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 Department's ultimate objective: 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 deliver 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 (domestic or foreign) deliver products with integrity that satisfy Department expectations in every respect (for example, free of device tampering and counterfeiting). Finally, a reliable industrial base is one that facilitates innovation by both larger and smaller subsystem providers; allows smaller, subsystem firms to compete meaningfully 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 market 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 diverse and competitive industry environment can be a hedge against cost growth. However, at the prime contractor level, a greater degree of industrial base competition for programs requiring significant development primarily drives pre-award market innovation rather than post-award cost control. The most significant drivers of programmatic cost increases are unrealistic requirements and requirement perturbations, inadequate cost estimates, optimistic schedules, funding instability, and technical immaturity. These generally cannot be solved directly through industrial competition. Lifecycle cost control can be a secondary effect of competition-driven innovation when products are evaluated on a lifecycle cost basis and when appropriate cost control incentives are used as part of the overall acquisition strategy to motivate the contractor. Direct competition on a price basis is effective for specific types of

acquisitions such as purchase of commercial items, and for sustainment support and modernization upgrades for mature weapons systems where there are multiple capable suppliers and proprietary data rights do not present an insurmountable barrier to competition. Robust competition in the industrial base sub-tiers avoids monopolistic pricing for components and subassemblies and mitigates the risk of cost growth from schedule disruptions and re-design/re-qualification efforts if a sole capable supplier should fail.

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.

In July 2008, the Defense Science Board Task Force on Defense Industrial Structure for Transformation issued its final report. The Task Force made several recommendations, one of which was that the Department should articulate a clear Vision of the National Security Industrial Base it needs to support the war-fighter in the 21st Century. The Task Force-recommended Vision would have four elements:

- Strong focus on competition to encourage both innovation and lower cost solutions, as well as to ensure that suppliers deliver their commitments, on schedule and within budget.
- Relentless search for superior technology, manufacturing and logistics coupled with a willingness to look beyond the traditional defense industry to commercial suppliers, including companies located outside the U.S. with militarily-relevant capabilities.
- Increased attention to Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR), information technology and other services. Renewed effort to build a true partnership between government and industry (i.e., working together, but still in a competitive environment). The next decade is likely to be a turbulent period and close cooperation will be essential if DoD is to provide effective support to the warfighter.

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 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.

The Department also periodically assesses the ongoing financial viability of the U.S. defense industry by measuring and tracking productivity, financial risk and valuation of the industry against a market baseline. The Department's quarterly *Defense Industry Update* summarizes major news events, transactions under review, and top level financial results for the quarter. It incorporates key aspects of each topic area and is timed to capture then-current defense industry financial results as they are released. Although raw data is public, the Department uses aggregate data from paid services (S&P Research Insight and Capital IQ) to assess financial viability. The *Defense Industry Update* is distributed electronically to key Senior Staff within the Department.

Defense sector companies (TDC) compare favorably to U.S. industry as a whole based on several key financial metrics: profitability, cash flow, and credit worthiness. The basis for comparison is full year-over-year 2008 over 2007 and fourth quarter 2008 over fourth quarter 2007.[1]

Comparing fourth quarter year-over-year, TDC operating earnings (earnings before interest and tax) increased 16 percent on a five percent increase in revenue; while for the S&P 500 earnings declined 52 percent on revenue that was down eight percent. On a full year over year basis, TDC operating earnings increased 13 percent on a six percent increase in revenue; while for the S&P 500 earnings declined 15 percent on revenue that was up six percent. Full year over year free cash flow (cash flow less capital spending and changes in working capital) increased by 30 percent for the TDC and declined by 24 percent for the S&P 500. This cash flow decline for the S&P 500 is driven primarily by lower profits though capital spending and net working capital each increased by two percent.[2] In contrast, TDC profit-to-cash conversion was strong enough to more than offset a 90 percent increase in net working capital.

These relative financial results reflect that the prime defense contractors are at the peak of the spending cycle and are much better positioned to withstand the problems in the credit markets and the general economy than commercial companies. The overall better performance of the TDC is due to the steady backlog buildup and predictable cash flow resulting from government-supplied contract financing (progress payments) and performance payments. These operating differences also have enabled defense companies to improve their relative credit worthiness, as measured by interest coverage (profit divided by interest expense), much faster than the S&P 500. The TDC increased its full year-over-year interest coverage by 27 percent compared with an 18 percent decline for the companies in the S&P 500. To prepare for less credit availability and a slower economy, companies in the S&P 500 increased their full year-end cash

[1] To compare the financial performance of the top contractors of the defense industrial base to the general business sector, we constructed an index of the top four defense contractors (General Dynamics, Lockheed Martin, Northrop Grumman, and Raytheon) and compared their data to the weighted average of the companies in the S&P 500 using company financial data. Boeing is excluded from the defense contractor sector index for this evaluation because the machinists strike in the third quarter of 2008 dramatically reduced its commercial aircraft segment financial results which obscured the better performance of its defense segment. Also, note that not all companies in the S&P 500 have reported final 2008 earnings as this evaluation was completed.

[2] Higher capital spending and net working capital lower free cash flow.

and cash-equivalents balance by 54 percent while the TDC cash and equivalent balances declined by 18 percent versus the prior year. Evidencing conservative financial management, S&P 500 companies increased their long term debt level by 23 percent while for TDC companies it only increased by six percent.[3]

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 significantly decreasing across the Future Years Defense Program (FYDP). A major 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). By contrast, aircraft procurement funding shows a steady increase through 2013 as a result of a general trend to accelerate priority aircraft programs into production to speed the overall recapitalization effort, at the expense of new development and innovation. The reduction in RDT&E funding does not bode well for companies without long term production programs. While Lockheed Martin and Sikorsky have current programs that will remain in production for the next 20 years, Boeing's future participation in the fighter/attack and transport segments is more problematic without the support of Foreign Military Sales (FMS) to keep existing production lines open. With the announcement of the C-17 program shutdown, coupled with the end of domestic F/A-18E/F production in FY12, the industrial base infrastructure at Long Beach, CA, and St. Louis, MO (solely supporting FMS) may have insufficient business to continue in place. Additionally, the lower-tier supplier industrial base continues to consolidate. Suppliers not associated with future production programs (for example, suppliers not participating in the F-35 or UH-60M) will be impacted the most. These suppliers will be forced to either exit the business or find new DoD or non-DoD programs for their survival.

Likewise, RDT&E funding for strategic and tactical missiles and smart munitions MDAPs shows a roughly 50 percent decline from FY07-13. 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

[3] In this case it is conservative to raise cash through debt when credit may not be accessible in the midst of the present economic crisis.

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 directed two studies—a strategic missile industrial base assessment; and a solid rocket motor industrial base assessment that supports missiles and space launch with a focus on sustaining strategic systems. The Air Force submitted the first report in October 2008. The solid rocket motor assessment will be submitted in early 2009.

The ground vehicle sector is highly dependent on supplemental funding. 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 continuing Army investments in Future Combat System (which accounts for almost 40 percent of the Army's RDT&E budget), the ground vehicle prime contractors are profitable. In most cases, they are meeting financial obligations, providing value to shareholders, and are reinvesting in their businesses via independent research and development (IRAD) and capital expenditures.

When/if supplemental funding ceases, the ground vehicle sector will become more fragile. It is a sector that warrants close monitoring. This is especially true given the current depressed commercial automotive sector. General Motors, Ford, and Chrysler no longer are active members of the defense industrial base, although some of their suppliers are. Most of the military ground vehicle supply chain also supports the commercial heavy truck industry. Approximately two-thirds of this supply chain also services the light passenger vehicle market. If domestic manufacturers for cars and sport utility vehicles enter bankruptcy, stop manufacturing, and/or default on their bills, some of their sub-tier suppliers which also support military vehicle programs also may experience financial difficulties. If some of these suppliers exited the business, the Department's military vehicle contractors would be required to identify and qualify other suppliers.

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, is being corrected with a "back to basics" incremental approach to space system acquisition. 2008 shows continued recovery for most space procurement 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.

Workforce concerns are evident in certain defense sectors. Although the shipbuilding industry on the Gulf Coast has recovered in capacity and restored their facilities following the severe damage from hurricanes Katrina and Rita two years ago, workforce issues remain due to the slow overall recovery within the region. Delays to production schedules as a result of two hurricanes during the summer of 2008 demonstrate how this sector is directly affected by the hurricane seasons. In addition, shipbuilding capacity in the mid-tier shipyards is limited by skilled workforce constraints—not by facilities.

In 2008, the Department, via the Defense Contract Management Agency's Industrial Analysis Center (DCMA's IAC), completed a study (tri-sponsored by OUSD(AT&L), the Air Force, and the Navy) to determine the sufficiency of current 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. Also as mentioned before, while Lockheed Martin and Sikorsky futures look bright with adequate sustained production, other primes and subtier suppliers not participating in the F-35 or UH-60M programs may be forced to exit the business, consolidate, or find non-DoD work. The study confirmed that the military aircraft design and development workload is at a historic low with significant skill and experience loss expected as the aging R&D workforce retires. Although there is potential for five new program starts over the next decade—Long Range Strike (LRS – a manned medium penetrating bomber), Navy Unmanned Combat Air System (NUCAS –unmanned carrier-based aircraft), Advanced Joint Air Combat System (AJACS – a tactical multi-mission air mobility vehicle), Sensorcraft (a high altitude long endurance Unmanned Aircraft System), and Prompt Global Strike (a hypersonic cruise vehicle)—each program faces significant technical, funding, and requirements challenges. And, only LRS is funded directly in the FY2009 President's Budget. Further, technology maturation efforts underway for other programs—UCAS Demonstration (UCAS-D), Blackswift, Advanced Composite Cargo Aircraft (ACCA), Falcon, Speed Agile, and Vulture—are facing funding constraints that are driving program managers to downselect to a single source earlier than desirable. Maintaining at least two competitive teams during this technology maturation/risk reduction phase would not only reduce technical risk, but also preserve competition and present an opportunity to recapitalize the aging R&D workforce. Industry also indicated a hesitancy to commit the necessary independent research and development (IRAD) due to undefined and fluid DoD requirements and the uncertainty caused by significantly reduced DoD RDT&E funding. Finally, there is widespread industry concern over continued viability/availability of essential test assets. The Office of the Deputy Under Secretary of Defense for Industrial Policy (ODUSD(IP)) is working closely with the DoD Test Resources Management Center (TRMC) to develop a follow-on plan to conduct a comprehensive industry/government assessment of test resources to include such issues as workforce, physical assets, and required funding.

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. DPAS, the regulations for which are established in 15 C.F.R. 700, ensures that the Department receives priority in the market over commercial orders. DoD contractors ordering titanium or other materials for DoD applications can use DPAS-rated orders and include the required delivery date, not the availability date quoted by the material supplier.[4] If a supplier cannot meet the required delivery date for a DPAS-rated order because of a conflict with an unrated order, the contractor must fill the rated order first.

Unmanned vehicles (UVs) represent a developing product segment within most industry sectors (e.g., aerial, ground, and maritime) 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 for UVs in their segment. These efforts will facilitate new developments such as collision avoidance and autonomy advances. Without a pilot, 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. A soon-to-be-released RAND study, sponsored by the ODUSD(IP), concludes that there will be significant challenges in the unmanned vehicle arena. In all three sectors (aerial, ground, and maritime), there are common requirements for greater autonomy, problems with incorporating more sophisticated payloads, and a need for common standards and interfaces. Strong growth is expected in this sector, but there are many barriers to entry—staffing, standards, cultural obstacles to integration within the Military Departments, and availability of testing areas in particular. Lowering these barriers may require significant incentives.

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

[4] As a result of the global recession, prices for the five primary metals (aluminum, copper, nickel, titanium, and stainless steel) dropped significantly in 2008. Availability has improved, as well. For example, the price of aerospace grade 6/4 titanium ingot declined 19 percent between January and November 2008, to about $29,179 per metric ton. Commercial titanium ingot lead-times declined from an average of 14.7 weeks in November 2007 to 9.3 weeks in November 2008. (Lead-times for primary metals for military applications can be 3-6 times longer than for commercial applications because of stringent military grade specifications.) Some analysts are projecting that global demand for infrastructure and aerospace replacement programs is expected to rebound in 12-18 months, increasing global demand for metals.

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"[5] 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 munitions (PGM) sector is a particularly apt example of an industry segment 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

[5] In an October 2008 report entitled "Department Of Defense: A Department-wide Framework to Identify and Report Gaps in the Defense Supplier Base is Needed," the GAO recommended that the Department take action to leverage and fully apply the criteria used by the ODUSD(IP) to guide the identification and monitoring of supplier base concerns throughout the Department. It further recommended that the Department create and disseminate DoD-wide written requirements for reporting potential concerns about supplier base gaps by delineating when, and to what level, supplier base concerns should be elevated. The Department agreed that there was merit in having formal, published criteria for making judgments regarding suppliers and components that are important to the Department and when program offices should report/elevate supplier issues to the ODUSD(IP). The Department is considering new acquisition guidance language that encourages program offices and the Military Services to resolve identified industrial capability issues at the lowest level possible. However, in cases where issues may impact more than a single program or Service, or when an industrial capability matter meets the criteria summarized in this section, the Department is considering instructing the program office to elevate the matter via their Program Executive Officer to ODUSD(IP) (even if the program office has ensured that its program requirement can and/or will be met).

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 visible sensor charge coupled devices, infrared detectors, radiation-hardened read-out integrated circuits, germanium substrates for solar cells, and high-reliability space-qualified diodes. Additionally, a demand gap risk for RS-68 rocket engines exists for the next two years. 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 traveling wave tubes (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 R&D funds to maintain alternative supplier design team(s), 4) down-select 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 available levers 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 two complementary assessments by the Institute for Defense Analyses (IDA) that collectively assess the extent to which current DoD profit policies: (1) provide an "adequate" profit to defense contractors; (2) incentivize contractors to control costs; and (3) can incentivize significant improvements to defense contract performance, schedule, and cost outcomes. The IDA report "Defense Department Profit and Contract Finance Policies and Their Effects on Contract and Contractor Performance," concluded that the profits of major U.S. defense contractors are above those required to keep them in the defense industrial base because government investments in direct research and development and contractor financing (e.g., progress payments and performance based payments) result in free cash flow return on invested capital that generally outperforms those of

other industries, including pharmaceuticals, software, services, and the overall S&P 500. The report did not show that contract type had a strong influence on contract outcomes. For example, the data did not show that firm fixed-price contracts exhibited better cost performance than cost-plus contracts. The complementary IDA report "Can Profit and Contract Incentives Improve Defense Contract Outcomes" concluded there is not a realistic prospect of using the incentive tools permitted by the DFARS (weighted guidelines and contract type) to greatly improve the average performance, schedule, and cost outcomes of DoD contracts. There is a tension between the goals of the incentive provisions of development and low-rate production contracts and the cross-contract incentives of comparatively large profits of the production phase. For example, the prospects of large profits during production may reduce the effectiveness of incentives in development and early production intended to lower procurement cost, and therefore lower profit during production.

In another effort to improve DoD acquisition practices, the Department communicates with individual members of its extremely broad and diverse industrial base. This is accomplished through both formal and informal events such as working level and executive roundtables. In 2008, such roundtables included traditional and non-traditional DoD suppliers in order to examine barriers to participation in the DoD enterprise and to enhance collaboration. Department representatives also participated in informal roundtables held in conjunction with defense industry conferences. During these sessions, Department and industry representatives engaged in dialogue regarding policies and programs affecting industry and defense relationships, and challenges to meeting the needs of the warfighter. Among industry concerns identified in 2008, are the lack of an Other Transaction Authority (OTA) for production contracts, the impact of export controls on companies' incentive to make commercial product innovations available for DoD applications, and the negative repercussions of a "mid-tier squeeze" when small businesses grow too large to take advantage of the DoD Small Business Program, but still don't have the deep pocket advantages of a larger company.

The following observations seemed to have widespread industry support:

- International Traffic in Arms Regulations (ITAR) may discourage firms from supplying their best technology to the Department where sales volume and potential profits are low in comparison to commercial and international markets where sales volume and profits are potentially orders of magnitude higher.
- DoD-specific benchmarks for commercial products discourage firms from competing for government contracts.
- Omnibus contracts with a broad scope of work preclude competition by firms that are more focused.

- The Department's unwillingness to purchase expert Systems Engineering and Technical Assistance (SETA) or other professional expert commercial services at market rates sometimes results in the Department not achieving the best results with commercial technology.
- The mismatch between long technology incubation periods in some cases and short DoD program management tenure can result in otherwise valuable products falling by the wayside.
- DoD program managers have less willingness to take risks with small companies than with large companies perhaps partly due to a belief that there is less personal career risk if a failed product comes from a well known company than if it comes from a company with lesser name recognition.
- Many businesses report feeling a mid-tier squeeze when they graduate from advantages of the small business program but still don't have the deep pocket advantages of a large company.
- For a number of reasons, working as a sub-contractor to a large prime contractor is much less desirable to business than working directly for the government as a prime.
- One of the frequently noted concerns is preservation of intellectual property rights both from government demands and from larger firms that have the resources for protracted litigation.

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.

