-Acid Batteries Industrial Base Analysis (September 2007)

DLA funded a Warstopper Lean Manufacturing improvement project at Enersys Energy Products, Inc., a sole-source maintenance-free lead-acid battery producer. The value stream analysis compared the current state production capacity with the projected contingency planning requirements for the "Armasafe" battery, which is 8,000 batteries per month. Under a worst-case scenario, demand for a similar traditional "vented" battery could also transition to the Armasafe battery, driving total demand to 20,000 batteries per month.

Based on the analysis, there is adequate capacity to meet the current 8,000 batteries per month planning level. Industry could also handle the 20,000 batteries per month demand scenario for a limited period (approximately three months), if operations were conducted on a 24-hour, seven days a week, fourteen (12-hour) shifts per week schedule. For sustained production beyond three months, production would have to be limited to five days per week. The five-day schedule would, however, require several improvements to the process flow to meet the 20,000 battery production level.

Enersys, assisted by the DLA-sponsored support contractor (TechSolve), initiated a Lean Process improvement effort to address the limitations identified for the five day per week schedule. This joint effort with the supplier enabled the identification of 13 corrective actions. These were then prioritized into two categories, items that could be addressed immediately and items that could be addressed as actual production demand materialized. The immediate task items focused on reducing changeover times and synchronizing battery production to smooth out flow. Because of these joint efforts, the contractor is now in a significantly improved posture to respond to our contingency requirements.

Cesium Lamp Cartridge (October 2007)

DLA completed a Minimum Sustaining Rate (MSR) Study in January 2007 for the cesium lamp cartridge, a sole-source item produced by BAE Systems in Ontario, California. This item is a vital component in infrared counter measure systems used on aircraft such as the KC-130, P-3, and helicopters including the HH-53, H-46, and CH-53. A Warstopper Program investment in sub-component kits remains in place at BAE's facility and effectively reduces the lead-time for the end item from 330 days to 30 days. Current stock levels exceed stockage objectives and the safety level required by recent demand history. Minimum sustaining rate measures to support the manufacturer were proposed as an option during the MSR Study due to a significant downturn in delivery orders at the beginning of FY08. A lean manufacturing initiative was also considered; however, it has been deferred at this time. In September 2007, management of this item was transferred to Defense Supply Center Richmond. The industrial capability

team continues to discuss options available for better controlling DLA stock levels in conjunction with developing a long-term procurement plan which maintains the industrial base.

Defense Wall, Rapid (Bastions) (October 2007)

DLA invoked the surge provision in its long-term contract for bastions to meet spikes in demand for these critical force protection items. Execution of the surge clause released pre-positioned raw materials (geo-textile material and steel components put in place by a FY06 Warstopper investment) to help reduce the lead-time for finished units needed to support sudden, unanticipated surges in demand.

The Services' demand for these sole-sourced items during the third and fourth quarter of FY07 far outstripped previous wartime usage estimates in both volume and breadth of product type. Increases in troop levels for Operation Iraqi Freedom (OIF) and changes in operating procedures (increased use of Forward Operating Bases) led to a surge in orders from the Army that totaled over $329M for the last six months of FY07. Due to the significant increase in wartime demand, the industrial capabilities team is considering an update to the 2005 industrial base study for the second quarter of FY08. The study timeline will help to enable the award of a new contract which should reduce backorders that were a result of the recent surges in demand in support of Operation Enduring Freedom (OEF)/OIF operations.

Industrial Base Extension Follow-on (October 2007)

The Industrial Base Extension (IBex) Program provides Outside the Continental United States (OCONUS) and Continental United States (CONUS) relevant data concerning inventory and global logistics capability to support U.S. military operations and natural disaster relief. DLA has formed strategic partnerships with industry experts that allow government planners to rely on the expertise of the commercial sector. These strategic supplier relationships transcend purchasing transactions and enhance DLA's ability to make improvements in the sharing of information. Capability reports and information gathered is also used to develop sourcing strategy solutions that include contingency plans to assure warfighter surge and sustainment support.

Following completion of the Virtual Wartime Visibility (VWV) contract, requirements and responsibilities for CONUS planning and data availability have been incorporated into the IBex program. A mutually beneficial arrangement with the SYSCO Corporation has been established under IBex to provide commercial asset data availability for inventory, supply, and logistics available in the United States. .

The IBex program is a mutually beneficial arrangement with multiple global logistics providers to develop an overlapping global network of information on inventory, manufacturing, logistics, storage, and transportation. For the expenditure of $200K per

year, the Government gains access and a better understanding of the global logistics networks and issues related to cultures, customs requirements/documentation, host nation knowledge, global constraints, and logistical nuances unique to any country or culture in areas of the world with limited U.S. resources. IBex includes Subsistence OCONUS Prime Vendors, other global logistics providers, and one major CONUS Subsistence Prime Vendor. IBex improves DLA's readiness posture by having private businesses provide the technical expertise and fundamental understanding of remote geographic locations to identify global supply chain issues and solutions prior to the onset of an emergency situation. IBex provides a flexible, efficient, and commercial approach to support the Combatant Commanders, the Defense Supply Center Philadelphia (DSCP)-Europe and DSCP-Pacific planning mission, U.S. Military Planners, and other government agency planners. It identifies new and innovative concepts and solutions to logistical problems. Information obtained through the IBex program in FY07 has supported the following: (1) OCONUS Steel Production for the Department of Defense; (2) lighting industry research/sourcing for Construction & Equipment commodities; (3) additional cold storage containers for U.S. Special Operations Command (USSOCOM); and (4) living containers for the Kandahar AFG Project and USSOCOM. In-depth geographic capability assessments were provided on Qatar, Ecuador, Belize, Indonesia, and Java in support of USSOCOM and the May 2007 Republic of China (ROC) Drill Exercise. The IBex program is also capable of supporting disaster relief efforts and continues to support the Services' ability to accomplish its mission in Southwest Asia and the Global War on Terror.

Joint Services Lightweight Integrated Suit Technology (JSLIST) Ensemble (October 2007)

Demand for JSLIST chemical protective suits significantly decreased in FY07, which resulted in a decline in industrial base capability. While FY06 production was sustained at 128,000 suits per month, reduced demands and increasing inventory levels resulted in a gradual monthly production decrease to 50,000 during 2007.

Because even the decreased production rates continued to exceed customer requirements, DLA requested Warstopper funding in August 2007 for a Minimum Sustaining Rate (MSR) Production initiative on JSLIST to maintain the industrial base. MSR Delivery Orders totaling $9.9M were issued in September 2007 to sustain three JSLIST manufacturers. Evaluation of a long-term solution is ongoing and may include additional MSR efforts and industrial base maintenance contracts. It may also include Warstopper funding for fixed costs or for staging long lead-time items for increased surge production.

In July 2007, the Joint Program Executive Office for Chemical and Biological Defense requested that the JSLIST be introduced in a new universal camouflage pattern. The full effect of this change within the industrial base is not clear, but future acquisition strategies will continue to include industrial base considerations for this critical go-to-war item.

Lithium Batteries BA-5390/5590 Industrial Base Improvement Program (October 2007)

During FY07, DLA's three lithium battery manufacturers (Saft, UltraLife, and Eagle Picher) completed their Warstopper-funded plant upgrades to enable capacity and ramp-up improvements. DLA also initiated a Value Stream Analysis (VSA) review, to validate/document the gains achieved through these investments.

The initial results of the VSA analysis showed that all three contractors were able to meet or exceed the targeted capacity goals. However, these improvements could not be fully leveraged because of other changes that adversely impacted the industry. Currently, the industrial base is no longer considered to be in a "warm" status (as battery demands have been dropping significantly below our initial projections). Consequently, ramp-up times for all three vendors could be up to three or four months greater than originally anticipated. The excessive ramp-up time poses significant risk to ground operations during major combat operations and to SOF operations as most of the Department's manpack tactical radios operate using these batteries.

As the analysis is being completed, the goal will be to work with industry to develop corrective actions to recover the responsiveness gained through the initial Warstopper investment

Meals Ready-to-Eat (October 2007)

Significant requirement support for the Meals Ready-to-Eat (MRE) combat ration program continued to be accomplished for operations in Southwest Asia. Although there was a mild hurricane season, the current commercial industrial base remains more than capable of handling surge requirements from military customers and from the Federal Emergency Management Agency should the need arise.

The approved five million case War Reserve level of MREs has been reached and maintained. However, future peacetime rotation and increased handling charges are still a concern. A possible solution to rotation issues for the increased war reserve levels of operational rations is the interest by other state and local agencies. In the past, these agencies have approached DLA for support, but are currently not authorized to purchase operational rations from DLA.

Nerve Agent Antidote Autoinjectors (October 2007)

Nerve Agent Antidote Autoinjectors (NAAA) are military-unique items designed for rapid self-administration through clothing upon exposure to a nerve agent. NAAA

are essential for modern warfare against states possessing weapons of mass destruction. Quantities of NAAA required to meet mobilization requirements greatly exceed peacetime needs. DLA has an industrial base maintenance contract (IBMC) with MMT to retain a capability to satisfy the Services' wartime surge and sustainment shortfalls.

The IBMC pays MMT to maintain a warm base capable of increasing, overnight, production capacity to satisfy the Services' wartime requirements for NAAA. Normal peacetime production is 200,000 autoinjectors per month or 946,000 in 142 days. Wartime support requires five million autoinjectors in the same five-month period. The NAAA IBMC investment for FY07 was $10.5M. With this investment, MMT maintains excess plant capacity and rotates components for autoinjectors that DSCP purchased and stored at MMT for use in contingencies. An industrial base assessment study of the IBMC was conducted during 2007. It was entitled *Validation of Warstopper Investment: NAAA Industrial Base.* The study concluded the IBMC is vital and should be funded.

Nomex® Supply Chain (October 2007)

Nomex® is the registered brand name of a flame retardant aramid fiber. Material made from this fiber, a sole source product from DuPont, is heat and flame resistant, and provides significant protection from fire. Nomex® material is required for several military clothing items including coveralls, gloves, and jackets. These items were traditionally worn by the aviation and combat vehicle communities. Due to increasing threats from improvised explosive devices (IEDs) and burn casualties, Army Division Commanders in Iraq requested Nomex® items for all wheeled tactical vehicle operators in theater. This request caused an initial surge of requirements in September 2006 followed by an additional large requirement in March 2007.

The typical production lead-time for end items with Nomex® material is six months to include the production of fiber, spinning the fiber into yarn, weaving the yarn into fabric, finishing the fabric, and producing the end item. With this extreme increase in OEF/OIF demand for Nomex® items, lead-times became longer as constraints developed within the supply chain. An industrial base analysis was initiated in February 2007 for the Nomex® supply chain in order to determine the constraining factors in the production stream and to evaluate the use of strategic buffers to shorten the overall production lead-time. To date, meetings and site visits have been held with vendors, and the resulting supply chain data is being analyzed. Recommendations from the analysis will likely include making investments through the Warstopper Program to support improved vendor ramp-up. The analysis is also expected to recommend confirming surge and sustainment requirements from the Services since these items are having a high wartime demand but little or no War Reserve Materiel (WRM) submissions.

Nuclear Biological Chemical Defense Program (October 2007)

The Industrial Base Maintenance Contract (IBMC) satisfies only 61 percent of the total requirement. Two initiatives with Warstopper funds provide additional capability to ensure the Services are able to obtain 100 percent of the total autoinjector requirement:

First, the Nerve Agent Antidote Autoinjectors (NAAA) Service Life Extension Program (SLEP) provides funding for management and remarking of the Services' NAAA stored at Meridian Medical Technologies (MMT) that are at or beyond their initial expiration date, yet remain potent. All autoinjectors in SLEP can be reallocated by DSCP to satisfy Service surge requirements. The NAAA SLEP investment for FY 07 was $1.3M.

Second, the NAAA Readiness Enhancement Program (REP) initiative provides funding to recruit, test, hire, train, and retain a pool of 25 personnel to staff on 24-hour notice the second shift at the MMT production facility in St. Louis, Missouri. The second shift is needed to quickly increase production to support contingencies. The NAAA REP investment for FY07 was $105,000.

Petroleum, Oil, and Lubricants (October 2007)

DLA's Defense Energy Support Center (DESC) continues to support the Department of Defense and commercial satellite industry with uninterrupted delivery of the two liquid propellants critical to the U.S. space program, hydrazine, and dinitrogen tetroxide (N2O4.) Both products have a limited domestic industrial base. During FY07, DESC awarded the long-term follow-on contract for N2O4 utilizing the authority for less than full and open competitive procedures at 10 U.S.C 2304(c) (3), Industrial Mobilization. Since missile fuels have been determined necessary and appropriate for priorities and allocations in support of the national defense under the Defense Priorities and Allocations System (DPAS), DESC considered it essential to restrict the award of the contract to a domestic source. In addition, the extremely hazardous nature of the product does not allow shipment by air from an overseas production facility, thereby precluding emergency shipments to DESC's customers. Lastly, if DESC's production source for N2O4 were located in a foreign country, it may be subject to terrorist activity or hostile action. Should that happen, the Government's only source for N2O4 would bring the Air Force satellite programs, the NASA Space Shuttle Program, and the commercial space launch industry to a standstill. As with the hydrazine contract awarded in FY05, the recently awarded long-term N2O4 contract utilizes a pricing structure that guarantees reimbursement to the contractor for all fixed costs at the production facility. Variable costs are then reimbursed via the unit price of product as orders are placed under the contract. DESC's contract award was based on a sole offer from the incumbent N2O4 supplier whose pricing was considered to be fair and reasonable.

DESC surveyed companies in September 2007 to determine whether potential domestic sources of synthetic fuel (synfuel) meeting the Fischer-Tropsch (FT) specification would require long-term contracts and what specific terms and conditions would be included in those contracts. Nine companies responded, and all indicated that a ten to thirty-year long-term contract would be required. Current law only allows for a five-year contract with options for five additional years. Eight of the nine respondents said they would enter into a five-year contract with conditions addressing higher prices, and one respondent rejected a five-year contract. In addition, all nine said that they are capable of blending up to 50 percent FT synfuel with conventional fuel. Eight of the nine respondents indicated they are capable of providing blended FT synfuel with additives. Based on industry responses, these longer-term contracts will provide the Government with more favorable terms and enable more companies to enter this market who would not otherwise do so without long-term arrangements.

The combined Air Force/NASA projected synfuel requirements for FY08 are 335,000 gallons (with no additives) and one million gallons (Air Force only) for both FY09 and FY10. The Navy does not anticipate synfuel requirements before 2010. For FY08, the Army anticipates 16,000 gallons of a 50:50 blend of FT synfuel and JP8 followed by 21,800 gallons of the 50:50 blend for FY09, and 110,000 gallons for FY10.

Pharmaceutical, Medical/Surgical, and Medical Equipment (October 2007)

Defense Supply Center Philadelphia (DSCP) currently has contracts in place that guarantee immediate availability of up to $358M in medical materiel for surge and sustainment. This coverage increases to a total of $627.5M, over a six-month period, if all ‘refresh’ options are exercised.

The basis for medical contingency contracts is the Medical Contingency File (MCF) database that consolidates and aggregates the Services’ time-phased wartime requirements. Once the requirements are known, DSCP works to obtain contract coverage for contingency materiel to meet the response times and levels defined by the Services. The commercial coverage of $627.5M represents the amount of the total requirement identified in the most recent MCF update that is owned or under contract by DSCP for the specific purpose of initial outfitting or re-supply upon deployment.

Rapid Assembly Program Follow-on (October 2007)

The Rapid Assembly Program (RAP) allows for increased surge capability for Unitized Group Rations (UGRs). It features flexible unitization capability via self-contained mobile production line assembly modules capable of being deployed to government depots, commercial ration assemblers, or through the subsistence Prime Vendors program. Their use will significantly shorten lead times of finished UGRs to theater by obviating the need to assemble and transport completed rations from the United States. The implementation of this program will also free up critical

transportation assets. The two additional assembly modules purchased during FY06 are being specially configured for OCONUS use, and will include voltage converters and air compressors.

Tents and Shelter Systems (October 2007)

DLA completed a Minimum Sustaining Rate (MSR) Study in May 2007 that defined the funding levels needed for an industrial base measure for current military-specific tent & shelter manufacturers. Initial awards of MSR contracts totaling $23.5M, including both directed and competitive contracts, were completed in September 2007.

Additional research of industrial base investments through the Warstopper Program to improve vendor ramp-up to maximum capacity is being conducted in conjunction with the MSR contract awards.

The Tent Network for Technology Implementation (TENTNET) program was initiated to explore ways to improve surge capabilities for military tent requirements through the collaboration of DLA/DSCP, industry, government, and academia to ensure the availability of tentage and shelters. Through this collaboration, the supply chain will be enhanced by improving surge capability, reducing production lead-times, and improving supply availability while providing tents and shelters with equal or improved quality and cost.

The following short-term TENTNET projects either have been funded or are being pursued:

- University of Tennessee - Supply Chain Audit
- Johnson Outdoors - Standardizing many similar smaller components (such as windows) to achieve greater commonality, reduce costs and inventories, and improve surge capacity.
- FTL Ventures Studio STP - Tent Packing and Shipping Optimization
- AC Industries – Base Camp transition to DoD EMALL.

DLA provided the Services with peak wartime demand data and has received formal validation of S&S requirements from both the Army and the USMC. DLA is awaiting an official validation response from the Air Force. An Issue Paper has been submitted in the Program Budget Review (PBR) FY08 requesting $44.4M from the Army to cover the FY09 to FY13 period. Additional PBR actions will be completed based on the current USMC response and the pending Air Force response.

Tray Pack Ration Readiness (October 2007)

Tray pack rations are a member of the family of DoD field combat rations. They are used to sustain groups of military personnel in highly mobile field situations. The component items are thermally processed, shelf-stable foods packaged in hermetically sealed, steam table-sized poly tray containers. DoD contingency requirements for tray pack rations have greatly exceeded peacetime requirements in the past. Current issues include:

- A food industry that has moved to polymeric trays commercially for shelf-stable food service items. The Services have also transitioned from metal tray cans to the polymeric tray for their peacetime requirements. This is in concert with developing new technologies for reducing costs and moving toward commercial applications.

- The identification and aggressive pursuit of using three-kilogram retort pouches for pumpable items in lieu of fill-and-seal trays to further ensure the industry's capability to meet both the peacetime and wartime demands. These pouches were seen with the rollout of the FY07 menus for the Unitized Group Rations (UGRs).

Termination of funding for storage of metal trays was accomplished during FY06 and FY07.