In addition to statutorily mandated restrictions on acquisition from foreign services, under 10 U.S.C. 2304 (c) (3), the Department has authority to restrict

procurements to domestic sources when it determines that a particular domestic industrial capability must be protected to sustain military readiness. These restrictions are implemented in the Defense Federal Acquisition Regulation Supplement (DFARS) by a DoD policy decision, not by a specific limiting statute. Currently, the Department has administratively-imposed DFARS foreign product restrictions for periscope tube forgings, ring forgings for bull gears greater than 120 inches in diameter, and ship propulsion shaft forgings (does not include service and landing craft shafts).

Finally, the Department has the framework and guidelines in place (via DoD 5000.60-H, "Assessing Defense Industrial Capabilities") to evaluate, 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.

In 2008, the Department reviewed 44 potential mergers and acquisitions for competitive implications, collectively valued at over $160B. Several transactions required remedies to preserve future competition and to address supply issues. In 2008, transaction filings for Committee on Foreign Investment in the United States review under the Exon-Florio Amendment set a post-1991 record of 165 transactions valued at more than $162B, despite the global credit crisis and economic downturn.

In its report, "Infrastructure Rationalization in the U.S. Naval Ship Industrial Base," IDA examined the cost and financial structure of the major U.S. shipyards for evidence of rationalization following the period of industry consolidation that began in the mid-1990s; and compared that with consolidation effects noted in the missile and aircraft industries. The report concluded that there has been significant rationalization in the missile industry, but not in the major U.S. shipyards or aircraft industry. This is

so, primarily, because, after consolidation there was significant “fungible” duplicate capacity in the missile industry, but not for shipyards or aircraft prime contractors. Fungible duplicate capacity enables a firm to rationalize production deliveries at its more efficient plant(s) and shutter the duplicate, less efficient plant(s).

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.[6]

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 5000.01 (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 CMI to the maximum extent possible by mitigating or eliminating legislation, regulations, and practices that create barriers to entry, especially at the lower tiers; and discourages the creation of defense-unique

[6] This emphasis also means that DoD must leverage the benefits of CMI, while mitigating the risks associated with the realities of commercial market forces (for example, lack of DoD strategic control and the implications of the global supply chains that support commercial industry, products, and technologies).

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 FY07, the Department awarded prime contracts to foreign suppliers at the prime contract level for defense items and components totaling $1.57B, less than one-half of one percent of all DoD contracts; and about 1.5 percent of all DoD contracts for defense items and components. The data does not suggest that the value of prime contracts for defense items and components awarded to non-U.S. suppliers is increasing over time. In fact, the value of such contracts decreased from FY06 to FY07. In FY06, the Department awarded contracts to foreign suppliers for defense items 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 items and components. (For FY05 contracts, the values also were $1.9B. less than 1 percent, and about 2.4 percent, respectively.)

The Department does not, and can not, drive global commercial markets. In certain markets—such as 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 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 ODUSD(IP) is working with other DoD elements, and with input from industry associations (the Information Technology Association of America and the Aerospace Industries Association), as ODUSD(IP) develops 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 exclusively on domestic sources, it would not be prudent to do so. 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 collectively enabled the Department to rapidly develop, build, and field these vehicles to protect U.S. soldiers and marines. The V-shaped hull was originally developed and refined in South Africa. The vehicles also use armor designed in Israel, robust axles developed in Europe, and microcircuits manufactured in Asia. And, just as defense companies from outside the United States have helped field the MRAP vehicle, so too has the commercial sector. 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 and follow on light-MRAP programs would not be fielded so quickly without innovative technologies and quality products from the global defense and global 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 paid for 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 where 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 cannot 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, as stated earlier, the Department does not, and can not, drive global commercial markets. Instead of hoping that global commercial markets will adapt to the Department, the Department must adapt its practices to become a better, more "commercial-like" customer wherever possible. Accordingly, as discussed in Section 1.2.2, the Department is reaching out to traditional and non-traditional defense suppliers in order to identify, understand, and eliminate/reduce unintended barriers that prohibit full participation by global commercial suppliers in DoD programs.

1.3.3. Understand and mitigate unintended consequences of domestic source restrictions

A 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, Section 2533b of Title 10 of the United States Code requires the purchase of specialty metals melted or produced in the United States. 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 (COTS) items, expanded the exception for electronic components, contained a new civil-military integration exception for commercial derivative military articles and fasteners, provided a new de minimis exception, and added 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. The Department will be issuing, after a lengthy public comment and analysis period, a Final Rule into the Defense Federal Acquisition Regulation Supplement (DFARS) implementing the statutory changes to 10 U.S.C. §2533b. While section 804 provides the Department 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 preclude 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.

The Department's Strategic Materials Protection Board recently addressed this topic area. As required by section 843 of the John Warner National Defense Authorization Act for Fiscal Year 2007, Public Law 109-364, the Strategic Materials Protection Board met on December 12, 2008. The Board discussed and approved definitions of "strategic material" and "critical material" as follows:

- A "strategic material" is material which is essential for important defense systems, is unique in the function it performs, and for which there are no viable alternatives. Strategic materials include those specialty metals listed in 10 U.S.C. 2533b.
- A "critical material" is a strategic material for which the Department of Defense dominates the market for the material, the Department's full and active involvement and support are necessary to sustain and shape the

strategic direction of the market, and there is significant and unacceptable risk of supply disruption due to vulnerable U.S. or qualified non-U.S. suppliers.

The Board also reviewed and validated an assessment conducted by the Institute for Defense Analyses of reinvestment by domestic sources of strategic materials as required by Section 803 of the National Defense Authorization Act for Fiscal year 2008. That assessment, completed prior to the advent of the global economic downturn, concluded that the U.S. specialty metals industry is investing in new processing plants and equipment. However, unlike the advanced materials industry of the 1980s that looked mainly to military applications, today's materials industry is dominated by global commercial applications, including aerospace, conventional and nuclear power generation, energy exploration, and chemical plants.

Finally, the Board reviewed and validated an initial analysis of national security issues associated with strategic materials prepared by the Board's Executive Secretary. The analysis concluded that specialty metals are "strategic materials" but not "critical materials"; and there is no national security reason for the Department to take action to ensure a long term domestic supply of specialty metals.

1.3.4. Employ rational export control policies

In 2008, the Department of Defense established an Arms Transfer and Technology Release (ATTR) Senior Steering Group (SSG). The ATTR SSG is co-chaired by the Under Secretary of Defense for Policy and the Under Secretary of Defense for Acquisition, Technology and Logistics. It includes representatives of the Military Departments, the Under Secretary of Defense for Intelligence, the Assistant Secretary of Defense for Networks and Information Integration, and the Director of the National Security Agency. It is designed to provide direction to the various processes within the Department associated with approving the transfer of armaments and the release of classified and sensitive technology to international partners via foreign military sales, direct commercial sales, or international cooperative initiatives. It will do this by making timely decisions that build the capacity of allies and coalition partners and advance U.S. political-military objectives, while protecting U.S. critical warfighting capabilities and technologies from compromise or diversion to potential adversaries.

Several separate, but related, processes support these decisions, including the National Disclosure Policy Committee, the Low-Observable/ Counter-Low-Observable Executive Committee, the Committee on National Security Systems, the Defensive Systems Committee, and DoD export licensing process. Additionally, each of the Military Departments has its own internal review processes determining the transfer of capabilities and technologies within its purview.

The ATTR SSG:

- Serves as the overarching formal mechanism to ensure clear, policy-level direction is appropriately considered in technology release processes.

- Ensures that technology protection and release considerations are included in the very first discussions of high interest export weapons systems, and provides initial visibility into possible export proposals among all key stakeholders.
- Serves as an ombudsman, as necessary, providing a forum to discuss and shape the competing interests inherent in the desire to tightly protect certain critical technologies while also supporting the operational interests of coalition partners.
- Recommends improvements to major existing DoD foreign disclosure and technology transfer processes and corresponding arms transfer processes, individually and collectively.

Finally, 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. Additionally, the European Commission recently issued a draft directive on transfers within the European Union (EU) that, coupled with a draft EU procurement directive, could have the effect of favoring non-ITAR controlled technology in defense procurements conducted by EU Member States. This action underscores the serious issue that U.S. export control law and policy has become in defense trade. 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.

1.3.5. Continue acquisition reform

In 2007, the 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. This 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.

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

Independent Research and Development

In June 2008, the Under Secretary of Defense (Acquisition, Technology, & Logistics) requested the formation of a Defense Support Team (DST) to make recommendations to improve the effectiveness, efficiency and fairness of the Government's expenditure on defense firms' Independent Research and Development (IRAD). The review was led by DUSD (International Technology Security) and DUSD(Industrial Policy) and initial recommendations were provided to USD(AT&L) on October 27, 2008. In October 2008, the USD(AT&L) reinstituted the OSD IRAD Technical Coordination Group (TCG) to provide industry the information it needs to effectively implement its IRAD programs; strengthened the Defense Technical Information Center's capabilities to gather and assess IRAD information; and tasked the Defense Contract Audit Agency to provide annual IRAD spending reports. The TCG continues to work to gain insight into IRAD expenditures and to identify specific longer-term changes that will further improve the IRAD program.

Defense Acquisition Guidebook (DAG) Update

In October 2008 U.S. Government Accountability Office (GAO) report (GAO-09-05) entitled: "Department Of Defense: A Department-wide Framework to Identify and Report Gaps in the Defense Supplier Base is Needed," recommended that the Department take action to leverage and fully apply the criteria used by the ODUSD(IP) [see page 9 of this report] to guide the identification and monitoring of supplier base concerns throughout the Department. It further recommended that the Department create and disseminate DoD-wide written requirements for reporting potential concerns about supplier base gaps by delineating when, and to what level, supplier base concerns should be elevated. The Department agreed that there was merit in having formal, published criteria for making judgments regarding suppliers and components that are important to the Department and when program offices should report/elevate supplier issues to the ODUSD(IP). GAO's report coincided with an ongoing Defense Acquisition Guidebook (DAG) update which presented a fitting and timely opportunity to institutionalize these criteria in acquisition policy. ODUSD(IP) submitted new DAG language that continues to encourage program offices and the Military Services to resolve identified industrial capability issues at the lowest level possible. However, in cases when issues may impact more than a single program or Service, or when an industrial capability matter meets certain criteria (i.e., represents a single or sole source supplier; used by three or more programs; represents an obsolete, enabling, or emerging technology; requires 12 months or more to manufacture; has limited surge production capability), the proposed language would instruct the program office to elevate the matter via their Program Executive Officer to DUSD(IP) (even if the program office has ensured that its program requirement can and/or will be met).

The draft DAG update also adds a requirement for the program office to conduct an Industrial Capability Assessment (ICA) early in the acquisition process (during the Technology Development phase and prior to source selection). An ICA has always been required at Milestone B and C decisions but the proposed new language would not only focus on industrial base impacts earlier in the lifecycle but also broaden the scope of the program office assessment to a sector level. The ICA would determine whether the program's acquisition strategy would promote or retard: (1) a competitive marketplace; (2) the viability of any associated essential industrial/technological capabilities; and (3) the potential viability of non-selected firms as enduring competitors for defense products. In addressing these factors, the program office should consider:

- span of time between current and potential future contract awards that make selection critical to supplier business decisions;
- other businesses of the same type or emerging capabilities that could serve as a replacement solution;
- decisions that will impact a supplier's future viability (jeopardize future competitiveness or does not provide a sufficient business case to keep the capabilities/unit around for the future); and
- decisions that will establish new industrial capabilities (new facilities, demonstrate and productionize new technologies, preserve health of the industrial base).

While the DAG is still in coordination as this report goes to press, final approval of these changes is expected in early CY09.

Industry Outreach

Recognizing the value to the Department of on-going communication with industry to hear their perspectives on doing business with DoD, the Deputy Secretary established a policy to specifically encourage it. There is a perception in industry that risk aversion and uneven application of statutory limitations on communication with industry has unnecessarily limited DoD-Industry communication to the detriment of both. National Defense Industrial Association CEOs met with the Deputy Secretary and the Under Secretary of Defense (AT&L) to discuss DoD-Industry communication, among other topics. In November, 2008, as an outgrowth of that meeting, the Deputy Secretary established a policy to explicitly encourage DoD-Industry communication. Subject to statutory limitations on the government's ability to exchange information and sound business judgment, the new policy encourages government officials to communicate with industry on matters of mutual interest, including technology trends and development objectives, program performance, and complementary DoD and industry business practices and policies.

3. Defense Mergers and Acquisitions

3.1 Introduction

Robust, credible competition is vital to providing the Department 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 flux 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.

DoD 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 as amended by the Foreign Investment & National Security Act of 2007, Pub.L. 110-49.

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 2008, the Department reviewed more than the 44 transactions shown in the following table (the table does not include potential transactions that were not made public). The Department selectively identifies transactions for review and thus the below listing 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 identified concerns on a limited number of transactions:

- Microsemi and Semicoa were the only two suppliers of qualified high-reliability, small-signal transistors. Further, at the time of the acquisition, Semicoa was in the final stages of developing a capability to compete with Microsemi on high-reliability, ultra-fast recovery diodes, a market dominated by Microsemi. The Department objected to the transaction. The Department of Justice found the transaction to be anticompetitive and filed suit to block.
- Reed-Elsevier's $4B acquisition of ChoicePoint represented a monopoly for data tools for the intelligence communities. The company agreed to a consent decree to divest electronic public record services to Thomson Reuters.
- Apple's $278M acquisition of PA Semiconductor involved an emerging low-power microprocessor which defense firms were seeking to incorporate in wide range of applications. Apple agreed to continue the development,

production, and support production for a limited time period if production minimums were maintained.

- BAE's collaboration with General Dynamics for land vehicles involved an agreement that may have been considered anticompetitive. The agreement was rescinded, but a management process was established to allow the PEO to achieve the intended commonality.
- Alliant Techsystems' $1.3B proposed acquisition of Mac Donald Dettwiler and Associates involved consolidation of composite bus structures for satellites. The Canadian government blocked the deal as it was deemed not "likely to be of net benefit to Canada."
- BAE and Northrop Grumman proposed integrating their competing airborne infrared counter-measure systems. The Department determined that remedies would be required to safeguard future competition if the teaming were to proceed.

DEFENSE MERGER AND ACQUISITION REVIEWS – 2008

Acquirer	Acquired Company	Value ($M)*	Disposition	Product Area
L-3	Chesapeake Sciences Corp		In Process	Undersea Warfare Sensors
Lockheed Martin	Marinette Marine (20%)	$24	In Process	Shipbuilding
Sierra Nevada	Spacedev	$38	No Objection	Operationally Responsive Space Satellites
Pratt & Whitney	ARDE		In Process	Pressurant Tanks
Fincantieri	Marinette Marine	$120	No Objection	Shipbuilding
Chemring Group	Non-Intrusive Inspection Technology	$40	In Process	Robot and vehicle-mounted mine detection systems
Precision Cast Parts	Fatigue Technology	$66	In Process	Fasteners
General Dynamics	AxleTech International		In Process	Wheeled Vehicle Axles
Microsemi	Semicoa		Objected. Resolution TBD	Space qualified diodes
Cobham	Global Microwave Systems	$26	No Objection	RF modules
Teradyne	Eagle Test Systems		No Objection	Semiconductor Testing
Babcock & Wilcox (McDermott)	Nuclear Fuel Services		No Objection	Nuclear fuel
Serco Inc.	SI International	$510	No Objection	IT Services

DEFENSE MERGER AND ACQUISITION REVIEWS – 2008 (CONTINUED)				
Acquirer	**Acquired Company**	**Value ($M)***	**Disposition**	**Product Area**
TransDigm	GE Aviation Engine Ignition	$69	No Objection	Aviation ignitions
Reed-Elsevier	ChoicePoint	$4,100	Divestiture	Investigative Data Services
Harbinger (MSV)	Inmarsat		No Objection	SATCOM
Cobham	M/A-COM	$425	No Objection	GaAs MMIC
Finmeccanica	DRS	$5,200	No Objection	Defense Electronics
Philadelphia Gears	GE Gear Business Unit		No Objection	Marine Gearing
Boeing	Insitu	$400	No Objection	UAVs
Honeywell	Intelligent Automation Corporation		No Objection	Helicopter Health and Usage Monitoring
Plansee	Global Tungsten and Powders		No Objection	Rocket Nozzle Components
B/E Aerospace	Honeywell's Consumables Solutions	$1,050	No Objection	Aircraft Supply Chain Management
Apple	PA Semiconductor	$278	Supply Commitment	Low Power Microprocessors
BAE & General Dynamics	Abrams/Bradley Collaboration		Required Agreement to be Rescinded	Tracked vehicle mods/upgrades
Comtech	Radyne	$224	No Objection	Satellite Modems
BHP	Rio Tinto	$147,000	No Objection	Depleted Uranium
Hampson Industries	Odyssey Industries and Global Tooling Systems	$314	No Objection	Composite manufacturing tooling
Emergent Biosolutions	VaxGen	$2	No Objection	Vaccine
Alliant Techsystems and Day Zimmerman Team	Iowa & Milan Facilities Use Contract		No Objection	Ammunition Facility Operations

DEFENSE MERGER AND ACQUISITION REVIEWS – 2008 (CONTINUED)				
Acquirer	**Acquired Company**	**Value ($M)***	**Disposition**	**Product Area**
Alliant Techsystems	MacDonald, Dettwiler and Associates' Information Systems and Geospatial Services Operations	$1,325	Blocked by Canada	Satellite Payloads and Systems
Konigsberg	Hydroid	$80	No Objection	Unmanned Underwater Vehicles
MacDonald, Dettwiler and Associates	Alliance Spacesystems		No Objection	Space Robotics
L3 Communications	Northrop Grumman Night Vision	$175	No Objection	Night vision
Rockwell Collins	Athena Technologies		No Objection	Flight control and navigation
SAIC	SM Consulting		No Objection	Translation / Linguistics
Goodrich	TEAC		No Objection	Flight Data Recorders
BAE	MTC Technologies	$450	Divestiture of contracts	SETA
Everest Kanto Cylinder	CP Industries		No Objection	High Pressure Vessels
SAIC	Icon		Program Manager to monitor MILES and OneTESS	Laser-based military training
BAE and Northrop Grumman Collaboration	ATIRCM-DIRCM		In Process	IR countermeasures
Cobham	BAE's Surveillance and Attack business unit	$240	No Objection	Radar and EW Systems
Cobham	SPARTA	$416	No Objection	BMD SETA
Allan Vanguard	MED-ENG	$621	Resolved Tech Data Issue	Counter IED and EOD Equipment

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. Section 721 was revised by the Foreign Investment & National Security Act of 2007, Pub.L. 100-49 (FINSA). Section 721 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.[7] Implementation of the Exon-Florio 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 by FINSA require appointment of a lead agency for each case, mandatory 45-day 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.

[7] Excepting the International Emergency Economic Powers Act.

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, as revised by FINSA, 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.

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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

Joint Industrial Base Working Group (JIBWG) Studies

The Joint Industrial Base Working Group (JIBWG) is a government chartered forum under the direction of the Office of the Deputy Under Secretary of Defense for Industrial Policy (DUSD-IP) 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. Defense Contract Management Agency's Industrial Analysis Center (DCMA IAC), the Executive Agent for the JIBWG, was tasked by DUSD-IP to perform three studies.

a. Assessment of DoD Industrial and Production Analysis Capabilities (Oct 2008)

The study found that being proficient as an industrial analyst depends on an aggregate/cumulative background. Although there are adequate numbers of personnel in the Department engaged in the broad range of Industrial and Production analyses, the majority are not focused on the niche area of industrial analyses which is

characterized by macro analyses of industrial sectors evaluating an extensive range of factors such as DoD investment, industry trends, advanced technologies, advanced materials, etc. The skills and competencies to perform Industrial Analyses are atrophying; few organizations surveyed have formal succession plans in place as the Department's organic industrial base workforce is aging. Most organizations utilize standard federal/normal backfilling procedures for a position once it is vacated.

DCMA IAC recommends the development of Desk Procedures for analysts to conduct industrial capability assessments; utilization of formal training and on the job training, as well as Defense Acquisition Workforce Improvement Act certification as a means to affect and equip the next generation of Department industrial base professionals. The Department should maintain a cadre of independent industrial capability analysts in a DoD organization that have no allegiance to programs or contractors so that analytical products contain objective and unbiased findings, conclusions and recommendations. The Department should also consider the institutionalization of an industrial base skill sets Component Succession Plans within DoD and establish formalized industrial base skill sets on web based training for use throughout the Department. It is also recommended to enhance integrating industrial base training modules in course curriculum at the Industrial College of the Armed Forces, War Colleges, and similar Department Institutions. The Department is considering the recommendations.

b. Identification of DoD Single Sources of Supply (December 2008)

During a review of service contracts, the Office of the Deputy Under Secretary for Industrial Policy (DUSD-IP) noticed that many contracts had single sources. The contracts were competed, but only one source entered the competition. This discovery of single sources on competitive contracts led to the question of "is the Department driving our contracts to single sources via some type of barriers to competition?" If the Department is in part causing limited competition, it would be prudent to identify where and what can be done to improve competition. JIBWG Members were tasked to assess/determine the possible reasons why the Department is in this situation.

A single source is a supplier that is the only source for the product, now, but other sources are or could be available if needed without significant additional cost, time, and risk. A sole source is a supplier that possesses unique equipment, processes, facilities, or technologies; and is the only source capable of producing the item. Other sources might be available with significant additional cost, time, and/or risk. The report concluded that Single Sources of Supply tend to be selected and qualified within a supply chain that may normally have a competitor. There are numerous policy and legislative requirements that limit competition at the sub-tier levels. DoD policy mandates competition in most cases even when it may be inefficient. Dual sourcing would be expensive and in many cases not practical. Addressing those barriers that limit DoD access to COTS products will improve competition, as well as allowing DoD to leverage suppliers sustained in part by commercial sales. DoD should continue to assess and monitor mergers and acquisitions, major contract awards, teaming and

subcontract agreements, outsourcing, and Government Furnished Equipment (GFE) decisions. Development of standards to obtain digital data will allow for increased competition and an increased number of selected repair and replacement parts throughout the systems life cycle.

c. Identification of Technology Investments Overseas to Avoid International Traffic in Arms (ITAR) Competition Barriers (December 2008)

The Deputy Under Secretary for Industrial Policy (DUSD-IP) office is concerned that U.S. suppliers are replicating or making new technology investments overseas to avoid export control and International Traffic in Arms (ITAR) competition barriers. Anecdotal data surfaced in some industrial sectors (mostly dual use or technology areas where we no longer lead the world) where U.S. firms are disadvantaged in foreign competitions due to delays in acquiring export control and ITAR licenses. It was theorized that firms may be replicating their U.S. investments in technologies and facilities overseas to eliminate this competitive disadvantage. JIBWG members were challenged to explore and identify instances where U.S. firms have either replicated or are making new investments overseas to avoid export controls and ITAR competition barriers. If information substantiated the theory, it would be used to ascertain the level of impact these regulations are having on the U.S. Industrial base. The results of the assessment will help in determining if the Department should consider developing a legislative proposal to limit or eliminate the competitive disadvantages to U.S. firms in certain Industrial Sectors.

The report concluded that ITAR regulations have either directly or indirectly precipitated global competition and is a significant impediment to the U.S. industry's ability to market to foreign buyers. Lost sales are significant. The licensing and Technical Assistance Agreements (TTAs) processes impact competitiveness and a significant number of firms at all tiers are not applying for export licenses and/or may be changing their business models. Many are focusing on domestic customers only. Some foreign firms advertise systems as "ITAR-FREE." This impacts Tier 2 and 3 suppliers exporting into foreign systems. Compliance costs are not generally substantial but have been relatively greater for lower tier companies. To maintain and enhance the U.S. competitive position in the global market, ITAR regulations and processes need to be frequently reviewed and adjusted to ensure personnel and funding levels align with the number of applications processed. Restrictions regarding sales to U.S. allies should also be re-examined to reflect geo-political and economic considerations. The ability to win additional major weapon systems sales will have spillover benefits for all tiers of U.S. industrial base and overall national security. As noted in section 1.3.4, the European Commission has issued a draft directive on transfers within the European Union (EU). This, coupled with a draft EU procurement directive, could have the effect of favoring non-ITAR controlled technology in defense procurements conducted by EU Member States, underscoring the issue that U.S. export control law and policy has become in defense trade.

Munitions Industry Capability and Surge Analysis (February 2008)

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. DCMA has provided annual updates to J-4 since 2001 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 de-conflicting of 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 Munitions (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. 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, near-term challenges 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.

Defense Department Profit and Contract Finance Policies and Their Effects on Contract and Contractor Performance (February 2008)[8]

The Institute for Defense Analyses (IDA) published two complementary ODUSD(IP)-sponsored reports. This report and "Can Profit Policy and Contract Incentives Improve Defense Contract Outcomes?" (October 2008)[8] collectively assess the extent to which current DoD profit policies: (1) provide an "adequate" profit to defense contractors; (2) incentivize contractors to control costs; and (3) CAN incentivize significant improvements to defense contract performance, schedule, and cost outcomes. This report concludes that the profits of major U.S. defense contractors are above those required to keep them in the defense industrial base because government investments in direct research and development and progress payments result in free cash flow return on invested capital that generally outperforms those of other industries, including pharmaceuticals, software, services, and the overall S&P 500. The report did not show that contract type had a strong influence on contract outcomes. For example, the data did not show that firm fixed-price contracts exhibited better cost performance than cost-plus contracts. The report is posted on the ODUSD(IP) website (http://www.acq.osd.mil/ip). ODUSD(IP) is working closely with the Office of Defense

[8] Revised February 2009

Procurement and Acquisition Policy (DPAP) to determine any necessary follow-up actions.

Defense Science Board Task Force on Defense Industrial Structure for Transformation (July 2008)

The Task Force identified key elements of an action plan to work with industry through the customer/supplier relationship to transform the consolidated 20th Century defense industry into the National Security Industrial Base needed for the 21st Century.

The action plan is based on four Key Findings:

- There is a critical need for DoD to establish a National Security Industrial Vision, working with industry to ensure realization of an improved Customer/Supplier relationship.
- DoD must drive business practice transformation of its own in support of a 21st Century military.
- The Government must facilitate the rapid and affordable acquisition of needed weapons, systems, and services that are world-class.
- The DoD acquisition workforce must be strengthened in order to facilitate the timely and cost effective acquisition of military capabilities and provide enhanced government oversight of program management.

Based on these Key Findings, the Task Force offered nine recommendations for a supporting Action Plan:

- Articulate a National Security Industrial Vision.
- Focus on interoperable, net-centric systems-of-systems.
- Achieve lower costs and faster-to-field capabilities while still achieving better performance.
- Train As We Fight: Recognize the role of contractors in the “battlefield.”
- Focus on "staying ahead" by adequately resourcing "Engines of Innovation. “
- Understand and realize the benefits of globalization while mitigating risk.
- Achieve far greater use of "best value" competitions and foster long-term competitive dynamics.
- Transform the DoD logistics system into a world-class, data-centric logistics system.
- Move aggressively to strengthen the future, high-quality, high-skill, Government Acquisition Workforce.

The Department is evaluating the Task Force’s findings and recommendations.

Foreign Sources of Supply: Assessment of the United States Defense Industrial Base (September 2008)

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 September 2008 report was, as required by law, based on an assessment of DoD prime contracts valued at over $25,000 for defense items and components exclusively. Other Department of Defense (DoD) reports to Congress provide information on total DoD purchases from foreign entities,[9] and total DoD purchases of supplies manufactured outside the United States.[10]

The report concluded that the Department employs foreign contractors and subcontractors judiciously, and in a manner consistent with national security requirements. In FY07, the Department awarded contracts to foreign suppliers for defense articles and components totaling approximately $1.57B, less than one-half of one percent of all DoD contracts; and about 1.5 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).

Can Profit Policy and Contract Incentives Improve Defense Contract Outcomes?" (October 2008)[8]

The Institute for Defense Analyses (IDA) published two complementary ODUSD(IP)-sponsored reports. This report and "Defense Department Profit and Contract Finance Policies and Their Effects on Contract and Contractor Performance (February 2008)[8] (see above) collectively assess the extent to which current DoD profit policies: (1) provide an "adequate" profit to defense contractors; (2) incentivize contractors to control costs; and (3) CAN incentivize significant improvements to defense contract performance, schedule, and cost outcomes. This report concludes there is not a realistic prospect of using the incentive tools permitted by the DFARS (weighted guidelines and contract type) to greatly improve the average performance,

[9] The Department of Defense Fiscal Year 2007 Report on Purchases from Foreign Entities can be found at http://www.acq.osd.mil/dpap/cpic/cp/docs/DoDfiscalyr2007_purchasefromforeignentities.pdf

[10] The Department of Defense Fiscal Year 2007 Report on Purchases of Supplies Manufactured Outside the United States can be found at http://www.acq.osd.mil/dpap/cpic/cp/docs/dodfy2007_purchofsupmanuoutsideus.doc

schedule, and cost outcomes of DoD contracts. There is a tension between the goals of the incentive provisions of development and low-rate production contracts and the comparatively large profits of the production phase. For example, the prospects of large profits during production may reduce the effectiveness of incentives in development and early production intended to lower procurement cost, and therefore lower profit during production. The report is posted on the ODUSD(IP) website (http://www.acq.osd.mil/ip). ODUSD(IP) is working closely with the DPAP to determine any necessary follow-up actions.

Strategic & Critical Materials Working Group (November 2008)

To ensure consistency for the various Department of Defense activities and reporting requirements related to strategic materials, the Strategic Materials Protection Board (SMPB) Executive Secretary formed the Strategic and Critical Materials Working Group (Working Group). The Working Group consists of representatives of the SMPB Executive Secretary, the Defense National Stockpile Center (DNSC), the Army, Navy, Air Force, Marines, and other government agencies such as the United States Geological Survey and the Department of Commerce.

The Working Group convened on February 25, 2008, and met regularly from March through August 2008. The primary tasks of the Working Group were:

- Develop a list of strategic and critical materials required for purposes of national defense;
- Develop a management system to maintain the list of strategic and critical materials on an ongoing basis;
- Identify specific execution authorities to be vested in USD(AT&L) by Congress;
- Identify a process for DNSC, upon USD(AT&L) validation of emergent requirements, to immediately procure;
- Identify a process for DNSC to take advantage of optimal market conditions in the procurement, holding, and release of materials to meet long-term, validated requirements;
- Analyze domestic availability and reliability of access to foreign markets for these materials, and the availability of foreign production facilities if no domestic production capability currently exists;
- Develop a strategy to ensure availability of these materials;
- Develop strategies designed to strengthen the industrial base; and
- Report on the efforts of foreign countries to stockpile critical materials.

The Working Group conducted the analyses and prepared the report requested by Title XXXIII of House Report 109-89 (*National Defense Stockpile*) and Page 189 of

Senate Report 110-155 (*Strategic and Critical Materials*). The report included a review of the current policy to dispose of material in the National Defense Stockpile (NDS) and recommendations regarding reconfiguration of the NDS to adapt to current world market conditions to ensure future availability of materials required for defense needs. In response to the request in Senate Report 110-155 that accompanied the Department of Defense Appropriations Act, 2008, the report also describes "the materials critical to the strategic defense interests of the United States, the domestic suppliers of those materials and their reliance on foreign sources of production, efforts by foreign countries to stockpile critical materials, and the steps that are being taken to ensure that strategic and critical materials not produced domestically will be available to support the defense needs of the United States during a protracted conflict."

Infrastructure Rationalization in the U.S. Naval Ship Industrial Base (November 2008)

IDA published this ODUSD(IP)-sponsored report that examined the cost and financial structure of the major U.S. shipyards for evidence of rationalization following the period of industry consolidation that began in the mid-1990s; and compared that with consolidation effects noted in the missile and aircraft industries. The report concludes that there has been significant rationalization in the missile industry, but not in the major U.S. shipyards or aircraft industry. This is so, primarily, because, after consolidation, there was significant "fungible" duplicate capacity in the missile industry, but not for shipyards or aircraft prime contractors. Fungible duplicate capacity enables a firm to rationalize production deliveries at its more efficient plants, move programs from less efficient to more efficient plants, and shutter the duplicate, less efficient plants. The report is posted on the ODUSD(IP) website (http://www.acq.osd.mil/ip). ODUSD(IP) is determining any necessary follow-up actions.

Assessment of Industry Investment in U.S. Domestic Production of Strategic Materials (December 2008)

Section 803 of the National Defense Authorization Act for Fiscal Year 2008 (Public Law 110-181) required the Strategic Materials Protection Board to "perform an assessment of the extent to which domestic producers of strategic materials are investing and planning to invest on a sustained basis in the processes, infrastructure, workforce training, and facilities required for the continued domestic production of such materials to meet national defense requirements." Only companies associated with the primary processing of strategic materials were studied, more specifically those involved in the melting of the metals and thus protected by 10 USC 2533b. Publicly available data and information supplied by the companies were utilized to determine the extent to which the companies are investing in the domestic production of strategic materials.

The study showed U.S. producers of strategic materials are investing for continued domestic production. Unlike the "advanced materials" industry of the 1980s

that looked mainly to military applications, today's materials industry is dominated by global commercial applications including aerospace, conventional and nuclear power generation, energy exploration, and chemical plants. Specialty metals investment is primarily driven by demand for commercial aircraft applications. For example, the titanium sector is investing aggressively for dramatic expansion in anticipation of a growing market for titanium a result of the demand for new, super-efficient airplanes like the Boeing 787 and Airbus 380. The analysis was completed prior to the worsening global financial crisis; however, the consensus viewpoint is that the sector's planned capital investments prior to the credit freeze and forecasted global recession is only being slowed to a more manageable pace and are not being cancelled for the long-term metals outlook still predicts global growth.

Strategic Materials Protection Board Report to Congress (January 2009)

Section 843 of the National Defense Authorization Act for Fiscal Year 2007, Public Law 109-364, required the establishment of a Strategic Materials Protection Board (SMPB) composed of representatives of the Secretary of Defense, the Under Secretaries for Intelligence and Acquisition, Technology, and Logistics, and the Secretaries of the Military Departments. The SMPB is to determine the need to provide a long-term domestic supply of strategic materials designated as critical to national security, and analyze the risk associated with each material and the effect on national defense that non-availability from a domestic source would have.