Unitized Group Ration – Express (October 2007)

Late in FY07, a compact, self-contained module that provides a complete hot meal for 18 warfighters was introduced. Called the Unitized Group Ration – Express (UGR-E), it uses a simple pull-tab to heat food in just 30-45 minutes and is served in trays like a cook-prepared meal.

To ramp-up production, subsistence industrial specialists spent approximately six to eight weeks to gather data, visit, and evaluate 22 vendors that would be used to provide components for this ration. As data on the components was gathered, some shortfalls were identified and immediate action was taken to find solutions.

New requirements for this ration have tripled from those originally received, and the industrial specialists will continue to work with industry to find solutions for any new shortfalls that may occur from these additional requirements.

4.7 Missile Defense Agency (MDA)

During 2007, the Missile Defense Agency (MDA) conducted the following studies as part of its effort to update the baseline assessments of missile defense industrial and technology capabilities. The MDA will consider the findings of these studies to implement its evolutionary strategy for missile defense systems, a strategy that capitalizes on missile defense technology advances and incorporates these improvements to adjust to threat and policy changes as appropriate.

Radar Industrial Base Assessment Update (April 2007)

The radar industrial base study involved surveying and assessing the industrial capability and viability of the radar systems industrial base. The study sought to identify sole/single sources, foreign sources/dependencies, and business and financial risks at radar systems developers, manufacturers, assemblers, and test sites.

The assessment concluded that the radar production base will remain stable in the foreseeable future, though it will remain limited and specialized. The study recommends investing in Traveling Wave Tubes (TWT), power supplies, amplifiers, Gallium Nitride, and thermal management to enhance quality, improve performance, and stimulate domestic alternatives. Currently, there are several single/sole source foreign-owned suppliers of key raw materials for radar subcomponents and the Raytheon Company is potential sole source for X-band radar. The study also recommends monitoring the radar industrial base so as to prevent skill loss as the highly-specialized skill base becomes increasing hard to replace. Finally, the study recommends periodic financial reviews on a few moderate-risk companies to ensure financial viability.

Battery Industrial Base Assessment Update (August 2007)

The battery industrial base study involved surveying and assessing the industrial capability and viability of the battery systems industrial base. The study sought to identify sole/single sources, foreign sources/dependencies, business, and financial risks at battery developers and component manufacturers.

The assessment concluded that the battery industrial base will remain stable for the foreseeable future although many batteries are unique to the Department of Defense and have limited commercial applications. The majority of commercial battery research and development is occurring in South East Asia. Within the industrial base it was noted that there were limited or restricted transfer of foreign technology advancements due to ITAR. The study recommends monitoring the battery industrial base so as to prevent skill loss as the highly-specialized skill base becomes increasingly hard to

replace. The study recommends periodic financial reviews on a few moderate-risk companies to ensure financial viability and establishing a domestic source for Meso Carbon Micro Beads, a material used as the anode in Li Ion batteries for Space based applications. As a final point, the study recommends expanding the scope of the Reserve Battery Subcommittee to address reserve battery industry challenges.

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5. Industrial Sector Summaries

5.1 Aircraft Sector Industrial Summary

The aircraft industrial base produces fighter/attack aircraft, vertical lift aircraft, transport/cargo aircraft, large fixed wing aircraft (i.e., aerial refueling tanker, Intelligence, Surveillance, and Reconnaissance (ISR), and multi-mission aircraft), trainers, and unmanned aerial systems.

Prime contractors have procurement orders from the Department of Defense for the next ten years. Lockheed Martin and Sikorsky have programs identified today that will carry production into the next 20 years. Boeing's future in the fighter/attack and transport segments is questionable. With the announcement of the C-17 program shut down coupled with the end of the F/A-18E/F production in FY11, the industrial base infrastructure at Long Beach, CA, and St. Louis, MO, may have insufficient business to continue in place.

The supplier industrial base may consolidate as military programs reduce over time. Suppliers not associated with future production programs (for example, suppliers not participating in the F-35) will be impacted the most. These suppliers will be forced to either exit the business or find new programs for their products.

Global partnerships have been increasing as European contractors have either formed an alliance or established domestic subsidiaries in the United States in order to better compete for U.S. defense-related programs. Today, the majority of aerospace suppliers supporting DoD programs are still U.S. suppliers. However, participation from global contractors is increasing. The Department awarded two helicopter programs that use airframes of European design. As such, the supplier support for these airframes will rely more on a global supply chain.

Research, Development, Test and Engineering (RDT&E) funding for aircraft programs is decreasing across the Future Years Defense Program (FYDP) primarily due to the reduction of F-35 (Joint Strike Fighter (JSF)/Lightning II) RDT&E funding as the program transitions from System Development and Demonstration (SDD) phase and into production. Also, there are more vertical lift programs using non-developmental airframes that install subsystems to meet their unique mission requirements.

Procurement funding will peak in FY10 due to the production ramp-up of the F-35 JSF Lightning II fighters as well as several vertical lift aircraft production reaching their maximum rate in these years.

Both RDT&E and procurement funding profiles will change as Pre-Major Defense Acquisition Programs (MDAP) emerge as MDAP programs.

Issues:

- Titanium availability is a significant issue within the aerospace industrial base. As future aircraft, both military and commercial, use more titanium in their design, it will more put pressure on the titanium industry as it also tries to meet demand from other industries such as automotive, health and industrial. Currently the shortage of titanium, coupled with long lead times, has delayed the production of airframe bulkheads, landing gears, and engine components.

- Unmanned Aerial Vehicles (UAVs) represent a developing product segment in which all contractors have an interest. Either by direct programs from the Department or through Independent Research and Development (IRAD), contractors are developing various UAV types to maintain a technological edge in their segment. These developments will lead to new developments in areas such as aircraft collision avoidance with other aircraft (i.e., manned and other UAV) and better flight autonomy programs. Without a pilot, these aircraft can perform at higher thresholds, therefore, requiring more demanding structural concepts and designs which may lead to new manufacturing processes and provide future growth in the aerospace industrial base.

5.2 Command, Control, Communication, Computers, and Intelligence (C4I) Sector Industrial Summary

C4I programs represent the backbone of the combat capability of our forces. Overall DoD procurement growth trends also are reflected in Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) program budgets. It appears that there is sufficient procurement funding in C4ISR programs to sustain essential C4ISR industrial capabilities.

The System Development and Demonstration Phase of the Joint Tactical Radio System Airborne Maritime/Fixed (JTRS AMF) Cluster continues through FY11. JTRS is a family of radios that will replace and integrate various incompatible Service radios. Funding also is budgeted for the migration of the Multifunctional Information Distribution System-Low Volume Terminal (MIDS-LVT) to JTRS compliance and continues the procurement and installation of MIDS-LVT System, Super High Frequency, and Extra High Frequency terminals, and in providing for upgraded power distribution and enhanced connectivity accomplished during equipment installations. Funding continues for the Advanced Tactical Data Links system, ensuring timely transmission of surveillance, targeting, engagement, combat identification, and battle damage assessment information over networks.

Workforce concerns evident in software development represent a challenge for all DoD systems, including C4ISR systems. The Department completed a two-part Software Industrial Base Study (SIBS) to assess the demand for software within the Department and the industrial base's ability to satisfy that demand. SIBS Phase II was completed in July 2007. Although Phase I found shortfalls in the number of upper echelon software managers and architects, the number of software developers overall appears adequate. Phase II, however, found shortfalls in the training of software developers. Software development jobs are being filled with staff lacking formal software engineering training. The demand for software developers is outpacing the number of university degrees granted by a ratio of 2 to 1. As a result, jobs are being filled with staff that are not formally trained in computer science or computer engineering.

In general, most U.S. and European defense C4ISR contractors are in good financial condition. The U.S. C4ISR contractor base is comprised primarily of BAE Systems, Raytheon, General Dynamics, Northrop Grumman, Boeing, Lockheed Martin, ViaSat, Data Solutions, and SAIC. For the most part, prime C4ISR contractors are able to meet programmatic technical performance requirements.

Issues:

- C4ISR products increasingly have become dependent on commercial information technology (IT) products. These commercial industry segments have increasingly globalized their supply chains. Both of these facts contribute to the Department's limited leverage in these markets. There is often little incentive for commercial companies to modify their procedures to meet the peculiar requirements of the government, particularly if these changes would impact a firm's competitiveness.
- There are supply chain risks as U.S. contractors move software development work offshore for economic reasons. For example, the potential security ramifications inherent in malicious code (e.g., Trojan horses, back doors, and time bombs) increase. Maintaining the ability to leverage commercial markets while minimizing risk continues to be a focus area for the Department.

5.3 Ground Vehicles Sector Industrial Summary

Ground Vehicles are categorized as either wheeled or tracked. The Mine Resistant Ambush Protected (MRAP) vehicle is an example of a wheeled vehicle and the M-1 Abrams Tank is an example of a tracked vehicle. Distinctions between tactical and combat vehicles have blurred recently as a result of the lessons learned in Iraq and Afghanistan. There is increased importance accorded to arming and armoring all ground vehicles to provide protection against constant and difficult to detect threats in both urban and rural environments.

The majority of ground vehicle suppliers have responded extremely well to significantly increased requirements in support of ongoing contingency operations. Programmed and supplemental funding in FY07 for vehicles totaled $21.5B. The Joint, Army, and USMC ground vehicle research-development and procurement funds for FY08 are $24.2B, and in FY09 they are $19.7B in then-year dollars, which includes approved and anticipated supplemental funding. The primary cost element in FY08 is the $13.5B allocated for MRAP vehicle production. Supplemental appropriations have almost doubled the amount of research and development and procurement funding that would have otherwise flowed to ground vehicle contractors.