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 Strategic Materials Protection met on December 12, 2008. In its report to Congress, the Board noted that it had:

- Discussed and approved the definitions of "strategic material" and "critical material."
- Reviewed and validated an assessment conducted by The Institute for Defense Analyses to be provided to the Congress under separate cover. The report concluded that U.S. strategic materials producers are investing in new processing and equipment, primarily to meet increased demand for commercial aircraft applications.
- Reviewed and validated a draft report, also to be submitted separately, responding to the requests of Title XXXIII of House Report 109-89, and page 189 of Senate Report 110-155. The report recommended transforming the National Defense Stockpile into a Strategic Materials Security Program that would enable the Nation to more quickly adapt to world market conditions and ensure the future availability of materials required for defense and national security needs.

- Validated an *Initial Analysis of National Security Issues Associated with Strategic Materials* and authorized its publication in the Federal Register. Section 843 of the National Defense Authorization Act for Fiscal Year 2007, Public Law 109-364, directs the Department to "publish not less frequently than once every two years in the Federal Register 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' for purposes of section 2533b of this title."
- Revised the Board's Terms of Reference to reflect the modified definitions for strategic and critical materials; and to give the Board more flexibility to address emerging topics of interest.

4.2 Army

Thermal Imaging Module (TIM) 1500 Industrial Capability Assessment (April 2008)

The Army Program Management Office Stryker Brigade Combat Team requested Defense Contract Management Agency, Industrial Analysis Center (DCMA IAC) to assess industry's ability to maintain sufficient capacity and capability to support production of thermal imaging devices to support remote weapon stations and targeting systems for various programs and upgrades. The Stryker vehicle currently utilizes a remote weapon station on its vehicle and is being upgraded. The Thermal Imaging Module 1500 (TIM 1500) Infra-Red (IR) Targeting/Camera is a critical long lead time component of the Common Remote Operating Weapon Station (CROWS) and is being considered for several military vehicle programs, including the Stryker. The objective of the study was to provide the Program Office with information, findings, and recommendations to alleviate risk in meeting the objective of the current and future acquisitions demands of the TIM 1500 component.

The study concluded that the industrial base does possess other prime suppliers of Thermal IR Camera and Remote Weapon Stations that are available and could support other programs. A cost benefit analysis would need to be conducted to determine the feasibility of this approach. The report recommended the progress of the prime contractor be monitored to ensure the ramp-up implementation plan is progressing on schedule.

Extended Range Multi-Purpose Unmanned Aerial Vehicle (May 2008)

The Army Program Manager for Unmanned Aerial Systems (UAS), Redstone Arsenal, requested DCMA IAC to perform an analysis of the industrial base to support the Extended Range Multi-Purpose (ERMP) UAS program. The study supports the

Army's Milestone C Defense Acquisition Board review. Twelve contractors supporting the ERMP program were assessed for this study.

Ten contractors assessed were rated at either a Low or Moderate Industrial Risk and two contractors were rated as a Medium to High Risk. For each of the ten contractors that were found to be a Low to Moderate Industrial Risk, their capacity utilization levels could support additional workload at this time and it is assumed that this capacity will be available to support the future ERMP UAS workload. The two contractors rated Medium to High risk could not support additional workload at this time. The performance of these two contractors will be monitored through routine oversight of the industrial base.

Common Remote Operated Weapon System and Thermal Imaging Module 1500 Foreign Supplier Assessment (June 2008)

The Army Director, Remote Weapon Stations Program Manager (PM) Crew Served Weapons and the Army Program Management Office Stryker Brigade Combat Team requested DCMA IAC to analyze several Fiber Optic Gyro (FOG) and motor drive foreign manufacturers supporting the Common Remote Operated Weapon System (CROWS) and Thermal Imaging Module (TIM) 1500 programs. Four contractors were assessed for the study.

Analysis concluded that selected foreign contractors supporting CROWS and TIM 1500 associated components and technology were viable, although several recommendations to monitor various plans for facility movement and or consolidation were identified. Additional analysis of domestic capability and technologies regarding CROWS FOG and TIM 1500 motor drive manufacturers was suggested.

Army's Communications Sector (November 2008)

The needs of Homeland Security, Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) mission has brought increased focus on Communications and Voice and Digital Data Communications systems support. This study examined the capability of the Transmission and Communications Sector industrial base (private and organic) to develop, manufacture, and support legacy and future weapon systems used by the warfighter. In general, communications and transmission systems in the Army are relying primarily on Commercial-Off-The-Shelf (COTS) hardware to provide the majority of equipment. There are significant exceptions where military unique IT systems fill critical mission needs, but, even in those cases, the military unique systems make use of commercial technologies for their underlying implementation. Certain critical technologies, such as encryption devices, are developed specifically for the military and government by contractors. In general, the U.S.-based and available foreign technology businesses are fiscally healthy and will continue to provide cutting edge supplies and services for military missions for the foreseeable future.

The following are ongoing issues:

- The use of Lead-free solder in COTS equipment as mandated by the European Union significantly increases the risk of tin whisker growth in critical parts thus potentially raising failure rates to unacceptable levels for military systems relying on COTS equipment for things such as client workstations, data servers, telecommunications devices, etc. While less of a concern in Communications and Voice and Digital Data Communications systems than in other areas of C4ISR industrial base interest, this remains an issue to be addressed.

- There is some concern regarding the length of time elapsed during the Army-wide standardization to Internet Protocol Version 6 (IPv6) process. We continue to assess forward compatibility from IPv4 systems to IPv6 systems. A focus is how we will deal with potential obsolescence issues regarding legacy systems running in a future IPv6 environment.

Army Raw Material Sector Assessments (November 2008)

The U.S. Army Research Development and Engineering Command's Aviation and Missile Research, Development and Engineering Center (AMRDEC), Engineering Directorate's Industrial Operations Division continued a Raw Material Sector Assessment process during 2008 to assess the availability status of our key raw materials. To date, assessments on Aluminum, Beryllium, Butanetriol, Composite Fibers, Copper, Iron-based Alloys, Magnesium, Molybdenum, Nickel, Rhenium, and Titanium have been initiated and are being updated on a regular basis. New materials will be added as resources allow. Each material assessment looks at the raw material's supply sources, manufacturing processes used, end users of the raw material, and AMCOM-supported weapon systems requiring the material. No special action was taken as a result of the review.

Power Sources and Products Sector (November 2008)

The needs of Homeland Security, Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF) mission brought increased focus on power sources and products support. The study examined the capability of the Power Sources Sector industrial base (private and organic) to develop, manufacture, and support legacy and future weapon systems used by the warfighter. In general, power sources and products in the Army are relying primarily on Commercial-Off-The-Shelf (COTS) hardware to provide the majority of equipment. There are significant exceptions wherein military unique power systems fill critical mission needs. But, even in those cases, the military unique systems and products are developed but they also make use of commercial technologies for their underlying implementation. Certain critical technologies, such as fuel cell and batteries are developed specifically for the military and government by

contractors, but, again, the underlying technologies are commercially based. In general, the U.S. based and available foreign, power technology businesses are fiscally healthy and will continue to provide cutting edge supplies and services for military missions for the foreseeable future.

The following are current power source and products Industrial Base issues:

- Implications of the 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.
- Emerging battery chemistries that yield greater power in smaller form factors and lower weights. Battery manufacturers as competitors with the hybrid vehicle manufacturers for key materials in order to implement these solutions in rate manufacturing.
- Future requirements for tactical power generation in the field for military ground forces (Army and Marine) and the technical improvements required for traditional mechanically based power generation systems. And whether new technologies such as portable solar panels and/or fuel cells fill some or all of these needs.

As a result of these sector assessments, the following actions are under active consideration by Army:

Service level monitoring: The Army Materiel Command will continue to monitor the capabilities of the industrial base to ensure that it can satisfy the needs of Army C4ISR programs and tactical power requirements. The entire Department of Defense must continue to take action, through Manufacturing Technology (ManTech), Title III and other research and development programs to develop and preserve militarily critical technologies.

Obsolescence Management: Obsolescence continues to be a major factor in the continued support of weapons systems. As the service life of a DoD weapon system is extended, the obsolescence issues increase. These problems affect readiness and operating cost if left unresolved by increasing repair times and the cost of resolving the materiel shortage. Army continues a proactive Diminishing Manufacturing Sources and Material Shortages (DMSMS) program for all programs in order to combat the effects of parts and material shortages in support of the warfighter. Program Managers (PMs), as life cycle managers, have some programs in place.

Core Logistics Analysis: The Core Logistics Analysis process states the Weapon System Integrated Product Team (WSIPT) should be identified as early as possible in the system's life cycle. Representatives from the organic industrial base are part of the WSIPT. Early involvement by organic industrial base ensures that issues are

quickly identified and adjustments can be made to effectively support the new requirements.

4.3 Navy

Small Tactical Unmanned Air System / Tier II UAS program (January 2008)

Naval Air Systems Command, PMA-263 requested that Defense Contract Management Agency, Industrial Analysis Center (DCMA IAC) conduct an industrial capability assessment to support the Small Tactical Unmanned Air System (STUAS)/ Tier II UAS program. Emphasis was placed on assessing industrial capabilities required to successfully obtain products and services required for Milestone B review. The assessment determined the Unmanned Aerial Vehicle industrial base consists of at least fifteen major contractors that possessed the industrial capabilities required for research, design, development, test and evaluation, and maintenance for a STUAS/Tier II UAS type system. DCMA-IAC selected a sample population of seven. The study concluded that all seven of the contractors assessed were rated either a Low or Moderate Industrial Risk. Each contractor's capacity utilization levels could support additional workload and it is assumed that this capacity will be available to support the future STUAS/Tier II UAS program. The analysis indicated that Critical Sub-contractors and Engineering talent, e.g., Aeronautical, Electrical, and Software Engineers issues warrant further attention.

Small Tactical Unmanned Aerial Vehicle Addendum (April 2008)

Naval Air Systems Command, PMA-263 requested DCMA IAC to perform an addendum to the analysis of the industrial base supporting the Small Tactical Unmanned Aerial Vehicle (STUAV) program. The study was designed to inform the program's Milestone B Defense Acquisition Board review. It assessed four contractors that build small-to-medium Unmanned Aerial Vehicles.

The study concluded that the industrial base is sufficient to support STUAV production. All four of the contractors DCMA IAC assessed were rated as Moderate Industrial Risk. Each contractor's capacity utilization levels could support additional workload at this time and it is assumed that this capacity will be available to support future STUAV workload.

Technology Innovator Industrial Base study for Counter Radio Controlled Improvised Explosive Device Electronic Warfare (CREW) 3.3 (June 2008)

Naval Sea Systems Command, PEO Littoral and Mine Warfare completed an Analysis of Technology Innovator Industrial Base for Counter Radio Controlled Improvised Explosive Device Electronic Warfare (CREW) 3.3 study. The study was

performed by RAND, National Defense Research Institute. The study's objectives were to assess the strength and viability of the industrial base to support CREW production, and to identify small to mid-sized vendors that possessed innovative technologies likely to be relevant to the Joint Counter Radio Controlled Improvised Explosive Device Electronic Warfare (JCREW) program that have been successful in competitive markets. The study found that a strong market and vendor base exists with companies that have designed and produced a wide variety of components and modules that are relevant to the CREW 3.3 system. The study also provided several recommendations as to how the Government may increase competition through participation by smaller non-traditional sources. The JCREW program office is assessing how to best incorporate the study's recommendations into the acquisition strategy.

Advanced Anti-Radiation Guided Missile (AARGM) (August 2008)

NAVAIR (PMA-242) requested DCMA IAC to perform an Industrial Capability Assessment on the Advanced Anti-Radiation Guided Missile (AARGM) program. The assessment provided a baseline of industrial capabilities, financial stability, risks, and potential alternate suppliers of the identified critical contractors for the AARGM program. The study supported the Navy's Milestone C Defense Acquisition Board review.

The industrial base supporting the AARGM program has at least one reliable source currently providing their capabilities with potential alternative sources available but not within time and cost parameters. The assessment established all ten of the AARGM contractors were considered to be a 'Moderate' industrial risk. Six of the ten contractors were considered a 'Moderate' financial risk while the remaining four were considered 'Low' financial risk. It was 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.

U.S. Microwave Tube Industrial Base Assessment (November 2008)

The U. S. Microwave Tube Industrial Base is a Department of Defense dominated third tier component supplier of critical technology devices for use in Detection (Radars), Deception (Electronic Warfare) and Communication functions by the three services. Microwave Tubes are utilized in 80 percent of the U.S. Combat Systems using over 800,000 devices to support land, sea, and airborne operations.

From the U.S. Industrial Base, devices are supplied by two dominate, broad spectrum Microwave Tube product line companies, one major supplier of high power broadband Travel Wave Tubes and several niche markets suppliers. Consolidation of the U.S. industry continues this year with the announced departure of one of the small niche suppliers.

Based on current planned system production and platform decommissioning schedules, DoD requirements for operational Microwave Tube assets to fulfill active deployed system requirements will continue to slightly increase to a peak in 2015. In addition to the platform schedules, the projection includes insertion of alternate technologies and system architectures as they reach Technology and Manufacturing Readiness Levels suitable for insertion.

In support of emerging operational requirements, Microwave Tube Research and Development efforts are centered around the core Vacuum Electronics technical group at Naval Research Laboratory. Research & Development investments in Microwave Tubes span the breadth of current, near term through long term efforts with issues being addressed by System Project Offices through the Defense Advance Research Project Agency.

Supporting the Industrial Base Capability are two current projects. Addressing the critical need for Space Qualified Travelling Wave Tubes for satellite deployment, investments under Title III of the Defense Production Act are being made with a U.S. company.

On a broader scale, the Defense Logistic Agency (DLA) under the Defense Research Innovation Fund, has started a Microwave Tube Project to address Manufacturing, Quality, Supply Chain and Product Design issues associated with Microwave Tubes.

It should be noted that under Base Realignment and Closure (BRAC) 2005, the procurement management and related support functions of all Class-IX Depot Level Repairables was transferred to DLA. Included in this transfer, which is to be accomplished over a three year period, is the acquisition of all replenishment Microwave Tube assets for all services. This consolidation will provide a single face to industry and allow consolidation of requirements to enhance the manufacturing flow process in the U.S. Industry.

The continued high level operational tempo of DoD Forces continues to drive the spares market for Microwave tubes. In the current economic climate, the cost and availability of specialty materials and processes used in the construction of Microwave Tubes continues to be an issue needing close monitoring to insure no impact on the availability of affordable Microwave Tubes to meet the operational requirements.

Advanced Extended Echo Ranging Program (December 2008)

Naval Air Systems Command, PMA-264 requested that the Defense Contract Management Agency, Industrial Analysis Center (DCMA IAC) conduct an industrial capability assessment to support a Milestone B decision for the Advanced Extended Echo Ranging (AEER) (ACAT IVT) program. DCMA was tasked to analyze the capability and capacity of the prime and subcontractors that will develop and integrate

the AEER sensor and associated software into the P-3C aircraft. For this study, two contractors will develop the sonobuoys and one contractor will develop and integrate the AEER aircraft software. DCMA intends to finish the industrial capability analysis prior to December 2008, which will meet the requirement for Milestone B. Expectations are that the study will conclude that the industrial base is sufficient to support the sonobuoy production and software development for the AEER program.

4.4 Air Force

Air Force Industrial Base Analysis of Ejection Seats (May 2008)

This report, completed by SAF/AQ as a result of a Congressional Inquiry, addresses concerns regarding domestic capabilities to design and produce crew safety systems, specifically ejection seats for combat aircraft. The study includes information on facilities, workforce, unique capabilities, supplier issues, and research expenditures. In addition, a market forecast of potential ejection seat production requirements for the next ten years was developed.

The Department of Defense has two suppliers of ejection seats; Martin-Baker and Goodrich. Martin-Baker is a UK company with a majority of their current ejection seat production occurring in Europe. Martin-Baker has established a U.S. facility that was initially built to upgrade its Navy Aircrew Common Ejection Seat (NACES) and is now assembling T-38 ejection seats. The company plans to use the facility for production of seats for the F-35. Goodrich has four facilities in the U.S. supporting ejection seat design and manufacture. Goodrich's Advanced Concept Ejection Seat (ACES) II ejection seat is on programs nearing the end of planned production like the F-15, F-16, and F-22. In addition to assembling the ACES II, Goodrich produces commercial crew seats, manufactures linear explosive products, assembles cartridge actuated devices and propellant actuated devices (CAD/PAD) components, and operates a high speed test sled.

During the next ten years, Martin-Baker will have an estimated 80 percent share of the ejection seat market. Martin-Baker has captured the majority of the U.S. market with existing and planned contract awards for the Mk. 16 ejection seat being built for the T-6A, T-38 Ejection Seat Upgrade Program (ESUP) and F-35 Joint Strike Fighter. Potential DoD ejection seat purchases from Goodrich include retrofitting the B-2 fleet with a newly designed modular ACES II in 2011. Domestic engineering capability is a concern for several reasons. Annual DoD R&D spending on crew ejection systems is less than $3M split between the Navy and Air Force. Martin-Baker owns all technical data for its ejection seats while the Air Force acquired all technical data for the ACES II and maintains organic expertise for maintenance and testing.

There are some supply chain issues associated with ejection seat production decisions. Martin-Baker manufactures proprietary CAD/PAD components. With

Goodrich's business declining there could be an impact to certain domestic product lines. U.S. CADs/PAD manufacturers retain significant commercial sales of comparable items due to automobile airbags devices. Also, Martin-Baker does not currently use U.S. manufactured parachutes, so the ejection seat is not compliant with the Berry Amendment.

Overall, the domestic industrial base for ejection seats remains robust with Martin-Baker's planned expansion of U.S. production. Given fewer DoD aircraft starts in the future, the study recommended establishing a Joint AF/Navy focal point for engineering and test as a means of maintaining organic expertise and oversight. This office should work with Martin-Baker to develop dual sources (at least one domestic supplier) for key components to meet Berry requirements and maintain industrial capability.

Airfoil and Structural Casting Industrial Base Assessment (June 2008)

This report, completed by Air Force Research Lab (AFMC), focuses on investments made by the Air Force over the past decade in the precision casting industry to support the maturation of new products and technologies that enhance the performance of advanced fighter engine and aircraft designs. In addition, the Department of Defense has worked closely with the domestic casting industry to identify and implement process improvements in the areas of affordability and quality. This study assessed the results from recently completed investments and developed strategies for future initiatives that would improve the U.S. airfoil and structural casting industrial base and enhance U.S. competitiveness in the global market for both man-rated turbine engine and airframe components.

Performance demands are requiring the increased use of exotic materials, complex cooling schemes, and advanced coatings. Adopting new technologies requires trade-offs as customers balance competing priorities for reduced acquisition costs and improved system capabilities. The ability to improve the producibility and production throughput of new cast products is critical if the demand required by planned systems such as the F-35 is to be met. The best way to improve part yields is with early process development and modeling of blade and core designs, identification of cooling and thermal management requirements, and cycle time reduction planning.

Planned requirements for Air Force engines, as well as, T700 blades for Army helicopters support the business case for further DoD and company collaboration in manufacturing processes within the domestic casting industry. Activities that have the potential to shorten the cycle time and reduce costs such as modeling, rapid tool making or tool-less manufacturing should be pursued. Investments in new shop floor technologies and processes related to pattern making, ceramic systems, casting and inspection were identified as needed to significantly change current cost and production metrics.

The Air Force is working to identify resources to structure a collaborative initiative that includes the other Services, propulsion and airframe original equipment manufacturers and the major precision casting suppliers. The initiative will focus on development and manufacturing process capabilities. The effort would be balanced towards legacy, development and advanced systems with strong metrics for direct and indirect savings to DoD warfighters.

Update to 2006 Fighter Engine Production Industrial Base Analysis (June 2008)

The Military Deputy, Office of the Assistant Secretary of the Air Force for Acquisition (SAF/AQ) requested Defense Contract Management Agency, Industrial Analysis Center (DCMA IAC) to update the Fighter Engine Industrial Capability Assessment performed in 2006. The purpose of the Study was to assess industry's ability to maintain sufficient advanced design and production capability for next generation of military aircraft fighter engines.

The study concluded that at the completion of F-135 & F-136 (Joint Strike Fighter engines) System Development and Demonstration (SDD) programs, Industry will be without a major fighter engine development program for the first time in over 35 years. Findings included that there is currently no defined (non-classified) DoD requirements for next-generation or derivative engines, Component Improvement Program (CIP)/Turbine Engine Technology Science & Technology (S&T) funding is insufficient to sustain design and engineering base and analysis of data suggests a quick erosion of engineering skills and infrastructure will occur. Information in the study is planned to support critical industrial base discussions with the next Administration. Site visits were completed to three contractors supplying fighter engines.

Infrared Focal Plane Array Substrate Industrial Base Assessment (August 2008)

Domestic manufacturers of third generation infrared (IR) focal plane arrays (FPA) are dependent on a sole supplier, the Japanese company Nikko Materials, for large format, high quality 211 Cadmium Zinc Telluride (CZT) substrates. Because domestic capability to produce CZT is currently limited by size, yield, and quality, there is no domestic supplier of production-ready substrates of this type. Lead times for substrate delivery have been increasing. This study characterized the risk associated with a sole-source dependency, evaluated the progress of ongoing research and identified Government investment options to mitigate potential risks. The assessment included an in-depth analysis of the health and viability of the substrate segment of the IR FPA industry, including key stakeholders, trends in supply and demand, and constraints throughout the supply chain.

211 CZT-based IR FPAs will remain the only viable option for space-based systems for at least the next decade. Next-generation materials and technologies are being developed, but will not be considered for use in military applications for at least

five years. Government program demand for CZT material is projected to increase substantially from ~$5M/year currently up to$20M-$25M early next decade as programs requiring third generation IR detectors enter full production. A large percentage of projected demand, perhaps more than 50 percent, will be due to programmed Army systems. Due to the expense of 211 CZT substrates, volume users will continue to look for both affordability improvements to existing processes and cost-effective alternative materials to satisfy requirements.

At current demand levels, Nikko is a reliable and sufficient supplier of 211 CZT substrate materials. Even though Nikko has no plans to exit the business and is making capital investments to increase capability and capacity, there are some risks associated with a foreign sole source supplier. For example, export control regulations in both the U.S. and Japan can delay and disrupt deliveries. The domestic FPA houses (Raytheon Vision Systems, Teledyne Imaging Sensors, BAE Systems, and DRS) are healthy. Three of the four are pursuing potential options for domestic 211 CZT substrate production at multiple points along the value chain. Additionally, two research projects are on-going that may provide alternatives for growth and polishing of 211 CZT substrates.

The assessment validated current DoD efforts to develop a domestic source for 211 CZT substrate through the establishment of a “merchant supplier consortium.” This approach leverages both government and domestic FPA industry investment. This “horizontal” arrangement prevents a single, vertically-integrated supplier (i.e., one of the established FPA houses) from refusing to sell substrates to a competitor. In addition, planned R&D funding into alternative and next-generation materials and technologies needs to continue with a goal of qualification in space applications in the next 10 to 15 years.

Solid Rocket Motor Industrial Base Assessment (August 2008)

There have been a number of recent efforts to evaluate the viability of the domestic solid rocket motor (SRM) industry. These studies have looked at SRM casting facilities and key material suppliers. The concern is that consolidation and declining demand jeopardizes the industry’s ability to maintain the necessary skill set for what is seen as the industrial “art” of casting motors. These prior studies have focused on space and strategic launch and have not included requirements and capabilities for tactical missiles when evaluating the long-term heath of this market and its ability to maintain critical skills, processes and suppliers. This report merged production forecasts for both strategic and tactical systems to evaluate potential risks to domestic manufacturing capabilities.

The SRM industry currently has adequate capacity to meet demand for small, medium, and large missiles. The industry has segregated its workforce and facilities by motor size with small tactical motors being produced at facilities primarily in the southeast and large motors for space launch and ICBMs being produced at locations in

the western U.S. In the small SRM market, demand is fairly steady over the FYDP. Small and medium missiles account for less than 20 percent of annual propellant production. Large motors production is necessary for sole and single source material suppliers, who are operating near minimal sustaining levels, to remain viable. Domestic availability of materials such as ammonium perchlorate, aluminum powder, HTPB R45 binder, and rayon-based carbon phenolic tape is at risk.

The large SRM market faces insufficient demand beginning in the 2010–2011 timeframe. Major DoD and NASA programs come to an end and the timing of follow-on launch programs create a gap in demand lasting anywhere from 18 months to four years. Current facility utilization is less than 30 percent, and is at risk of declining below levels that can sustain two companies with large motor casting capability. This gap puts infrastructure and workforce at risk, and creates an environment that will most likely precipitate the further consolidation of casting facilities. Factors such as lengthy/expensive qualification requirements and environmental restrictions inhibit the use of alternative materials further constraining lower tier suppliers.

The Government will need to pursue several options, including: monitoring further consolidation of both primary and sub-tier SRM manufacturers; cataloging critical skills, facilities and equipment to evaluate both investment requirements and synergy with small/medium tactical SRMs; and adoption of alternative technologies, materials and qualification methods. Depending on funding, the Government will need to evaluate the feasibility of restructuring program portfolios to level SRM demand. This could include shortening the Shuttle-to-Ares transition, extending the Propulsion Replacement Program (PRP), or accelerating a Minuteman III replacement program.

Large Optical Coatings and Mirrors Industrial Base Assessment (October 2008)

This study, completed by Air Force Research Laboratory (Defense Production Act Title III Program), focuses on the U.S. large optics industry capable of producing coated optics with effective diameters > 0.50 meters. Large optics are cost and schedule drivers for the systems that employ them. This assessment provides an industry perspective on the technical and competitive challenges facing the large optics industry and identifies investment and policy initiatives to improve the ability of the industry to respond to forecasted customer requirements.

The market for large optics has steadily increased over the past decade and is driven predominately by DoD and NASA requirements. The large optics value stream consists of three distinct segments: optics fabricators (responsible for delivering a specified, coated optic), optical coating providers, and material substrate manufacturers who specializing in various types of materials with competing characteristics for specific application environments. Current product development efforts are focused on lighter-weight materials, greater surface precision, faster aspheric design, and advanced optical coatings for laser applications. Large optics manufacturers and suppliers provide niche capabilities for low volume manufacturing. The market is persistently

barely sufficient to sustain the small teams of designers, engineers, and highly skilled production workers.

The large optics fabricator segment of the large optics industrial base (and the optical coating segment to some extent) has seen consolidation through mergers and acquisitions. Conversely, the number of suppliers (both foreign and domestic) in the material substrate segment has increased with the development of new materials. Several programs requiring fused or IR-transmissive silica rely on sole foreign sources. In addition, glassy materials compete for both R&D funding and sales with alternative materials such as beryllium and silicon carbide. To adapt to new materials, manufacturers have to invest in process capabilities in order to respond to demands for stringent performance specifications, lower costs and shorter production schedules. Given the limited market for these products, investments are needed, especially in the areas of innovative mirror design, *in situ* metrology, process control, and test automation for optical fabricators and optical coating providers.

The Air Force is evaluating the need to establish a joint working group comprised of inter-departmental and inter-agency participants to capture near and long term large optics requirements, develop government-wide strategic investment roadmaps, and address foreign dependency issues by performing cost-benefit analyses for qualifying alternative sources of IR transmissive laser glass and SiC seed crystal.

Organic Matrix Composites Fiber and Resin Industrial Base Assessment (October 2008)

This study, completed by Air Force Research Laboratory, assessed the health of the industry that produces organic fibers and thermoset resins used in the fabrication of aerospace structures and components. In addition to using many fibers and resins that have commercial applications, the Department of Defense uses specialty, high temperature resins and high modulus carbon fibers that currently have limited or no commercial use. This places the Department in the position of both relying on commercial production capacity and market pricing for the majority of its fiber and resin purchases, and funding technology development that results in the production of small lots of specialty materials.

Aerospace usage of carbon fiber has grown from one percent of the market eight years ago to nearly 15 percent today. The expanded use of high volume composite fibers and resins, such as carbon/epoxy, in commercial aviation has kept domestic suppliers healthy. Oil price increases have been a two-edged sword. Price increases have varied from minor for high volume resin and fiber to moderate for smaller volume specialty resins. At the same time, rising fuel costs have accelerated the adoption of composites to make aircraft lighter and more fuel efficient. As DoD requirements for advanced systems (UAS, hypersonic aircraft) increase, demand for high modulus carbon fiber could exceed current industry capacity.

Many specialty polyimide resins precursors used by the Air Force come from single and foreign sources. In most cases, the formulas are proprietary and have to undergo expensive qualification processes. A significant portion of the production capability for quality high and ultra-high modulus carbon fibers and precursor resides in Japan. Japanese trade policy restrictions have the potential to disrupt shipments of these proprietary materials exported for U.S. military applications. On-going actions are in place to find a qualified replacement material for rayon-based carbon fiber (domestic source exited the market) but indications are the USAF has stockpiles sufficient for programs of interest for the next several years. Environmental and occupational health concerns are increasing with respect to some resins (and their precursors). To address this, the industry and their government customers are supporting research on processing methods that reduce or eliminate human exposure to current qualified resins, and investigating resin systems with alternative materials that will require qualification prior to substitution.

The assessment outlined recommendations to mitigate risks that might impact the availability of aerospace composite fibers and resins for planned and future Air Force systems. A dual strategy needs to be implemented that strengthens domestic sources through research and process improvement investments while securing agreements with overseas sources and/or their governments to avoid adverse supply disruptions. The Air Force is also investigating cradle to grave, recycling options for organic composite resins used on current systems.

Photomask Sets for Microelectronics Industrial Base Assessment (October 2008)

As many semiconductor companies shift to “fabless” manufacturing, becoming more reliant upon merchant suppliers at all stages of the production process, the high cost associated with photomask operations made it one of the first processes to be divested and in most cases moved off-shore. Divestiture of photomask operations from vertically integrated device manufacturers and consolidation of the photomask industry has resulted in fewer photomasks providers of leading edge technologies.

Photomasks for ground and space do not differ substantially with uniqueness of the end product integrated circuit dictated by design requirements. Currently, photomasks to meet classified requirements for space systems are being met by a sole domestic source, IBM. Supplier capacity is keeping pace with demand but concern exists whether sufficient government demand will encourage industry providers to maintain accreditation. In order to minimize risk and assure the availability of a trusted supplier in the future, two additional suppliers, Photoronics and Toppan Photomask, are being assessed. Both should complete the accreditation process by mid-2009.

IBM is currently expected to maintain its accreditation as a captive and merchant supplier. The possible addition of two more accredited suppliers should increase the domestic supplier base and sustain the ability to provide the full spectrum of leading edge mature geometries. In addition, increasing the number of photomask suppliers

should offer wafer foundries greater opportunities for competition for masks at the mature geometries.

This assessment supports findings from other organizations that no government investment should be necessary at this time given the current status of the photomask and space systems markets. However, the Government should continue to monitor the supplier base to ensure continued participation in the sector and provide incentives for suppliers to maintain accreditation if demand does not materialize to offset accreditation costs.

Report on ICBM Industrial Base Capabilities to Maintain, Modernize, and Sustain Minuteman III through 2030 and Provide a Replacement Land-Based Strategic Deterrent System After 2030 (October 2008)

Recent analyses of the strategic ballistic missile industrial base have identified increased challenges associated with the Air Force's ability to maintain a viable deterrent. This report, directed by Senate Report 110-155, dated 9-14-07 and performed by SAF/US, addresses the capability of the defense industrial base to support the Air Force InterContinental Ballistic Missile (ICBM) program through 2030. The Air Force's on-going Minuteman III ICBM modernization programs will be complete by FY2009. These modernization efforts have focused on the replacement of propulsion, guidance, and reentry subsystems. Modernization program funding has averaged $400M annually over the past eight years. This has sustained expertise and facilities within industry and the government. Additional modernization programs are programmed through 2015, but at only ten percent of the previous annual funding level.

At the completion of the current ICBM modernization efforts, the probable scenario is that large portions of the current workforce will retire, be moved to other work within the companies, or go to new jobs elsewhere. Most likely, these skills will not be recoverable. The risks of not having industrial resources in place to develop and produce a follow-on land based strategic deterrent are quantifiable in terms of cost, schedule, and capability. The skills and capabilities need to be preserved during the period between the end of the current modernization programs and the start of new systems development. The risk is further exacerbated in that companies in the lower tiers of the ICBM supply chain with unique materials, processes and specific skill sets may choose to exit the market due to the drop in demand.

An effective combination of focused research and development, maintenance upgrades, and a minimum sustaining rate production line for key subsystems/components are required to retain critical skills and capabilities existing in the current industrial base. The Air Force is currently employing a holistic approach working with DoD and industry partners to preserve a national industrial capacity to develop, produce, and deploy strategic missile capabilities. Air Force Research Laboratory (AFRL) continues to focus on developing and maturing new technologies that can be applied to meet future land based strategic deterrent requirements. The

ICBM Demonstration/Validation Program is actively exercising selected critical research, design and testing skills through technology development, but has limited impact on long term sustainment of manufacturing infrastructure.

The Air Force will continue to coordinate with other Service and Agency programs such as the Navy Strategic Systems Program (SSP), Conventional Prompt Global Strike (CPGS) and Missile Defense applications, in order to monitor the aggregate impact to ICBM related industrial base capabilities. To continue to maintain, sustain, and modernize the ICBM system to 2030, sufficient resources are required to preserve selected, unique ICBM production and development capabilities. This assessment is being used to evaluate programmed budgets for sufficiency and to highlight additional investments to infrastructure and technology development.

Solar Cell Coverglass Industrial Base Assessment (October 2008)

Used on satellite solar panels/arrays, solar cell coverglass protects the underlying power-generating solar cell from the harsh radiation environment of space and from micrometeorites. Current market demand is about evenly split between Government and commercial customers. This study, completed by Air Force Research Laboratory, was initiated due to concerns regarding the availability of quality material for the approximately 40 National Security Space programs that require the material. While next-generation solar arrays may not require coverglass (e.g. flexible, thin film arrays), these new technologies are not anticipated to be widely implemented for at least a decade.