In addition to new acquisitions, the Department must maintain and even increase overhaul and repair of the vehicle fleet due to the severe service experienced in Iraq and Afghanistan. The cost of this work is estimated at $17B to $19B annually for the next several years as compared to $2.5B to $3B per year prior to the war.

None of the five major ground vehicle acquisition programs tracked in the Defense Acquisition Management Information Retrieval (DAMIR) system are experiencing delivery schedule issues. For the most part, program schedule requirements are at or within the prime contractor's capacity to achieve. The MRAP program is not tracked in the DAMIR system, but even this program with its extremely short and steep ramp up schedule has successfully transitioned from low to full-rate production in under a year. In general, the MRAP program, the continued research and development of the Future Combat System (FCS), and the increased rates of overhaul and maintenance operations have enabled prime contractors to remain profitable. For the most part, they are able to meet financial obligations and reinvest and grow their businesses via research and development, acquisitions, and capital expenditures.

Medium and small ground vehicle contractors have also benefited from additional supplemental funding from the Congress, especially for the production and rapid fielding of MRAP vehicles in 2007 and 2008. However, MRAP has created an environment of winners and losers. A total of $5.4B was obligated in FY07 to achieve the maximum production ramp up possible. From $13.5 to $16.8B more will be obligated by the end of FY08 to complete the program. This has created an unprecedented surge in demand and temporary shortages of armor steel plate, tires, axles, and the fabricators needed to assemble vehicles. Many companies seeking to win contracts invested heavily in anticipation of receiving orders. Those that received a steady flow of then generated significant revenue for their shareholders, while those who have not have been financially stressed.

The significant drawdown of defense budgets in the 1990s reduced the number of major ground vehicle prime contractors for wheel combat and tracked vehicles from more than eleven to two, currently General Dynamics Land Systems (GDLS) and BAE Systems (BAE) Ground Systems Division. The merger and acquisition process continued last year with Armor Holdings acquisition of Stewart and Stevenson, which makes the Family of Medium Tactical Vehicles, which was followed soon after by BAE acquiring Armor Holdings.

Both BAE and GDLS possess unique industrial capabilities, and as result, have partnered to support the FCS program. At the same time, GDLS is engaged in new production of the Stryker and Expeditionary Fighting Vehicle development. With the exception of the FCS Non-Line-Of-Sight Cannon, BAE does not have any major new production work; but it is engaged in a significant program upgrade for the Bradley Fighting Vehicle.

There are "important" component suppliers for the ground vehicle industry. Examples of "important" components include tracked vehicle transmissions, rubberized track assemblies, and military unique forgings, castings; and metallic and composite armor materials.

Issues:

Ability to leverage Commercial Technologies

- Advanced power-generation systems
- C4ISR consolidation and net-centric systems
- Improved vehicle components
- 360 degree awareness
- Speech technology
- Drive-by-wire
- Autonomous control

Ability to Address Current Threat

- Increased Survivability
  - Improvised Explosive Device (IED) protection and defeat
  - Explosively Formed Penetrator (EFP) protection and defeat
  - Active Protection System (APS)
  - Lighter/Stronger Armor
  - Passenger Safety
- Common Power Distribution / Databus System
- Common Operating System – Hardware / Software
- Jammers for IED defeat

Ability to continue to maintain legacy systems while addressing the above.

5.4 Missile Sector Industrial Summary

Missiles are classified into four segments—tactical missiles, strategic missiles, missile defense systems, and smart munitions. Generally, missile subsystems are categorized in four main areas – propulsion; armament, airframe, and navigation, guidance, and control (NGC).

The DoD missiles procurement funding for FY07 through FY13 is roughly $38B in then-year dollars. The procurement funding is level to slightly increasing over that period. Tactical missiles and smart munitions account for a little more than 50 percent of the procurement, with strategic missiles taking almost 25 percent. The procurement funding in the missile defense sector is for the PAC-3 and Standard Missile programs.

The Department's RDT&E funding is about $35B over the FY07-FY13 period. More than 75 percent of the funds are for the missile defense systems. RDT&E funding is declining over the period from FY07 through FY13. Funding for tactical and strategic missiles and smart munitions segments declines roughly 50 percent from FY07 to FY13. Many of the missile design and development industrial capabilities necessary for these segments are supported by the work performed in the missile defense systems including propulsion, airframe, warhead, and navigation, guidance, and control, and reentry vehicles for strategic systems.

Of the 15 missile programs tracked by the Defense Acquisition Executive Systems (DAES), five programs reported delivery issues in 2007. The problems do not appear systemic to a particular prime or the industry as a whole. Delivery recovery plans have been implemented for most programs.

The Department's missile prime contractors are profitable, able to meet their financial obligations, generally consistent in providing value to its shareholders, and willing to invest back into the company via research and development or capital expenditures.

The significant drawdown of defense budgets during the 1990's reduced the number of missile prime contractors from more than twelve to seven. The prime contractors are not necessarily equal in industrial capabilities. Four of the primes operate only in one of the missile segments (Boeing – Smart Munitions, General Dynamics – Tactical Missiles, ATK – Tactical Missilesand Textron Systems – Smart Munitions). In addition, while Northrop Grumman is the prime contractor in two segments, Raytheon is designing and producing the interceptor missile in the Kinetic Energy Interceptor program. ATK, General Dynamics and Textron are prime contractors on only one program – ATK the AARGM program, General Dynamics the 2.75" rockets (Hydra rockets), and Textron the Sensor Fuzed Weapon (SFW).

Lockheed Martin and Raytheon account for roughly 85 percent of the Department's missile procurement funding. This indicates that while there is competition in this sector, it appears mostly limited to two contractors. As one might expect, Raytheon and Lockheed Martin are the prime contractors on the majority of our missile programs and both have a mix of missile segment programs (tactical, ballistic missile defense, etc.).

For the most part, our primes are able to meet our technical performance requirements. Two of the fifteen programs tracked by DAES identified technical issues – one being a Lockheed program and the other being a Raytheon program.

"Important" components in the missile industry segment include thermal batteries, tactical missile rocket motors, jet engines, inertial measurement units (IMUs), GPS receivers, seekers, fuzes, and warheads. These components are considered "important" because they are used on multiple programs and some of these components require 12 months or more to manufacture.

Issues:

- The strategic missile segment funding is declining and the few remaining programs are coming to an end. With the MM III Guidance and Propulsion Replacement Programs ending, the Trident (D5) missile is the only remaining program. Congress has shown an interest in this defense unique segment and has asked the Air Force to provide an industrial base assessment this year.
- Due to declining RDT&E funding levels and lack of investment in missile system concepts and development, prime contractors are being challenged to maintain their engineering base and are facing skill shortages in areas such as Propulsion, Guidance and Control and Systems Engineering.
- RDT&E funding for missiles declines from FY07-FY13 with roughly a 50 percent decline in the strategic and tactical missiles and smart munitions segments over the same period.
- At this time, there is only one major missile program being competed – the Joint Air-to-Ground Missile (JAGM). This is an indication of limited opportunities for our industry to maintain their design teams.

5.5 Services Sector Industrial Summary

In FY06 48 percent of all DoD contract spending was classified as supplies, 38 percent as services and 13 percent as Research, Development, Test and Evaluation (RDT&E). All DoD contract actions are classified by Federal Supply Class/Service Codes (FSCs) and the FSC schema includes 23 service categories. For analytical purposes it is useful to consolidate these categories into a smaller number of groups. DUSD (IP) organizes all services into the following groups in order of spending size: Facilities Related (FR), Management Support, Professional and Administrative (MSPA), Equipment Related (ER), Construction Related (CR), Engineering (Eng), Information and Communications Technology (ICT), Medical (Med) and Transportation (Trans).

Examination of company cross-participation in multiple service sector groups reveals a breakout into two major sectors. One sector has high levels of cross-participation in other service groups while the other sector has low levels of cross-participation in other service groups. Because the leading companies in the sector with high cross participation are traditional defense contractors and the leading companies in the other sector are not, DUSD (IP) labels them as the Defense Industry Services sector

and the Commercial Industry Services sector. The Defense Industry Services sector includes ER, Eng, ICT and MSPA while the Commercial Industry Services sector includes Trans, FR, CR and Med. The Department's service contract purchases are split evenly (by dollar share) into each sector.

In addition to cross-participation rates, the members of the two sectors share other characteristics. As measured by the share of dollars awarded with sole-source contracts, every member of the Defense sector is less competitive than every member of the Commercial sector. A large share of contract dollars going to mid-tier companies is considered by some to be another significant measure of service group competitiveness. Every member of the Defense sector has a lower share of dollars going to mid-tier companies than every member of the Commercial sector. A company is defined as being mid-tier if it has less than $1B in annual revenues but is not classified as a small business by government standards.

Because two-thirds of DoD RDT&E costs consist of manufacturing development, advanced component development and advanced technology development for major weapons systems, it's arguable whether RDT&E should be considered a service or as a separate intermediate RDT&E category that's neither a supply nor a service. Regardless of preference, the RDT&E category has all the characteristics described above of Defense Industry Service sector members.