Solar cell cover glass is a mature technology. Currently, worldwide demand averages only $6.5M annually. There are currently two manufacturers of this material and only one, JDS Uniphase with 40 percent of the market, is a domestic supplier. Demand is projected to remain relatively stable for the next five to ten years and the market is not large enough for a third supplier. There are high barriers to entry in terms of equipment and qualification costs that limit developing new suppliers. Recent quality problems have occurred due to incompatibility between small batch coverglass manufacturing and the requirement to obtain precursor glass in large batch purchases from the current sole source supplier, Corning.

The current production capability for solar cell coverglass is adequate to meet forecasted demand in advance of new technologies that might eventually supplant it. Buying smaller batches of precursor glass from a second source would improve both the affordability and quality of JDSU's solar products and allow them to be more responsive to their customers. Currently, AFRL is overseeing a commercialization pilot program with Infoscitex and Schott to create an alternative supplier of precursor glass. To improve industry responsiveness to Government specifications, additional funding is needed to qualify the precursor material from a second source.

This assessment supports investment planning within the Air Force and broader DoD research and development communities. The study supports Government investment to space-qualify an alternative supplier of precursor glass to be used with current optical coatings that meet customer and government specifications and expectations. In addition, DoD needs to continue funding R&D into next-generation coverglass materials and alternative technologies.

Annual 2008 Air Force Industrial Base Assessment (December 2008)

This report provides an assessment of trends and issues affecting the Air Force industrial base. It summarizes the findings of numerous Air Force, DoD, 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 five 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. Overall market growth has slowed as delayed commercial product launches, airline operating losses and delayed military procurements have caused sales projections to level. 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 five to ten years, most current military aircraft production programs will end, 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 are driven by DoD budgetary limitations and re-capitalization decisions. Primary concerns include; the potential decline or loss of engineering and manufacturing skills unique to combat aircraft development, and the increased costs associated with strategic metals and energy driven by increased global demand which translate directly to budget increases for both aircraft procurement and operations.

The ***Sustainment*** sector consists of commercial and government facilities that provide maintenance, repair and overhaul services of aircraft and aircraft subsystems. Increased per unit replacement costs, lengthy development programs, and finite government resources are forcing the service life extensions of many systems. As a result, this sector has seen consistent growth over the past decade. Customer requirements to decrease costs, improve operational readiness, increase visibility through the adoption of information technologies, and maintain a balance between organic and commercial operations will drive changes over the upcoming decade in business practices, facilities and the workforce.

The ***Command, Control, Intelligence, Surveillance and Reconnaissance (C2ISR)*** sector heavily leverages a robust commercial electronics/telecommunications

design and production capability to support military 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. Most of the capability to manufacture commodity items such as semiconductor packages, substrates, and flat panel display glass has moved off-shore. As a result, there is growing concern that low quality counterfeit or tampered electronic devices are making their way into the market. DoD has worked with the industry to maintain domestic, "trusted-foundries," but the cost to continuously capitalize to the current state-of-the-art is significant.

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 2008 and 2014. 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, and 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, and aggressive foreign competition. 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 active advanced technology demonstrations. 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 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 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 pose a risk based on current requirements, but need to be understood and monitored for their potential impact to DoD as an enterprise in the future.

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)

After Mine Resistant Ambush Protected (MRAP) Vehicle Impact Study (May 2008)

The Deputy Under Secretary of Defense for Industrial Policy (DUSD-IP) requested Defense Contract Management Agency, Industrial Analysis Center (DCMA IAC) to perform an Industry Capability Assessment on MRAP Vehicle prime contractors and key suppliers to determine capabilities that may be at risk when the MRAP Vehicle production program ends. The Secretary of the Army and other DoD senior leaders wanted a better understanding of what may happen to MRAP Vehicle contractors and subcontractors when production ends and whether the Department should take steps to "soften the landing" on the industrial base.

The assessment identified prime contractors and key suppliers possessing industrial capabilities that provide systems, subsystems or components (including key Government Furnished Equipment (GFE)) that the Department should be concerned with losing when the MRAP Vehicle program ends. The process to conduct the assessment included developing a survey which was coordinated throughout the DCMA Enterprise by DCMA's Ground Systems & Munitions (GS&M) Division's Tactical Wheeled Vehicles Chicago office. Results of the survey became the basis for a decision to conduct a more detailed analysis to quantify risk to the broader ground systems industrial base.

The assessment quantified projected business bases for prime contractors and suppliers and identified risks and sustainment options, where applicable. The study provided information, conclusions, and recommendations to senior acquisition officials that will help support and refine current and post MRAP Vehicle production and sustainment strategies.

Military Aircraft Design Industrial Capability Assessment (May 2008)

The Deputy Under Secretary of Defense for Industrial Policy (DUSD-IP) requested DCMA IAC to assess industry's ability to maintain sufficient advanced design and development capabilities for the next generation of military/combat aircraft. The project had joint service sponsorship and was supported by the Air Force and NAVAIR. This request is a direct result of risks identified in earlier DCMA-IAC studies from the F-22 production line shutdown. Military programs have reduced over time and concern has been raised on the ability of the large aircraft designers to maintain the required skill sets and staff to meet future design needs. The study excluded commercial derivative aircraft, evolutionary modifications/upgrades to existing designs and rotary-wing aircraft.

Prime contractors were evaluated to determine if there would be sufficient business base in the future to meet DoD mission requirements. A government study team met with senior company leadership at each facility to gain their business perspective into the future acquisition programs and processes. Industrial capability data was collected through survey questions, tours of the facilities and interviews with senior company officials. Research, Development, Test and Engineering (RDT&E) funding for aircraft programs is decreasing across the Future Years Defense Program (FYDP) primarily due to the F-35 entering Low Rate Initial Production. With the F-35 completing design and entering production, the future available projects consist of Long Range Strike (LRS) with a potential start in FY11, a new heavy lift cargo aircraft in FY14 and the ongoing evolution of the Unmanned Combat Air Vehicle Navy (UCAV-N), all of which have technical requirements and acquisition strategy challenges that are largely undefined.

The study found that military aircraft design and development workload is at a historic low and that industry is hesitant to commit the Independent Research and Development (IRAD) effort required to maintain design and development capabilities to keep pace with advance technologies. Depending on requirements, future programs will likely involve teaming of the airframe manufactures rather than taking total system from inception to delivery. Evolutionary modifications and upgrades to existing designs such as the F/A-18 E/F, EA-18G do not fully challenge the design teams to maintain core engineering proficiencies required for future systems. Other findings in the study were that currently there is not enough new unique military aircraft engineering projects to maintain competencies needed for DoD manned aircraft design teams at the key prime contractors. This is causing a generation gap and lack of incentive for young engineers to enter the aerospace industry due to the uncertain future of new design and engineering workload projections. As unmanned air platforms evolve, some of the core

engineering skill sets for manned systems are at risk of becoming degraded as senior engineers leave the industry.

Army Future Combat Systems Tier 1 Unmanned Aerial Vehicle (June 2008)

The Defense Contract Management Agency Future Combat Systems (FCS), Program Integration Office (PIO), requested DCMA IAC to perform an assessment of the Army FCS Tier 1 Unmanned Aerial Vehicle (UAV) Prime Contractor and two of its critical subcontractors.

The study concluded that the FCS Tier 1 UAV is rated as a Moderate Industrial Risk due to two of the Prime's critical subcontractors experiencing some degree of difficulty in supplying their products. Also, neither subcontractor's capacity utilization levels could support additional workloads at this time.

The performance of these contractors will be monitored through routine oversight of the industrial base.

Steel and Specialty Metals Trend Analysis (July 2008)

Over the past four years U.S. manufacturers and distributors of steel products and specialty metals have experienced sharp price increases and availability disruption. In 2004 DCMA Industrial Analysis Center (IAC) was tasked to assess and prepare a presentation for the 2004 Army Material Command's Principal Assistant Responsible for Contracting (PARC) Conference, detailing the short, medium, and long-term price impacts of steel on the DoD Industrial Base.

Wide DoD distribution of the 2004 assessment led to interest in periodic updates on steel and specialty metals including titanium, aluminum, copper, nickel, and stainless steel. Because the cycle of price increases lasted longer than any commodity boom of the past 50 years and is projected to continue well into the next decade, DCMA IAC's initial assessment transformed into a detailed steel and specialty metals trend analysis requested biannually by the Deputy Under Secretary of Defense for Industrial Policy (DUSD-IP).

The purpose of the report is to provide steel and specialty metals price and availability trends and analysis to the DoD acquisition community. The assessment is assembled using government and commercial data sources that provide commodity, product availability, pricing, and industry trends information. DCMA IAC also utilizes insight gained from interviews with company officials during the course of the fiscal year and participation in various specialty metals working groups.

The DoD is not a major industry driver for steel and specialty metals, thus a growing concern within the defense community, especially for Ground Systems and

Aircraft program offices, is that the turmoil within the industry could have an adverse impact on cost, schedule, quality, and availability of critical steel and specialty metals. The trend analysis is comprised of pricing, lead time, capacity utilization and economic and industry factors that influence current and future conditions of the marketplace; the trend analysis is intended to assist the DoD acquisition community in preparing acquisition strategies and program budgets in an environment of increasing material prices.

The assessment found that during the first half of 2008, the price of four of the six primary metals (copper, titanium, nickel, and stainless steel) stabilized. Meanwhile, carbon steel and aluminum increased in price 73 percent and 22 percent respectively, since January 2008. The slowdown of the American economy in the first half of 2008, especially within the automobile and construction industries, was not enough to retard the escalation of higher metal prices.

(Note: Economic forecasts provided in this report were based on best assumptions of events current as of July 1, 2008.)

Decontamination Formula 200 Industrial Capability Assessment (August 2008)

The Joint Program Executive Office (JPEO) Chemical and Biological Defense's Joint Service Transportable Decontamination System (JSTDS) Program Office, through Joint Program Manager of Decontamination (JPM Decon), requested DCMA IAC to perform an Industrial Capability Assessment (ICA) of the two prime contractors producing Decontamination Formula (DF) 200. The two prime contractors are the only Environmental Protection Agency (EPA) and Sandia Laboratory licensed manufacturers of the Chemical and Biological Warfare neutralizing product. The JSTDS Program Office is developing acquisition strategies for DF200 to support fielding, sustainment, and ensuring a sound production base throughout the lifetime of the JSTDS-Small Scale (JSTDS-SS). The JSTDS-SS consists of an applicator module and accessory case; option items include DF200. The JSTDS Program Office is testing possible replacement, DF300, which has not yet met efficacy criteria.

The ICA assessed the requisite contractor production, financial, and economic capabilities to produce DF200. The Decontamination (Decon) Sector appears to be healthy over the next few years with current budget projections for Decon appearing to be more than adequate to sustain both manufacturers in the DF200 market. However, given a declining perception of threat and tighter overall budget levels anticipated in the out years, Decon may be one area vulnerable to budget cuts. Both companies could survive a one or two year trough. However, a sustained down turn of many years could threaten the viability of both companies, and possibly their major subcontractors.

Based on these finding and the uncertainty of DF300 approval, DCMA recommended that DoD continue to produce DF200 at no less than minimum sustaining

rates for both prime contractors to preclude loss of capabilities as well as avoiding the timely validation process through the EPA and Sandia Laboratory License procedures.

Joint Tactical Radio System Industrial Capability Assessment for Single Channel Handheld Radios (September 2008)

The JPEO Joint Tactical Radio System (JTRS) requested DCMA IAC to perform an Industrial Capability Assessment of current and potential defense contractors for Single Channel Handheld Radio Sets, as well as for the commercial portable radio sector. This assessment analyzed the industrial base sector involved in the manufacture of handheld radios. The objective of this study was to identify, assess, and determine the risk associated with industry's capability and capacity to support current and future requirements for handheld radio sets for the JTRS Program.

DCMA IAC conducted market research to develop a population of companies that participate in the defense and commercial handheld radio markets. The commercial market is highly competitive and there are at least fifteen competitors. The defense industry for Type 1 radios is restricted and the number of contractors on formal programs of record is limited.

The handheld radio industry is expected to remain relatively stable financially over the next few years, barring any major or drastic changes in market conditions. However, the continued weak American dollar increases the potential for foreign acquisitions of U.S. based companies.

One item has been identified as critical to the production of Type 1 Software Defined Radios - the encryption chip. Encryption chip manufacturers must also go through the NSA certification process and each encryption chip is designed for a specific radio. These suppliers are typically sole source. DCMA IAC recommends performing a separate ICA on the producers of the Type 1 encryption chips that hold relevant Commercial Communications Security (COMSEC) Evaluation Programs (CCEPs) and the fabricators of the base encryption chips. A baseline can then be established for a relatively unknown, yet highly specialized and crucial sector, important to secure defense communication systems.

All of the companies in the assessment population that are supporting major programs of record have demonstrated the manufacturing capability to produce handheld radios. The process for producing handheld radios at each company is essentially the same, with minor differences in the manufacturing technology employed. Defense contractors are running at approximately seventy percent plant utilization levels. Industry capacity, while not underutilized, is certainly not near capacity. Commercial and defense industry capacity can produce well into the hundreds of thousands of units per year. The industry is capable of supporting JPEO JTRS requirements out to 2013.

Industrial Capability Assessment Supporting Operational Capabilities (October 2008)

The Deputy Under Secretary of Defense for Industrial Policy (DUSD-IP) requested DCMA IAC to evaluate the niche industry comprised of critical aerospace electronic suppliers. The Global War on Terrorism caused the DoD to increase the fleet of aircraft to support ground commanders and the increased demand has caused the services to compete for electronic system resources drawing from the same supply sources. This evaluation focused on identifying critical electronic suppliers required to support multiple aircraft mission systems. Collection of data from contractors through the use of a survey, as well as interviews with company officials, helped examine potential chokepoints for on-time system delivery. The survey contained data sets on delivery rates, queuing for DoD priority ordering system DO/DX ratings and lead times to produce the components. The IAC collected insightful data to help program managers proactively reduce chokepoints that may affect on-time system delivery to the field.

The assessment identified chokepoints in the supply chain, and that competing demand for contractors with unique capabilities present a challenge for companies acting as program integrators. Also, insight into the aircraft modification process is needed to determine what components could be considered show stoppers for on-time delivery. Finally, the supply system must not only support new system delivery but also provide spares to support fielded systems in multiple locations.

4.6 Defense Logistics Agency (DLA)

Defense Wall, Rapid (Bastions) (October 2008)

DLA invoked the surge provision in its long-term contract for bastions to meet spikes in demand for these critical force protection items to release pre-positioned raw materials.

The Services' demand for these bastion items outstripped previous wartime usage estimates in both volume and breadth of product type. Increases in troop levels for Operation Iraqi Freedom and changes in operating procedures (increased use of Forward Operating Bases) led to a surge in orders from the Army. In 2008, DLA awarded a contract for continued production of HESCO bastions. Proposals from other manufacturers are being reviewed for production of rapid-wall force protection barriers in 2009.

Dress Uniforms (October 2008)

The Army has proposed the introduction of a new dress uniform, the Army Service Uniform (ASU). An industrial base capability study was performed in May 2008 to determine if the industry was capable of meeting the Army's requirements for the introduction of the new uniform. The proposed introduction schedule required a five-year period with a sharp increase in required quantities so that existing production rates would be doubled in the third year. In addition to the steep production increase that would be required, there is a sharp decline in the fifth year before the requirement levels off to a sustainment quantity.

Of the items included in the ASU, the initial study in May 2008 focused on dress coats only. A similar capability assessment on the dress shirt industry was completed in September 2008. Both the shirt and trousers/slacks industrial base are able to meet the Army's requirements – the only issues are with the dress coat industry; therefore, the coats are the pacing factor for the entire uniform. There is little to no commercial dress coat industry left in the United States which limits the overall industrial base. Historically, there are only three producers of military dress coats; two additional sources were added in 2008 due to increased requirements across all Services. The original three producers are operating at maximum capacity, and the two new sources are producing at required rates but have not yet reached their theoretical maximum capacity. If the two newest sources can attain their theoretical level of maximum production, they would provide nearly half of the required capability to meet the Army's aggressive requirements.

The study's shortfall analysis concluded that there will not be sufficient industrial capability in the third and fourth years to support the requirements, and the shortfall could be increased if the two newest producers cannot maintain their estimated capabilities. The shortfall could also be exacerbated by the introduction of an additional new dress uniform by another Service during the same timeframe.

As a result of the capability analysis, it was recommended that the Army level the requirements for the introduction of the ASU. By spreading out the requirement more evenly over a six-year period, shortfalls will be eliminated and the industrial base will be able to maintain a healthier rate of production rather than steep increases and decreases.

Industrial Base Extension Follow-on (October 2008)

The Industrial Base Extension (IBex) Program provides Outside the Continental United States (OCONUS) and Continental United States (CONUS) asset visibility over inventory and global logistics capability available to support U.S. military operations and relief efforts following natural disasters with possible access to these capabilities if required. 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 develop improvement opportunities that facilitate 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 (S&S) support.

The IBex program is a government/industry partnership with multiple global logistics providers that develops an overlapping global network of information on inventory, manufacturing, logistics, storage, transportation, humanitarian support, and base camp construction and maintenance. 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 information and capability reports continue to support military planning missions overseas. The IBex program has supported the new Africa Command and has responded to numerous requests for information and requests for supplies and services from U.S. Special Operations Command. In-depth geographic capability assessments are routinely forwarded to the DLA Liaisons to the Combatant Commands.

The IBex program supports other DLA and Defense Supply Center Philadelphia (DSCP) Offices, such as the Clothing and Textile Commodity, the Construction and Equipment Commodity, the DSCP Executive Agent Offices, and the DLA Liaisons to the Combatant Commanders. Representatives from these offices are active participants in the IBex program and meetings. Future plans for the IBex program are to develop the process to transform IBex from a planning tool into a valuable contingency contracting mechanism for supplies and services.

IBex provides a flexible and efficient planning tool that supports the Combatant Commanders, DSCP-Europe and DSCP-Pacific planning, U.S. Military Planners, and other government agency planners to identify new and innovative concepts and solutions to logistical problems.

Joint Services Lightweight Integrated Suit Technology (JSLIST) (October 2008)

Customer requirements for Joint Services Lightweight Integrated Suit Technology (JSLIST) chemical protective suits continued to decline in 2008, leaving the industrial base in a critical situation. As the level of production decreases, the capability of the industrial base to surge if needed is also decreased. To determine the impact of reduced production, an industrial base assessment was conducted in July 2008.

The objective of the study was to examine the JSLIST supply chain in an effort to determine if a Warstopper investment in the JSLIST suit program is warranted to ensure that the industrial base has the capability to meet S&S requirements. The study addressed critical issues concerning the JSLIST program, including the determination of

S&S requirements, identification of current inventory levels, assessment of the industrial base, and an examination of supply chain issues.

As a result of the assessment, a decision was made to enter into a Minimum Sustaining Rate (MSR) contract with one of the JSLIST vendors. This will ensure a warm industrial base during a period of low demand and maintain the surge capability if needed. A $25.9M MSR contract will provide a low-level production stream and mitigate any future industrial base shortfalls. In addition, the contract maintains a minimum level of production necessary for the supplier of the fabric. The MSR Support option is considered a low-risk option as any accumulated stock can be liquidated if no further support actions are needed in subsequent years. The initiative provides an immediate resolution to the potential loss of industrial base capability and added flexibility in developing long-term solutions.

Meals Ready-to-Eat (October 2008)

Significant requirements for Meals Ready-to-Eat (MRE) have continued in support of operations in Southwest Asia. The Federal Emergency Management Agency (FEMA) has also had significant requirements resulting from hurricanes that came to shore this season. Industrial Specialists continue to monitor the MRE vendors and have noted that the current commercial industrial base has been more than capable of handling the added surge.

The approved five million case war reserve level of MREs has been reached and maintained. With the significant requirements from Southwest Asia and FEMA there have been no problems noted with rotation of the increased levels.

Nomex® Supply Chain (October 2008)

Nomex® is the registered brand name of a flame retardant aramid fiber. Material made from this fiber, a sole source product from DuPont Advanced Fiber Systems, 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; however, due to increasing threats from improvised explosive devices and resulting burn casualties, the need for flame protection spread to non-traditional users including wheeled vehicle operators and ground troops.

Based on increasing requirements for these Nomex® items in 2006 and 2007, it was determined that the supply chain had some inherent constraints that limited its ability to meet surges. 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 the production of the end item.

An industrial base assessment of the Nomex® Supply Chain was completed in February 2008 to determine the overall industrial capability and identify specific constraints. The study recommended pursuing a Warstopper investment in either fiber alone, fiber and yarn, or fiber, yarn, and griege fabric. Because the fiber is sole source, discussions were entered into with DuPont to determine the most appropriate acquisition strategy. An acquisition will be awarded for a performance-based contract with DuPont to establish a strategic buffer stock of fiber which will allow the industrial base to surge in response to contingency requirements.

Petroleum, Oil, and Lubricants (October 2008)

DLA's Defense Energy Support Center (DESC) continues to support the DOD and commercial satellite industry with uninterrupted delivery of the two liquid propellants critical to the U.S. space program, specifically, hydrazine and dinitrogen tetroxide (N2O4). Both products have a limited domestic industrial base for missile fuel production but are supported under a long-term contract (ten-year plus two five-year options) with a reliable supplier. There were no interruptions of supply during FY08 for either product. In addition to the commodity supply, DESC manages the transportation component of the supply chain. During FY08, DESC awarded a follow-on contract for bulk N2O4 transportation services to the same carrier who delivers bulk shipments of hydrazine under a five-year DESC contract.

To date, DESC has awarded three contracts in support of the Air Force's Aviation Synthetic Fuel (synfuel) Certification Program. DESC awarded the first synfuel contract to Shell Oil Products in June 2007 for 315,000 gallons and this contract has been fully performed. In FY08, DESC awarded two synfuel contracts to Sasol Oil (Proprietary) Limited (Sasol). One contract was for 60,000 gallons of synthetic fuel, which specifically required coal as the feedstock, for delivery to Wright-Patterson Air Force Base (AFB), Dayton, Ohio, and Edwards AFB, North Edwards, California. The second contract was for 335,000 gallons, with no restrictions on the feedstock.

DESC continues to support the Air Force by supplying Turbine Fuel, Aviation, Thermally Stable (JPTS) for use in its highflying U-2 aircraft. DESC currently has only two suppliers for JPTS; one CONUS and one OCONUS. AGE Refining Inc. (San Antonio, Texas) supplies approximately 4,074,000 gallons of JPTS per year and SK Energy Co. Limited (Ulsan, Korea) supplies 750,000 gallons annually. The JPTS contracts are for a two-year base performance period, with three one-year option periods. AGE delivers fuel on a free on board (f.o.b.) destination basis via railcar to Beale AFB, California, and Seabrook, Texas. The AGE contract also includes an f.o.b. origin truck line item for delivery to various locations. SK delivers by truck to Osan Air Base, Korea. DESC encounters difficulties in securing suppliers of JPTS due to the extensive qualification process required to be a certified supplier.

Rapid Assembly Program Follow-on (October 2008)

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 Vendor program. Use of these assembly modules 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 Outside the Continental United States (OCONUS) use, and will include voltage converters and air compressors. Defense Supply Center Philadelphia (DSCP) allocated $40K for FY09 to review, modify, and upgrade all four units to make them interchangeable. As funding is received, these upgrades will be scheduled at industrial facilities, and completed units will be deployed as follows:

- Subsistence Prime Vendor, Hawaii
- Subsistence Prime Vendor, Europe
- Defense Distribution Depot, location to be determined by Deployable Depot Concept feasibility study
- Disaster Relief, Continental United States (CONUS)

Tents and Shelter Systems (October 2008)

DLA completed a Minimum Sustaining Rate (MSR) study in May 2007 which defined the funding levels needed to support an Industrial Base Support Initiative for the current MIL-SPEC tent and shelter manufacturers. Initial awards of MSR contracts in 2007 totaled $23.5M and included both directed and competitive contracts. In 2008, requirements, inventory levels, and production levels were again analyzed, and an additional $23.5M of Warstopper funding was obligated to continue the MSR contracts.

The 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, efforts to enhance the supply chain will focus on improving surge capability, reducing production lead-times, improving availability, and providing tents and shelters that possess similar or improved quality and cost.

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

- University of Tennessee – Supply Chain Audit
- University of Tennessee – Buffer Stock Decision Tool

- Johnson Outdoors – Component Assemblies Standardization
- AC Industries – BaseCamp transition to DoD EMALL

Tray Pack Ration Readiness (October 2008)

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.

A Value Stream Analysis is being conducted with one of our major vendors under Lean Six Sigma to identify areas where readiness and surge may be improved. This analysis will include data on the 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 peacetime and wartime demands.

Unitized Group Ration – Express (October 2008)

Late in FY07, a compact, self-contained, module that provides a complete, hot meal for 18 Warfighters was introduced. The Unitized Group Ration – Express (UGR-E) uses a simple pull-tab to heat food in just 30-45 minutes and is served in trays to provide a hot meal to our Warfighters. There are on-going plans to modify the heater element in a future release.

Subsistence Industrial Specialists visited and evaluated 22 different 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 to these shortfalls. A continuing evaluation is being performed on all elements of the UGR-E ration as items are modified.

This ration has been the center of many meetings with the demand tripling from the original predictions and then dropping sharply within just a few weeks. As newer production techniques are applied to the changing demand requirements, alternative suppliers are researched, to include component alternatives when shortages occur to back-fill the line.

The UGR-E shares poly tray production lines for its entrees with the UGR Heat & Serve and has been identified as part of the Value Stream Analysis to be conducted during the course of FY 09.

Acrylic Sand Bags (December 2008)

An industrial base study was completed for the acrylic sand bag in 2008. The study indicated that the acrylic sandbag supply chain has significant bottlenecks that impact wartime readiness, primarily in the availability of domestically produced acrylic fabric, which must be acquired domestically as a result of the Berry Amendment.

Even with the approval of a Domestic Non-Availability Determination for the acrylic staple fiber (a sub-component of the fabric threads), the manufacturing base for the fabric is limited to only two or three domestic sources that produce on a made-to-order basis. DLA is currently investigating options to utilize Warstopper funding to invest in the supply chain.

4.7 Missile Defense Agency (MDA)

During 2008, the Missile Defense Agency (MDA) conducted the following studies as a part of its effort to update the baseline assessments of missile defense industrial and technology capabilities. The MDA considers the findings of its 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. Recently, the MDA became the Space Industrial Base Council lead organization for Infrared (IR) detectors and substrates. The goal is to assure a healthy U.S. IR industrial base that is less dependent on foreign sources and capable of supplying space qualified sensors for National Security Space (NSS) systems. The concerns are that a possible loss of sensor capabilities from yield problems, material defects, impurities and sustainability need to be addressed across the NSS enterprise.

Cadmium Zinc Telluride Assessment (January 2008)

The Missile Defense Agency (MDA) and the Deputy Under Secretary of Defense for Industrial Policy (DUSD-IP) requested Defense Contract Management Agency, Industrial Analysis Center (DCMA IAC) to perform an analysis of the capability and interest of Nikko to continue as the sole source supplier of Cadmium Zinc Telluride substrate for Mercury Cadmium Telluride Infra-Red sensor detectors. The request was an outcome of the 2007 MDA Infra-Red (IR) Sensor Assessment. DCMA IAC worked with DCMA Pacific to perform an analysis of Nikko's industrial viability and planned capitol investments.

The analysis concluded Nikko had a business plan to remain viable which included facility upgrades and capitol investments for additional capacity.

Infrared Sensor Assessment (February 2008)

The infrared sensor industrial base study (conducted by IAC of DCMA) involved surveying and assessing the industrial capability and viability of the infrared system industrial base. The study sought to identify sole/single sources, foreign sources/dependencies, business, and financial risks at infrared sensor developers and component manufacturers. For example, SAES Getters was identified as the sole source provider for HgCdTe-based infrared sensor getters.

The assessment concluded that while there were no high financial risks, the infrared satellite sensor integration capabilities of Northrop Grumman may be compromised if its business declines in the next several years. The state of the art for MDA systems uses a mercury cadmium telluride (HgCdTe) focal plane array (FPA) as an infrared detector. MDA capabilities will increasingly require molecular beam epitaxy (MBE) to grow HgCdTe detectors, which is a difficult and expensive process that, for HgCdTe, is currently only carried out by Raytheon Vision Systems and Teledyne Imaging Systems. The MBE process relies on a sole source supplier, Nikko Materials Co., Ltd., located in Japan. The study recommended an assessment to determine an alternative for Nikko substrates that would assess the time and cost to develop a domestic supplier of HgCdTe substrates suitable for the MBE process. The study also found Type II Strained Layer Superlattice as a possible long-term alternative for some infrared sensor applications.

Update to the 2003 Missile Defense Agency Divert and Attitude Control System (DACS) Industrial Capability Assessment (September 2008)

The Missile Defense Agency (MDA) requested DCMA IAC to perform an update to the 2003 Industrial Capability Assessment of the Divert and Attitude Control System (DACS) industrial base for Liquid, Solid and the transition to a Throttleable DACS design. Thirteen contractors performing non-classified DACS related work were assessed for the study.

Site visits were completed with initial analysis identifying a market concentrated on MDA DACS systems. The results of the analysis concluded that future DACS technologies are focused on Liquid DACS (LDACS) and a move toward proportional valve Throttleable DACS (TDACS) capabilities with MDA investment in potential Rhenium high temperature DACS thruster replacement material. The study recommended monitoring the financial viability of the prime contractor that is the only prime integrator with solid, liquid, and throttleable DACS design, production, integration and test capability. Monitoring of the production of high temperature DACS nozzle material is also recommended as it uses Rhenium, an expensive material sole sourced from Kazakhstan, which is difficult to process.

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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. This sector is projected to grow into the near future with procurement funding levels increasing across the Future Year Defense Program (FYDP).

The Department of Defense is in the middle of a large-scale recapitalization effort with the demand for new or upgraded aircraft remaining strong for the next ten years. The impact of airframe corrosion and aging aircraft subsystems on mission readiness has become increasingly problematic for the services. Sustaining legacy aircraft has become progressively more expensive and time consuming for maintainers with many aircraft types operating beyond their original design life. Maintaining and upgrading these aircraft is proving to be far less cost-effective in the long term than buying replacement aircraft with increased capabilities.

While overall funding levels remains strong, there is a general trend to accelerate priority programs into production to speed the overall recapitalization effort over the need to pay for new development and innovation. Procurement funding shows a steady increase through 2013. Five major 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 for the next 20 years.

In contrast to the increases in procurement, aviation has seen significant reductions in Research, Development, Test and Engineering (RDT&E) funding. RDT&E funding for aircraft programs is projected to continue to decreasing across the FYDP. A major driver for this is 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. Additionally, more vertical lift programs are now using non-developmental airframes that install military unique subsystems to meet their mission requirements avoiding the obligation of large amounts of RDT&E funds.

The reduction in RDT&E funding does not bode well for companies without long term production programs. Boeing's future in the fighter/attack and transport segments is questionable without the support of FMS programs to keep existing production lines open. With the announcement of the C-17 program shut down coupled with the end of the F/A-18E/F production in FY12, the industrial base infrastructure at Long Beach, CA, and St. Louis, MO (solely supporting the EA-18G production), may have insufficient business to continue in place. Additionally, the lower-tier supplier industrial base

continues to consolidate as the numbers of military programs reduce over time. Suppliers not associated with future production programs (for example, suppliers not participating in the F-35 or UH-60M) will be impacted the most. These suppliers will be forced to either exit the business or find new non-DoD programs for their products.

Global partnerships have also 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. Recently, the Department awarded helicopter programs to two European airframe designs over U.S. aircraft. As a result, it is expected these suppliers will rely on their existing foreign supply chain for the manufacture of required subsystems and assemblies.

Another area of sustained growth in the aviation sector is the unmanned air vehicle (UAV) market. UAVs have proven themselves an effective new tool for the 21st century warfighter. Interest in UAVs has grown dramatically since the start of conflict in Afghanistan and Iraq. Demand for the capabilities they bring has far exceeded the supply.[11] Predator and Global Hawk provide constant imagery and are now virtually indispensable to combatant commanders in theater. Today, U.S. firms control more than 60 percent of the UAV market.[12] The leading firms are Northrop Grumman and General Atomics that produce the Global Hawk and Predator/Reaper UAVs respectively. Recently, Boeing strengthened its presence in the UAV market with the purchase of Insitu Inc. After partnering with Insitu since 2002 on the ScanEagle UAS system, Boeing purchased Insitu in July 2008.[13] Insitu will operate as a wholly owned subsidiary of Boeing's Integrated Defense systems Military Aircraft Division. Further consolidation within the UAV industry is expected as the UAV demand continues to expand.

In June 2008, the Government Accountability Office sustained a competing contractor's protest of contract award for the System Development and Demonstration phase of the Air Force's KC-X airborne tanker replacement program. As a result, the Secretary of Defense, in consultation with senior Defense and Air Force officials, determined that the solicitation and award could not be accomplished by January 2009. Accordingly, the Department has notified the Congress and the two competing contractors that it is terminating the current competition for an airborne tanker replacement. The Air Force was directed to terminate the contract and solicitation for the Air Force's airborne tanker replacement; however, the KC-X program shall remain on Department of Defense records for the next Administration. In making this decision, it was concluded that the current KC-135 fleet could be adequately maintained to satisfy Air Force missions for the near future. Sufficient funds will be recommended in the FY09 and follow-on budgets to maintain the KC-135 at high-mission capable rates. In addition, the Department will recommend to the Congress the disposition of the pending

[11] GAO Report August 2008
[12] Forecast International; Unmanned Vehicles Forecast, October 2007
[13] www.insitiu.com September 24, 2008

FY09 funding for the tanker program and plans to continue funding the KC-X program in the FY10 to FY15 budget presently under review

Issues:

- The vertical lift industrial base continues to be impacted by the government and industry response to the Nunn-McCurdy cost breaches of 2001. The consequences of Department-endorsed teaming arrangements that resulted in an interlocked industrial base has restricted Department and industry flexibility dealing with vertical lift needs.[14] The Department's budget-driven remanufacture strategy produced a series of sole-source relationships, leaving few real competitive opportunities among the helicopter prime contractors to force technology refresh cycles. With limited competition, few new platform contracts, and declining government technology investments, industry has been left with little incentive to invest in independent research.