Issues:

- While exact causes and remedies for a lack of competition are difficult to define, many believe that a vibrant mid-tier industry presence improves competition. Developing industrial policy to promote and sustain mid-tier companies, particularly focused on the Defense Industry Services sector, appears to be in the best interests of the Department.
- While there has been a clear improvement in the use of competitive contracting procedures in service procurements over the past decade, this good news appears to be offset somewhat by an increased number of competitive contracts receiving only a single offer. It's not clear from the data reported upon to date what factors are resulting in single bids. Although there is some correlation of contracts awarded competitively with a single offer to membership in either the Defense services or commercial services sector, it is not a defining characteristic to the extent of others described above. Although there is arguably some benefit to the buyer of awarding a contract competitively rather than sole-source even if only a single offer is received, it's also arguable that if a contract receives only a single offer then it's an indicator of a lack of competition. This finding correlates with anecdotal information that the Department sometimes has difficulty attracting competitive bidders.

5.6 Shipbuilding Sector Industrial Summary

The shipyard facilities that make up the defense shipbuilding industrial base consist of two segments—first tier and mid-tier shipyards that produce six functional product segments including –submarines, aircraft carriers, amphibious ships, surface combatants (cruiser, destroyer, littoral combat ship), sealift, and research/special vessels. Major ship subsystem providers can be categorized as system integrator, mission system integrator, armament, mission systems, propulsion or main engine, and yard/builder providers.

Six major U.S. shipyards build nearly all of the Navy's ships. Those shipyards are Newport News, Avondale, and Ingalls, owned by Northrop Grumman (NOC); and Electric Boat, Bath Iron Works, and National Steel and Shipbuilding Company, owned by General Dynamics (GD). Some of the first-tier shipyards have unique capabilities that affect how the Navy and Congress have allocated new-construction contracts.

Little first tier shipbuilding capacity is devoted to the commercial sector which places an increasing overhead burden on Navy and Coast Guard shipbuilding programs, which in turn, are producing fewer ships in the available plant capacity as shipbuilding costs continue to rise at a rate well in excess of inflation. In fact, U.S. commercial shipbuilding accounts for less than one percent of the world commercial shipbuilding output and 80 percent of this output comes from the mid-tier sector alone.

U.S. Shipbuilders have recently produced the most capable warships in the world. Since ODUSD Industrial Policy's benchmarking study in 2005, manufacturing technology improvement and productivity improvement have lagged behind international yards on average; however, anemic relative shipbuilding volume and almost a complete industry dependency on volatile year-to-year government spending plans accounted for this cautious plant investment. Shipbuilders' claimed in Congressional testimony that funding instability, low throughput and multiple changes in build rate plans are significant factors in shipbuilding cost increases and lack of facility investment. The Navy's response to the shipyard's call for a stable plan produced the 313 ship force structure plan, block purchases, and multi-year procurement, where authorized. All offer needed stability for the major primes; however, continued upward cost pressure has forced the Navy to reduce new shipbuilding volume by canceling/delaying some Littoral Combat Ship contracts, and extending the useful life of the DDG-51 class in the most recent version of the shipbuilding plan.

Significant excess plant capacity also drives up overhead costs. The Department sponsored the Institute for Defense Analyses (IDA) to conduct a study of the cost structure of the major shipyards to discover evidence of rationalization following the period of consolidation between 1995 and 2002. Rationalization refers to the reduction of infrastructure that has become redundant as a result of lower demand. Typically, the costs associated with this infrastructure are fixed costs. In the aggregate, the shipbuilding segment has been profitably sustained by the U.S. Navy in its present state. It makes little business sense for the industry to rationalize when its return rate

exceeds the cost of capital. However, in spite of the apparent barriers to rationalization, the shipyards are very sensitive to their operating costs, particularly labor hours, and are pushing to get cost out of their products. But, despite efforts to improve their operations, these efforts to date have not resulted in absolute cost savings on a per ship basis. Rather, it appears as though these efforts have at best enabled them to maintain their cost structure in the face of falling demand.

Workforce issues remain in the shipbuilding sector well after hurricanes Katrina and Rita shocked shipbuilding production on the Gulf Coast. Northrop Grumman and mid-tier shipbuilders have been able to rebound, although workforce flux, and lingering absenteeism on the Gulf Coast persist as a result of post-hurricane rebuilding that is exacerbating existing workforce constraints due to aging and attrition. In addition, shipbuilding capacity in the mid-tier shipyards is limited by skilled workforce constraints—not by facilities. Increased labor costs as well as the increased indemnity burden placed on the government for shipbuilding in the Gulf Coast region is likely to close any previously held cost advantage for building ships in that area.

The VIRGINIA class submarine program appears to be the Navy's model program for demonstrating cost reduction success through design-for-producibility improvements, reduced unique parts, and improved throughput using block purchases and more thoughtful allocation of work between the two building partners. Much opportunity exists to apply the lessons learned from this program to aircraft carrier and amphibious shipbuilding programs that would free up significant savings that could produce room for incremental shipbuilding volume in the Navy's long term plan.

The persistent inability for the aggregate shipbuilding industrial base to meet cost targets such that the Navy and Coast Guard are not likely able to recapitalize to meet future capability requirements, indicates a continued downward trend in the health of the defense shipbuilding industrial base.

5.7 Space Sector Industrial Summary

The space industrial base supports two primary segments—spacecraft and launch systems. The on-orbit spacecraft subsystems are categorized as structure, propulsion, command and control, telemetry, and payload. Launch systems are subdivided into liquid-propelled rockets, solid rockets, guidance and control, and the payload adaptor. Space systems support five military, civilian and commercial markets. They are warning/surveillance, communications, weather, navigation, and manned space exploration.

Financial metrics indicate that the Department's space primes are currently profitable, able to meet their financial obligations, fairly consistent in providing value to their shareholders, and willing to invest back into the company via research and

development or capital expenditures. Revenues of the satellite manufacturing firms were up 56 percent in 2006 from 2005.

In FY07, space acquisition programs recovered from previous past-performance issues. The seven Major Defense Acquisition Programs (MDAPs) reported limited cost or schedule breaches with no new Nunn-McCurdy breaches. Past problems related to systemic issues of immature technology and low budget estimates in space program procurement have been corrected with the new "back to basics" incremental approach applied to space system acquisition. Block build plans have been implemented for all new space acquisition programs.

Workforce employment is up in the satellite manufacturing industry. From 2003 to 2006, workforce employment rose from 120,000 to 145,500. Notable hiring increases occurred at Orbital Sciences and Space Systems Loral.

The Department's space research and development funding is approximately $31B over the FYDP. More than 50 percent of the funds are for the military satellite communications and for early warning. This funding includes the R&D for on-orbit spacecraft subsystems and for new small launch system design, development, and demonstration. This includes Missile Defense Agency funding for the space-based missile early warning Near Field Infrared (NFIRE) demonstration. Corporate IRAD for space grew in the period 2003-2006 from $1.8B to $2.3B or eight percent per year.

Three primes contractors account for the majority of major defense space programs, Boeing (Global Positioning System II, Wideband Gapfiller Communications, Evolved Expendable Launch Vehicles, and the Future Imagery Architecture), Lockheed Martin (Global Positioning System II, Space Based InfraRed System, Advanced Extremely High Frequency Communications, and Mobile User Objective Communications), and Northrop Grumman as the prime contractor on the weather satellite system National Polar-orbiting Operational Environmental System and on the Missile Defense Agency Space Tracking and Surveillance System. Northrop Grumman and General Dynamics were awarded additional design contracts for the Alternative InfraRed Satellite System. Orbital Sciences Corporation provides its Taurus and Pegasus launchers to the Department of Defense. Lockheed Martin and Boeing continue to consolidate the United Launch Alliance to provide Atlas V and Delta IV launch vehicles to the DoD. The last Titan vehicles have been launched and are no longer in the DoD inventory. It is notable that three large programs are in competition and have yet to award contracts—Global Positioning System III, Transformational Satellite Communications (in source selection) and Space Radar. The Space Radar budget has been significantly reduced in FY08 Congressional appropriations.

DoD space procurement funding is at all-time high levels due to the re-capitalization of space systems for all the military missions including early warning and surveillance, communications, weather, and navigation. The DoD space procurement funding level for FY07-FY10 is roughly $125B in current year dollars. In FY07, Military satellite communications systems and surveillance and early warning systems account

for the majority of the funding with weather systems, navigation systems and launch vehicles accounting for remainder. Over the FYDP, program funding for space programs will increase to a maximum of $37B in FY10. Currently, this provides the basis for a profitable space industrial base. However, a precipitous reduction in the budget after FY10 would create volatility in the sector and could lead to consolidation.

The Department's space programs have had significant cost growth, averaging 19 percent annually since 2000, and 44 percent from initial estimates from FY06- FY11, for a total of $12.2B, according to the GAO. Overall the military space budget is estimated to grow 13.9 percent from FY06 through FY10.

DoD space primes were able to meet technical performance requirements for the period of this report. Only one of the programs tracked by DAES, the National Polar-orbiting Operational Environmental Satellite System, reported technical issues that required significant changes to the satellite payload. Significant progress was made on the visible radiometer payload. In addition, the Transformational Communications Satellite programs successfully demonstrated high technology readiness levels for key on-orbit subsystems prior to source selection.

Critical components and their sub-tier suppliers for the space industry include nickel-hydrogen and lithium ion batteries from EaglePicher, traveling wave tubes (TWTs) from L-3 Comm, space-qualified solar cells from EMCORE and Spectrolab, control moment gyros and radiation hardened circuits from Honeywell and BAE, and precision space bearings from Timken. A demand gap risk for RS-68 rocket engines exists for the next three years.

The predominant reasons why these components and their suppliers qualify as "critical" are that these components are used on multiple programs, they are long lead items to manufacture, and few suppliers exist. In addition, the commercial market size is small and research investment is low for these technologies. Title III programs have been implemented to improve the domestic manufacturing performance for TWTs and long-life Li-ion batteries.

Issues:

- Bottlenecks in the supplier base limit excess production capacity of key components such as Nickel Hydrogen space batteries, K-band traveling wave tubes, and high output solar cells.
- Continuing concern that U.S. Government export restrictions are increasing costs and causing delays, particularly for sub-tier space satellite component providers.
- Workforce concerns exist for U.S. Government space oversight and acquisition personnel and for satellite manufacturing primes and sub-tier suppliers.

6. Related Activities

The Department of Defense's preferred approach to establishing and sustaining the defense technology and industrial base is to leverage its research, development, and acquisition processes and decisions to create a competitive environment that encourages industry to invest in technology development and make sound technology insertion and production capacity/facilitization decisions. When market forces are insufficient, however, the Department uses powerful Defense Production Act tools to focus industry attention on critical technology development, accelerate technology insertion into manufacturing processes, create, or expand critical production facilities, and direct production capacity towards meeting the most urgent warfighter needs.

6.1 Title III of the Defense Production Act

The availability of domestic production capabilities for critical defense technologies is an essential element of national security. Title III of the Defense Production Act (50 U.S.C. App. 2061 *et seq.*) is a program specifically designed to establish, expand, maintain, or modernize industrial capabilities required for national defense. A key objective of the Title III Program is to accelerate the transition of technologies from research and development to affordable production and insertion into defense systems. To create the needed industrial capacity, Title III authorities provide for the use of financial incentives in the form of purchases, purchase commitments, the purchase or lease of advanced manufacturing equipment for installation in government or privately owned facilities, the development of substitutes, and loans or loan guarantees. Title III activities strengthen the economic and technological competitiveness of the U.S. defense industrial base and can reduce U.S. dependency on foreign sources of supply for critical materials and technologies.

In calendar year 2007, the Title III Program had twenty-three projects underway. The following are brief descriptions of each of the on-going projects.

ALON and Spinel Optical Ceramics

Military weapon platforms such as the C-17 and High-Mobility Multipurpose Wheeled Vehicle (Humvee) require lighter weight, higher performance, and lower cost optical materials. Aluminum oxynitride (ALON™) and magnesium aluminate spinel (spinel) are extremely durable optical ceramics with excellent ballistic and transmission capabilities that are used in military applications for transparent armor, missile domes, and infrared windows. ALON™ and spinel components demonstrate optical, physical, and mechanical characteristics similar to today's standard sapphire, but with significantly lower cost. This is primarily due to the manufacturing process, which uses well-understood, conventional ceramic powder processing techniques. ALON™ optical

ceramics are currently being utilized as a cost-effective alternative to sapphire for many infrared (IR) window and dome applications. This project will establish an integrated, flexible manufacturing process capable of producing these two extremely durable, transparent materials in the shapes and sizes required for aircraft transparencies, missile domes, reconnaissance windows, and transparent armor applications. Emphasis will be placed on increasing size, quality, yield, and affordability of both ALON™ and spinel, and on facilitating component evaluation, qualification, and insertion.

Atomic Layer Deposition Hermetic Coatings

U.S. industry has historically used metal, ceramic, or plastic hermetic enclosures (or modules) to protect Monolithic Microwave Integrated Circuits (MMICs) from harsh, performance-degrading environments. Each of these approaches contains undesirable attributes and all limit technology advancement for radar, communications, and other electronic warfare. Adding these necessary protective packages to MMICs present significant integration complications and can significantly increase manufacturing costs by as much as 40 percent. Recent advancements in the field of Atomic Layer Deposition (ALD) technology have demonstrated the feasibility of applying a near hermetic coating directly to the MMIC. ALD is a deposition technique that lays down films one atomic layer after the other. The process results in robust and atomic-level control of film thickness and properties. It deposits continuous and uniform films on virtually any three-dimensional surface structure, penetrating the most narrow and deep grooves, vias and cavities. It promises increased corrosion protection, reduced size, weight and cost factors, improved manufacturing yields, and much greater operational life of the coated item. This Title III project will establish a domestic manufacturing capability for ALD Hermetic Coatings for Microelectronics which satisfies Department of Defense and commercial demand. The project consists of process validation and qualification, a capacity expansion effort, and initiation of low-level production.

Beryllium Production

This project will overcome the lack of a continuing supply of primary (high purity) beryllium metal available to the United States and its allies for defense and critical civilian applications. Imports of beryllium (from Kazakhstan) cannot meet the purity levels required for many defense applications. Disposals of the current supply of beryllium ingots from the National Defense Stockpile (NDS) is being monitored and carefully managed. In accordance with criteria established by the Under Secretary of Defense (AT&L), sales of high purity beryllium from the NDS are only allowed to US incorporated firms with a recent history of providing beryllium products for defense and critical civilian applications. The rates of disposals are controlled in relation to the progress of the new beryllium production facility being constructed under this project to ensure supplies are adequate for defense and essential civilian requirements. Critical strategic applications, where there is no suitable substitute for beryllium, include:

airborne forward looking infrared systems for fighter aircraft and attack helicopters; guidance systems on existing strategic missiles; surveillance satellites; missile defense systems; and numerous others. The project will ensure future supplies of high purity beryllium metal by establishing a new primary beryllium production facility through a cost share program with private industry.

Coal-Based Carbon Foam

This material is an inexpensive, lightweight, fire-resistant, impact-absorbing material which can be fabricated in a variety of shapes, sizes, and densities. It replaces conventional materials which are higher cost, lower structural capability, hazardous for fire, and heavier. Its electrical conductivity can be varied over nine orders of magnitude, and it has a low coefficient of thermal expansion. Carbon foam's applications include replacing components in naval ship exhaust and ventilation systems and rapid development of manufacturing tooling. It exhibits similar properties as other materials at a lower cost, and outperforms other products at noise reduction, fire resistance, impact resistance, energy absorption, and thermal properties. This Title III project will expand the domestic production capability for coal-based carbon foam to meet the Department's need for blast mitigation, hot structure applications and for low-cost tooling.

Continuous Filament Boron Fiber

Boron fiber is a critical material for several defense systems, and there is only one small domestic producer of this material. Preventing material shortages and mitigating potential risks of escalating production costs through optimal production rates is the objective of this Title III project. Boron fiber is needed to support current and future military requirements for aircraft structure reinforcement and repair. Also, several emerging applications may be able to take advantage of this unique material, which has high compressive stiffness and strength. This project is focusing on leveraging mature, proven commercial manufacturing processes to produce boron fiber of high quality, adequate volume, and at a reduced cost for DoD applications.

Flexible Aerogel Materials Supplier Initiative

This project is establishing affordable production by a domestic supplier of flexible aerogel materials. Aerogels are nanoporous solids with up to 99 percent open porosity often called "frozen smoke." The nano-scale lattice and pores provide high performance with minimal weight and space. Military applications are expected for high temperature thermal insulation, acoustic protection, infrared suppression, and energy absorption. Many commercial applications for these same qualities are expected at lower temperatures. The project involves testing and qualification of the materials for potential applications and eventually a full scale, high volume production capacity.

Integrated Advanced Composite Fiber Placement

Current process/production rates for large aerospace composite products are slow and time consuming in comparison to expected demand. Significant aerospace industry growth and inadequate manufacturing capabilities could jeopardize the assembly demands required by the Department of Defense. This Title III project will expand the domestic supply base for automated composite technologies, maximize processing/cost benefit ratios, and provide cost efficient fiber placement composite processing technologies for military and commercial aircraft structures. The project aims to increase commercially viable production efficiency and make the process enhancements generally available to the commercial composite production market.

Lithium Ion Battery Production

This project will establish a U.S.-owned domestic source of high reliability, long-life lithium ion batteries for spacecraft use. Lithium Ion (Li-Ion) rechargeable battery technology provides higher power for longer durations with lower weight and favorable space constraints when compared to Nickel Cadmium or Nickel Hydrogen rechargeable batteries. The Li-Ion battery offers the highest energy/power package of the developed batteries today. This technology offers designers a weight saving option when compared to other battery types for overall weapon systems performance. Additional advantages include better recharging capability with no memory effect and broader temperature operating ranges.

Methanol Fuel Cell Components

As weaponry and armaments continue to become more sophisticated, employing larger quantities of power-consuming technology, soldiers are becoming overburdened by the need to carry more and more batteries. Military operations in Iraq and Afghanistan have highlighted the importance of reliable electrical power in mounted and dismounted soldier operations. Replacing batteries with methanol fuel cells as the power source of choice for the soldier has significant impacts on several key operations parameters. Unfortunately, due to low production volumes, manufacturing costs for methanol fuel cell membrane electrode assemblies remain high. This Title III project will develop low rate initial production capability, supporting increasing demand levels, and reducing cost through increased production efficiencies.

Military Lens System Fabrication & Assembly

This Title III Program is establishing a domestic capability for mono-spectral and advanced multi-spectral optical systems and lens components. It will develop a

manufacturing capability for design, fabrication, finishing, coating, assembly, and testing of mono and multi-spectral night vision optical systems that can be integrated into military and commercial surveillance systems. Multi-spectral systems are shared-aperture systems that allow widely separated wavelength bands to be transmitted through a common aperture and share common elements in the optical train. They offer considerable advantages for the Warfighter including weight and volume reduction by allowing the Warfighter to carry fewer pieces of equipment, improved performance by allowing both bands to utilize the full aperture of the systems, and optimized system design for a larger set of operating conditions/environments.

Mini-Refrigerant Compressors for Man-Portable Cooling

This project is establishing a domestic low-volume production facility for mini-refrigerant vapor compressors. The Title III Program's industry partner recently purchased a production facility, and Title III is assisting this partner with plant facilitization, to include the purchase of manufacturing, assembly, and test equipment. Applications for personal cooling systems encompass aircrew cooling; soldier cooling (both dismounted and within ground vehicles); and personal protective equipment cooling, such as Explosive Ordinance Disposal and Chem/Bio-Hazard suits. The compactness of these mini-compressors enables them to be installed within electronics cabinets to provide active cooling of components. This increases the performance, reliability, and life of mission-critical electronics systems in high temperature environments. In late 2007, industry will demonstrate a 10,000 unit per year production capacity and engage in continuous improvement and optimization of its production processes.

Photovoltaic (PV) Solar Cell Encapsulant

The objective of this Title III project is to expand the current domestic production capability for Photovoltaic Solar Cell Encapsulants. This material is used to protect delicate PV modules and solar cells from natural elements while also insulating the imbedded electrical circuits. There is insufficient domestic production capability for Ethylene Vinyl Acetate (EVA)-based PV solar cell encapsulant material to meet defense needs for military photovoltaic equipment applications. Key military applications using EVA-based encapsulant include portable power pack batteries, power for electronic and propulsion systems on high altitude airships and Unmanned Aerial Vehicles, power lighting and battery recharging shelters, and PV systems on military installations to reduce energy consumption. Industry's inability to scale up to required production levels has caused PV solar cell encapsulant material to be unavailable in quantities and sizes necessary to meet DoD requirements.

Polyhedral Oligomeric Silsesquioxanes (POSS™) Nanotechnology

This project is scaling up production of Polyhedral Oligomeric Silsesquioxanes (POSS™), a nano-sized material that, when used as a chemical additive, can greatly enhance the performance of polymers for a variety of Department of Defense and commercial applications. POSS™ has been demonstrated as useful in applications such as radiation shielding for space-based microelectronics, coatings that prevent growth of tin whiskers on lead-free solder, photoresist material for semiconductor manufacturing, automotive fuel filters, food packaging, optical lenses, and aircraft tires.

Radiation Hardened Cryogenic Readout Integrated Circuits (ROICs)

This Title III project is establishing a viable, domestic foundry for commercial production of less than or equal to 0.35 micron, deep sub-micron Complementary Metal Oxide Semiconductor (CMOS) ROICs. Radiation hardened (RH) cryogenic microelectronics is a critical technology employed in the manufacture of focal plane arrays (FPAs) that are utilized in high altitude and space-based imaging and missile systems which must function in harsh natural or man-made radiation environments that are compounded by the cryogenic requirements of high altitude and space. RH cryogenic microelectronics process technology is used to manufacture read-out integrated circuits, which are integral components of FPAs. The next generation imaging requirements of high altitude and space-based weapon systems are dependant on the availability of advanced ROICs that provide high density with analog components, smaller pixels (increased resolution), increased functionality (on-chip processing), lower power dissipation, lower noise, larger focal plane arrays (stitching technology), and better producibility (yield). All these improvements will collectively increase the mission capability of the systems.

Radiation Hardened Microprocessors

This Title III project is scaling up production capacities for high performance radiation hardened microprocessors with a progression from radiation tolerant to radiation hard. The much higher clock rates will lead to significant cost and weight savings for space systems. Higher performance means greater on-orbit processing capabilities and lower ground support requirements. As with the other Title III radiation hardening projects, these microprocessors will enable spacecraft to operate in the challenging radiation environments of nuclear threats and long-term natural radiation.

Reactive Plastic CO2 Absorbent

This Title III project is increasing the domestic production capacity of Reactive Plastic Carbon Dioxide (CO2) absorbent material. Reactive plastic CO2 absorbent material is a technology that secures the CO2 absorbing material to a plastic sheet in a

polymer matrix bond. This material is a critical technology for national defense. It is utilized primarily in military scuba, submarines, space, and an array of homeland security applications to “clean” CO2 from air needed for breathing. This technology is driven by the Navy, which seeks to utilize the advantages of reactive plastic CO2 absorbent in rebreather gear. These advantages include stealth diving capabilities (i.e., no bubbles from the rebreather) with extended diving durations and reduced breathing effort by the divers. Other applications include medical, fire rescue, and mining operations where an inherently high risk of CO2 contamination exists.

Silicon Carbide MMIC Devices

This project is establishing a domestic supplier of low cost and high performance silicon carbide (SiC) metal semiconductor field effect transistor monolithic microwave integrated circuits (MMICs) that can satisfy military requirements for advanced radar systems. The project will also demonstrate improvements in the characteristics of 100mm SiC substrate and epitaxial materials and processes to enable high yield, high performance, and reliable SiC MMICs that can be produced at an affordable cost. The project will develop and demonstrate substrates and epitaxial structures with defect densities commensurate with high yield production of high performance, reliable SiC MMICs.

Silicon Carbide Powder Production and Ceramic Armor Manufacturing

High purity silicon carbide (SiC) powder, specifically submicron alpha SiC powder, is a critical technology item for national defense. This refined form of SiC powder is the key ingredient required to produce high quality, light weight, and cost competitive SiC ceramic armor for the Warfighter. SiC ceramic armor military applications include body, vehicle, naval, and aircraft armor. Without access to submicron alpha SiC powder, production of high quality SiC ceramic armor would be unachievable. SiC ceramic armor is especially beneficial to applications that protect against higher ballistic threats. Primary applications include armor for land and air vehicles associated with the Future Combat Systems program, armor for naval ships, and lightweight armor for helicopters and other aircraft. This Title III project is increasing the domestic production capacity for both submicron alpha SiC powder and ceramic armor.

Thermal Battery Production

The objective of this Title III initiative is to establish, strengthen, and expand a domestic source for advanced thermal batteries. Military unique, high performance batteries are the only viable power source for many defense systems. The Missile Defense Agency and Service program offices have identified several high performance battery technologies for which there is insufficient availability or producibility to meet

known and planned program requirements. These critical materials and technologies represent gaps that must be filled for the advanced systems to meet performance and production schedule goals. The DPA Title III Program is incentivizing a domestic company for production scale up and capacity expansion efforts. The applicability of these critical batteries to a wide variety of DoD weapons systems offers Army, Navy, and Air Force program offices the ability to greatly enhance system performance.

Thin SOI Wafers

This project is establishing a domestic full-scale production capability for thin silicon-on-insulator (SOI) wafers. Thin Film SOI electronic wafers are critical materials that enable the fabrication of radiation-hard, ultra large scale digital devices such as microprocessors, application-specific integrated circuits, and static random access memories. These radiation hard circuits fabricated with SOI materials are essential to defense systems, such as surveillance, communication and navigation satellites, ballistic missiles, surveillance systems, and inertial navigation systems. They provide a superior technology for sensitive ultra-low power space, and battery- powered applications due to reduced power requirements, increased device density, and faster device performance over circuits fabricated in bulk substrate technologies.

Titanium Metal Matrix Composites (TiMMCs)

Titanium Metal Matrix Composites (TiMMCs) are a critical technology item for national defense. TiMMCs offer material properties that enable aircraft designers to engineer components that are stronger, lighter, and more durable than existing steel and pure titanium components. These improvements can expand United States air superiority margins over opposition forces by increasing lethality for U.S. munitions, increasing survivability for the Warfighter, and ultimately increasing mission success rates. The desirable material properties offered by TiMMCs allow aircraft designers to utilize TiMMCs as the material of choice for components that require weight reduction, improved strength, and/or longer fatigue life. These properties will reduce product lifecycle costs and improve heat resistance characteristics. This Title III project is expanding the domestic production capacity of TiMMCs to support the Warfighter. Additionally, Title III funding will support the development of a database of TiMMC material characteristics and characterization of the production processes required to produce TiMMCs.

Traveling Wave Tube Amplifiers for Space

This Title III project is focusing on leveraging proven manufacturing processes to produce K-band Traveling Wave Tube Amplifiers (TWTAs) of high quality with improved manufacturing yield at reduced cost for DoD applications. A TWTA is a vacuum electronic device whose function is to amplify a radio-frequency signal. K-band TWTAs

provide superior signal strength and larger bandwidth compared to today's satellite communications. Currently only a single foreign source for K-band TWTAs exists. Advancements in the domestic production capability for K-band TWTAs will support existing and future military and commercial requirements. DoD satellites using K-band TWTAs will support the growing need for real-time information and controls among deployed assets.

Yttrium Barium Copper Oxide (YBCO) High Temperature Superconductor

This Title III project is establishing large volume, high quality, domestic production capacity for second-generation High Temperature Superconductor (HTS) coated conductor. The conductor, based on YBCO material, is a higher-performance, lower-cost substitute for the first-generation HTS wire. Second-generation HTS coated conductor is the critical component for several defense applications which require high electrical power, principally Directed Energy Weapons (high power microwaves and electrically driven lasers) and Electric Warships & Combat Vehicles programs. Components that will use HTS coated conductor include: gyrotron magnets, power generators, power converters and transformers, motors, primary power cabling, and magneto hydrodynamic magnets. Complete development of the technology will lead to transfer of the YBCO coated conductor into electric power applications such as transformers, transmission cables, motors, fault current limiters, and generators. The project will establish two domestic sources for YBCO coated conductor, making the benefits of second-generation HTS available five to seven years earlier than might otherwise be feasible.

6.2 Defense Priorities and Allocations System/Special Priorities Assistance

Title I of the Defense Production Act provides the President the authority to require preferential performance on contracts and orders, as necessary, to meet national defense and emergency preparedness program requirements. Executive Order 12919 delegates these authorities to various federal departments and agencies.

The Secretary of Commerce has been delegated the authority to manage industrial resources. To implement its authority, the Department of Commerce (DOC) administers the Defense Priorities and Allocations System (DPAS). The DOC has further delegated authority to the Department of Defense under the DPAS to: (1) apply priority ratings to contracts and orders supporting national defense programs; and (2) request the DOC provide Special Priorities Assistance (SPA) to resolve conflicts for industrial resources among both rated and unrated (i.e., non-defense) contracts and orders; and (3) authorize priority ratings for other U.S. federal agency and friendly

nation defense-related orders in the United States when such authorization furthers U.S. national defense interests.

The Office of the Under Secretary of Defense for Industrial Policy (ODUSD(IP)) also convenes and chairs the Priority Allocation of Industrial Resources (PAIR) task force. The task force's mission is to ensure industrial resources are allocated to DoD programs in accordance with operational priorities when emergent requirements create competing demands among Services. The task force works closely with the DOC to ensure effectively allocation of materials, or to expedite deliveries of defense items in accordance with PAIR decisions. During 2007, the PAIR forecasted Department-wide armor plate requirements and coordinated with affected steel mills to prevent production constraints for the joint Mine Resistant Ambush Protected (MRAP) and other important armored vehicle programs. As a result, the PAIR has been able to balance delivery requirements and industry capacity, permitting the MRAP program to meet its full-rate production objective with a minimum of disruption on other programs.

Not all SPA requests are a result of PAIR actions. During 2007, ODUSD(IP) executed 20 SPA requests as depicted in the following table. Five of these addressed the needs of U.S. forces, and the remaining 15 accommodated the needs of foreign allies engaged in Operation Iraqi Freedom or Operation Enduring Freedom.

DEFENSE PRIORITIES AND ALLOCATIONS SYSTEM/ SPECIAL PRIORITIES ASSISTANCE CASES – 2007			
Date(s)	**Item**	**Assistance for**	**Summary**
01/07	Aircraft Target Pod	Netherlands	Sponsored priority rating and expedited delivery
01/07	Machine repairs for armor production	U.S. Steel Mill	Provided rating authority to expedite repair and resume production
01/07, 06/07, 08/07, 09/07, 10/07	Night Vision Equipment	United Kingdom	Sponsored priority rating and expedited delivery
01/07, 12/07	Helicopter Ammunition	United Kingdom	Sponsored priority rating and expedited delivery
03/07	Helicopter Electronic Display	United Kingdom	Sponsored priority rating and expedited delivery
03/07	Cryptographic Computer	United Kingdom	Sponsored priority rating and expedited delivery
03/07, 10/07	Military Vehicle Transmission	United Kingdom	Sponsored priority rating and expedited delivery
06/07, 09/07	Mine Resistant Ambush Protected Vehicle & Route Clearance Vehicle(s)	Joint Program and Army (four programs)	Completed two industrial capability assessments, engaged multiple industries to address capacity constraints. Successfully sponsored DX rating.
06/07	Rocket Warhead	United Kingdom	Sponsored priority rating and expedited delivery
08/07	Aircraft Data Link	Netherlands	Sponsored priority rating and expedited delivery
09/07	Steel Armor Plate	Army	Arranged for alternate source for Stryker program when primary became constrained
10/07	Helicopter Bearing Sleeve	United Kingdom	Sponsored priority rating and expedited delivery
11/07	Tooling for Army helicopter steel forgings and castings	U.S. Steel Foundry	Provided rating authority to expedite plant expansion and increase capacity
Source: ODUSD(IP)			

6.3 DoD Manufacturing Technology Program

DoD's Manufacturing Technology (ManTech) program develops and matures key manufacturing processes to accelerate technology improvements in the acquisition and sustainment of DoD weapon systems and components. Ensuring that technology is affordable and producible remains imperative to making our forces more agile, deployable, sustainable, lethal, and dominant anywhere in the world. This program addresses process technology issues early in the design process, in development, in production, and into sustainment. ManTech investments enable industry to develop and provide defense-essential, affordable, low-risk manufacturing processes that effectively transition technology into new and existing equipment for the warfighter. Teamed with industry, ManTech provides crucial links from technology invention to production of defense-critical needs that are beyond normal investment risk for industry. ManTech investments generally translate into affordability improvements or cycle time reduction. However, investments also focus on developing "new capabilities" that result in a more expensive component, but will provide dividends in system performance or life cycle cost that far outweigh initial cost. The program is structured around three major thrusts areas:

- *Processing and Fabrication* activities develop affordable, robust processes and capabilities for metals, composites, electronics, and energetics/munitions critical to defense applications over their full life cycle. Projects create improvements to manufacturing processes on the shop floor and in repair and maintenance facilities (depots, logistics centers, and shipyards).

- *Advanced Manufacturing Enterprise* accelerate implementing world-class industrial practices and advanced design and information systems in the defense industrial enterprise that supports weapon system development, production, and sustainment

- *Sustainment* projects coordinate common DoD requirements for maintenance, repair, and overhaul technologies and advancements to affordably extend current weapon systems beyond their intended operational life.

Although the requirement to submit a five-year plan for the ManTech program has been repealed with the deletion of 10 U.S.C. Section 2521(e), the Department continues to monitor the status of transition and implementation.

ManTech program success is measured by the transitioning of advanced technology from research and development to implementation into new or existing weapon systems. Examples include two projects that represent affordable technology transitioned to the warfighter as a result of manufacturing technology advancements.

Air Force ManTech Attacks Number 1 F-22A Maintenance Problem

F-22A canopies have coating durability issues, driving up fleet support costs and impacting mobility. A more durable canopy technology has been identified, but it had limited production capability. Air Force (AF) ManTech performed a Manufacturing Readiness Assessment (MRA) which identified critical production processes needed to address full scale canopy implementation. AF ManTech worked to mature and validate the manufacturing processes required to transition to the F-22 program office. The result, canopy life improved from a baseline 155 hours to currently 300 hours with end state expected at more than 800 hours, an improvement of more than 500 percent. Increased canopy life improved F-22A mission capable rate and concurrently reduced maintenance man-hours per flying hour, resulting in an estimated life cycle cost avoidance of $450M.

Army ManTech Delivers New Armor Drilling Capability to Warfighter

In theater maintainers were using five to eight drill bits to drill one hole on armor plating material, a time consuming and fatiguing process that limited the ability to return critical equipment back to theater. The Army ManTech National Center for Defense Manufacturing and Machining (NCDMM) designed mobile drilling kits specifically for armored drilling during field operations. These kits provide the correct tools for the maintainers including carbide drill bits and magnetic drill press to provide the rigidity required for armor drilling. Army ManTech and NCDMM delivered nearly 800 kits reducing drill time from 120 minutes per hole to four minutes, decreased drill bits from five to eight bits per hole to one bit per multiple hole, enabling maintainers to return vehicles to operations expeditiously.

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7. Programs and Actions to Sustain Capabilities

In 2007, the Department acquired and/or maintained facilities, equipment, or components, or took other actions needed to meet projected and actual military contingency requirements.

- DLA invested $23.5M in contracts as a result of a Minimum Sustaining Rate (MSR) Study for The Tent Network for Technology Implementation (TENTNET) program. The study determined the funding levels needed for an industrial base measure for current military-specific tent and shelter manufacturers. TENTNET was initiated to explore ways to improve surge capabilities for military tent requirements through the collaboration of DLA/DSCP, industry, government, and academia to ensure the availability of tentage and shelters.

- DLA invested $9.95M in minimum sustaining rate contracts for the Joint Service Lightweight Integrated Suit Technology (JSLIST – chemical suit). The JSLIST is a tactical investment to bridge a gap in production. A significant supply chain interruption has occurred due to a change in the camouflage pattern for the suit. A more strategic JSLIST investment is being planned for FY09 and beyond.

- DLA invested in $1.3M Nerve Agent Antidote Autoinjectors (NAAA) Service Life Extension Program (SLEP) during FY07 for management and remarking of the Services' NAAA stored at Meridian Medical Technologies (MMT) that are at or beyond their initial expiration date, yet remain potent. The Industrial Base Maintenance Contract (IBMC) satisfies only 61 percent of the total requirement. This Warstopper-funded initiative provides additional capability to ensure the Services are able to obtain 100 percent of the total autoinjector requirement.

- DLA also invested $105K during FY07 in the NAAA Readiness Enhancement Program (REP) initiative to recruit, test, hire, train, and retain a pool of 25 personnel to staff on 24-hour notice the second shift at the MMT production facility in St. Louis, Missouri. The second shift is needed to quickly increase production to support contingencies.

- DLA obtained "no charge" surge coverage on 705 contracts. This coverage represents a cost avoidance of $22,698,493 that neither DLA nor the Services will have to expend for supplies to insure that critical war/contingency items will be available. Examples of items included in the new FY07 contracts include repair parts, lithium- and lead acid-batteries.