- The Aircraft sector relies on 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, but challenges still remain with respect to foreign competition, foreign outsourcing, changing defense requirements and missions, declining research and development, an aging workforce, and infrastructure consolidation and modernization. Over the next few years, multiple military aircraft production lines will terminate leading to 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. DoD must track and understand the impact of these tradeoffs on the Defense industrial base.

- Unmanned Aircraft Systems (UASs) represent a developing product segment in which all contractors have a keen interest. Either by direct programs from the Department or through Independent Research and Development (IRAD), contractors are developing numerous UAS types with the intent to maintain a technological edge in this sector. These initiatives will lead to new developments in areas such as aircraft collision avoidance with other aircraft (i.e., manned and other UAS) 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. Without an updated

[14] The Vertical Lift Industrial Base: Outlook 2004-2014; July 2004

comprehensive UAS roadmap, these efforts have the potential to be uncoordinated and unproductive.[15]

- 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.

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 is not formally trained in computer science or computer engineering.

[15] http://www.fas.org/irp/program/collect/uav_roadmap2005.pdf; UAS Roadmap 2005-2030, August 2005

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 Lockheed Martin, Raytheon, Northrop Grumman, General Dynamics, ITT, Harris Corporation, L3, BAE, EDS, Boeing, and DRS. 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.

- Industry is shifting from the use of traditional leaded solder to new lead-free solders in response to European Union (EU) mandates. Even though the EU does not have jurisdiction over United States commerce and has exempted their own defense applications from the mandate, for cost and simplicity reasons, industry is moving towards lead-free solder for everything. Lead-free solder that may be adequate for consumer electronics with a relatively short life-cycle in favorable environments may fail with serious consequences in the harsher environments or longer life cycles often experienced in military applications.

- 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. Under the umbrella of the President's Cybersecurity Initiative, DoD is working with other federal agencies to develop standards, policy and pilot projects to address this risk.

5.3 Ground Vehicles Sector Industrial Summary

Ground Vehicles are 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 as a result of the lessons learned in Iraq and Afghanistan. There is increased importance accorded to arming and armoring vehicles to protect against constant and difficult to detect threats in urban and rural environments.

The majority of 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 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 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 $13.5B 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 British Aerospace Engineering (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.

BAE and GDLS possess unique industrial capabilities, and are partnering to support the FCS program. Both companies along with Navistar have received development contracts for the Joint Light Tactical Vehicle. In addition, GDLS has production work for the MRAP and Stryker and is developing the Expeditionary Fighting Vehicle development. BAE has MRAP, FMTV, and FCS Non-Line-Of-Sight Cannon, BAE also has significant reset and upgrade work for Bradley Fighting Vehicle.

There are “important” component suppliers for the vehicle industry. Examples include tracked vehicle transmissions, armament and military unique forgings, castings; and metallic and composite materials used to make armor.

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. This funding includes the ground systems required on many of the Army tactical and missile defense programs like the Patriot and Guided Multiple Launch Rocket System (GMLRS) programs. 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. Again, this includes the necessary ground systems funding. 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 16 missile programs tracked by the Defense Acquisition Executive Systems (DAES), seven programs reported issues in 2008 – four delivery issues and three funding issues. 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 six. The prime contractors are not necessarily equal in industrial capabilities. Three of the primes only operate in one of the missile segments (Boeing – Smart Munitions, General Dynamics – Tactical Missiles and ATK – Tactical Missiles). 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 and General Dynamics are prime contractors on only one program – ATK the AARGM program and General Dynamics the 2.75" rockets (Hydra rockets).

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. One of the sixteen programs tracked by DAES identified a technical issue.

"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.

- 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.

- Declining RDT&E funding coupled with limited competitive opportunities projected in the near-term will make it difficult for the missile sector industry to attract and retain a workforce with the industrial capabilities to design, develop and produce future missile systems that will meet national security requirements.

5.5 Services Sector Industrial Summary

In FY07 49 percent of all DoD contract spending was classified as supplies, 51 percent classified as services, with 13 percent of these services spent on Research, Development, Test and Evaluation (RDT&E). As the unescalated dollar value of overall contract spending has increased dramatically, 174 percent since 1997, the percentage of spending in each domain has exhibited noticeable trends undoubtedly related to spending on Middle East conflicts. The percentage of supplies increased from 43 percent to 50 percent, the percentage of services decreased from 40 percent to 36 percent and the percentage of RDT&E decreased from 17 percent to 13 percent. All DoD contract actions are classified by Federal Supply Class/Service Codes (FSCs) and the FSC schema includes 23 service categories. In order to identify strategic sourcing opportunities, the Office of Strategic Sourcing in the Defense Procurement and Acquisition Policy (DPAP) Directorate consolidated the 23 service categories, resulting in eight portfolios including Research and Development. ODUSD (IP) embraced the portfolio perspective as an analytic technique to evaluate the industrial base for services. To align with the DPAP portfolios, DUSD (IP) currently studies the following service portfolios, listed in order of largest to smallest total spend: Management Support, Professional and Administrative (MSPA), Facilities Related (FR), Equipment Related (ER), Construction Related (CR), Information and Communications Technology (ICT), Medical (Med) and Transportation (Trans).

An examination of FY06 data for 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, ICT, and MSPA while the Commercial Industry Services sector includes Trans, FR, CR, and Med. Due to accuracy concerns, FY07 contract action reports, unlike previous year's data, do not identify the parent companies of business units contracting with government precluding on-going examination of this phenomenon.

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 since 1997, this good news appears to be offset by an increased dollar value of competitive contracts receiving only a single offer. This lack of competitive offers also applies to task orders on multiple award contracts with less than 75 percent by dollar value of task orders receiving multiple offers. 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 that it's an indicator of a lack of competition. This finding correlates with anecdotal information that the Department sometimes has difficulty attracting competitive bidders and suggests that the root causes lie in work definition rather than in the choice of contracting vehicles.

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, which together comprise Northrop Grumman (NOC) Shipbuilding; and Electric Boat, Bath Iron Works, and National Steel and

Shipbuilding Company, owned by General Dynamics (GD). In January 2008, Northrop Grumman implemented a reorganization of their shipbuilding sectors – combining Northrop Grumman Ship Systems, which comprised of Avondale and Ingalls shipyards, and Northrop Grumman Newport News shipyard into a single entity, Northrop Grumman Shipbuilding (NGSB). Organizing all three shipyards under a single business segment will improve the company's ability to share resources and workload across all three shipyards. Some of the first tier shipyards have unique capabilities that affect how the Navy and Congress have allocated new construction contracts.

U.S. commercial shipbuilding accounts for less than one percent of world commercial shipbuilding output and 80 percent of this comes from the mid tier sector. Little U.S. first tier shipbuilding capacity is devoted to the commercial sector and its overhead burden therefore rests on Navy and Coast Guard shipbuilding programs. As fewer ships are produced in the available plant capacity, shipbuilding costs continue to rise at a rate well in excess of inflation.

While U.S. shipbuilders produce the most capable warships in the world, ODUSD Industrial Policy's 2005 benchmarking study shows that U.S. manufacturing technology improvement rates and productivity improvement rates lag those of international yards. Industry investment in improvements however, is risky given anemic shipbuilding volume and an almost complete dependency on volatile year-to-year government spending plans. Shipbuilders have 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 shipyards' call for stability produced the 313 ship force structure plan, block purchases, and multi-year procurements (where authorized.) All of these offer needed stability for the major primes, however, continued upward cost pressure has forced the Navy to reduce new shipbuilding volume by 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. Any further decrease in ship procurements, particularly surface combatants, places further stress on overhead rates if remaining work is spread among the six first tier shipyards.

Because the costs associated with shipyard infrastructure are typically fixed costs, a reduction in naval ship construction quantities drives up overhead costs on a per-ship basis. Rationalization is a term used to describe the reduction of infrastructure that has become redundant as a result of lower construction demand. The Department sponsored a study by the Institute for Defense Analyses (IDA) of the cost structure of the major shipyards to discover evidence of rationalization following the period of consolidation between 1995 and 2002. 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.

The VIRGINIA class submarine program appears to be the Navy's model program for demonstrating cost reduction success through design-for-producibility improvements, a reduction in the number of 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 the Navy's other shipbuilding programs that would free up significant savings and 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, continues to indicate a downward trend in the health of the defense shipbuilding industrial base.

Issues:

- A RAND study released in May 2007 found strong evidence that growth in demand of certain engineering fields – nuclear engineering in particular – will outpace supply. This will primarily impact US nuclear submarine design capabilities, which has not seen a hiatus in new design since beginning on the first nuclear submarine. The study concluded the loss of specialized design and engineering skills was a driving force behind problems with the United Kingdom's design efforts for their newest attack submarine. The potential of loss of the submarine design capabilities has been a strong consideration during the planning for the design of the next Sea-based Strategic Deterrent (SBSD).

- Significant excess plant capacity exists in the first tier shipbuilding industrial base, driving up overhead costs. Construction of LCS and other classes of ships in the competitive mid tier sector may be adding additional capacity the industrial base does not need. ODUSD(IP)'s mid tier benchmarking study warned that reconfiguration of mid tier shipyards to build naval ships will likely make them non-competitive in the commercial market as has happened in the first tier sector. In addition, shipbuilding capacity in the mid-tier shipyards is limited by skilled workforce constraints – not by facilities.
- Workforce concerns continue in the shipyards operating on the Gulf Coast. Although the industry has recovered in capacity and restored their facilities following the severe damage from hurricanes Katrina and Rita three years ago, workforce issues remain due to the slow overall recovery within the region. Delays to production schedules as a result of two hurricanes during the summer of 2008 demonstrate how this sector is directly affected by the hurricane seasons.

5.7 Space Sector Industrial Summary

The space industrial base supports two primary segments—spacecraft and launch systems manufacturing. 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 satellite manufacturing 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. The health of the top tier manufacturers in the space industrial base is good, but there are areas of concern within the industry.[16] Profit margins are below defense industry averages and margins for Tier 2/3 space companies only average five percent. Revenues of the U.S satellite manufacturing firms were down 20 percent in 2007 from 2006 having been up 56 percent in 2006 from 2005.[17] Total satellite manufacturing revenues in 2007 were $4.8B. It is notable that Loral Space and Communications, a major supplier of commercial GEO satellites is expanding capacity to handle nine spacecraft per year, up from six.[18]

In FY'08, space acquisition programs continued to recover from previous past-performance issues. The "back to basics" incremental approach continued to correct systemic issues of immature technology and low budget estimates in space program procurement. The seven space Major Defense Acquisition Programs (MDAPs) reported limited cost or schedule breaches with one new Nunn-McCurdy breach. The AEHF program reported a 25 percent cost growth with testing issues and the order of an additional fourth satellite. Space Based Infrared System (SBIRS) costs grew from $4B to $11B with the number of planned spacecraft reduced from five to three and the National Polar-orbiting Operational Environmental Satellite System (NPOESS) is now three years behind schedule with costs rising from $6B to $11B.

Workforce employment is steady in the space industry at 144,400 in 2008. 16,184 are currently employed in satellite manufacturing, 78,162 in launch manufacturing and operations, and another 49,423 in satellite services.[16] Employment had increased from 120,000 to 145,500 in the period 2003 to 2006.[19]

[16] Health of the Space Industry and Impacts of Export Controls, CSIS, Feb 2008
[17] State of Satellite Industry Report, Satellite Industries Association, June 2008
[18] Space News, Nov 2007
[19] Space Industry Survey Results, Department of Commerce, Mar 2008

Space R&D funding was 32 percent higher in the DARPA FY09 request from the current FY08 funding.[20] This funding includes on-orbit spacecraft subsystem funding and money for new small launch system design, development and demonstration. New starts include programs that could provide situational awareness for satellites and early warning of other approaching spacecraft. Total U.S. federal space-related R&D gained 5.6 percent to $12.3B from gains in development funding of new NASA space vehicles instead of the broader space R&D portfolio.[21] Corporate IRAD for space grew in the period 2003-2006 from $1.8B to $2.3B or eight percent per year.[22] Overall, the combined public and private investment in space research, development, and commercial production has increased steadily through 2008 with the shift from government being the primary source of funds for space research toward private investment being more pronounced over the past decade.[23]

Three primes contractors account for the majority of major defense space programs, Boeing (Global Positioning System II, Wideband Gapfiller Communications, and Delta Evolved Expendable Launch Vehicles), Lockheed Martin (Global Positioning System II/III, 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 (NPOESS) and on the MDA Space Tracking and Surveillance System. Orbital Sciences Corporation provides its Taurus, Pegasus and Minotaur launchers to DoD; Ball Aerospace is building the SBSS block one and NPOESS Prep Project risk reduction mission spacecraft; and General Dynamics provided the GeoEye-1 in partnership with NGA. During the period of this report Global Positioning System III was awarded to Lockheed Martin. Transformational Satellite Communications has yet to award a contract and Space Radar funding was significantly reduced pending cancellation.

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 for FY09 is $11.9B, a 5.3 percent increase from FY08. In FY09, Military early warning systems and communications systems account for the majority of the funding with weather systems, navigation systems and launch vehicles accounting for remainder. Over the FYDP, a drop in FY11 large program budgets of 12 percent from FY09 could create volatility in the sector and could lead to consolidation.

Only one of the programs tracked by DAES, the SBIRS program, reported technical issues that required significant changes to the satellite payload flight software. Otherwise, DoD space primes achieved significant technical performance milestones. Lockheed Martin and Boeing completed consolidation of Evolved Expendable Launch Vehicles (EELVs) with the United Launch Alliance and began launching Atlas V and

[20] Space News, 25 Feb 2008
[21] American Association for the Advancement of Science, Report XXXIII, FY09 R&D, Apr 2008
[22] Update 2007 to The Space Report 2006, Space Foundation, April 2007
[23] The Space Report 2008, Space Foundation, April 2008

Delta IV launch vehicles to the DoD. The first of six WGS satellites is now operational and a fourth AEHF satellite is on order to provide protected communications. The MDA/General Dynamics NFIRE satellite tested laser terminal communications at 5.5 gigabits per second and observed a Minotaur target launch.[24]

During the period of this report, critical components and their sub-tier suppliers were investigated for visible sensor CCDs, infrared detectors, radiation hardened ROICs, germanium substrates for solar cells and high-reliability space qualified diodes.[25] Additionally, a demand gap risk for RS-68 rocket engines exists for the next two years.[26]

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 ITAR export restrictions are reducing sales overseas, particularly for sub-tier space satellite component providers.

- Aging workforce concerns exist for U.S. Government space oversight and acquisition personnel and for satellite manufacturing primes and sub-tier suppliers.

[24] Space News, 17 March 2008 & 29 September 2008
[25] Aerospace Corporation, Economic & Market Analysis Center, Fall 2007
[26] Liquid Rocket Engines IB Study, DCMA IAC, 2007

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 2008, the Title III Program had twenty-eight projects underway. Following are brief descriptions of each active project.

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® and

spinel optical ceramics are currently being utilized as a cost-effective alternative to sapphire for many infrared (IR) window and dome applications. Title III is supporting an initiative to 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 is placed on increasing size, quality, yield, and affordability of both ALON® and spinel, and on facilitating component evaluation, qualification, and insertion.

Armor and Structures Transformation

The excellent strength-to-weight and corrosion-resistance properties of titanium make it useful for many structural applications. It also has excellent ballistics properties that, along with the low weight, make it ideal for armor. Due to large increases in commercial aerospace demand for titanium, lead times for titanium have grown to over one year, while costs have more than tripled. By working outside the aerospace titanium supply chain, this Title III program will help reduce cost and shorten delivery lead-times for structural titanium and titanium armor. The initial effort is focusing on implementing the capability to direct-roll titanium in widths and thicknesses that can be used for armor tiles on military ground vehicles.

Armstrong Titanium Production

Titanium has several beneficial material properties that lead to the ability to reduce weight, reduce maintenance costs, and improve Warfighter safety in a variety of non-aerospace weapons systems. This Title III effort is seeking to improve the supply of titanium metal by increasing the domestic capacity to produce low cost metallic titanium powder. The Armstrong process has potential as a continuous process to produce metallic titanium powder directly from chlorinated titanium ore. This complements the current industry-standard batch distillation, melting, and refining processes required to produce titanium sponge. This alternative method could replace the current energy intensive titanium powder metal manufacturing process with an advanced process which will be used to develop near net shape consolidation processes; and fabricate products and components for testing, evaluation, and potentially qualification. Furthermore, the investment would form the basis for a long-term purchase agreement that would guarantee the Department access to favorable market prices for fixed material quantities over a multi-year period.

Atomic Layer Deposition (ALD) Hermetic Coatings

ALD is a deposition technique that lays down protective films one atomic layer after the other directly onto essential circuits, thus eliminating the need for costly and inefficient protective encapsulates. The purpose of this program is to establish and

expand a domestic industrial base capability to apply near-hermetic quality environmental coatings to both military and commercially viable microelectronics. Compared to traditional hermetic enclosures, microelectronic protection through ALD coatings will result in increased corrosion protection, reduced size, weight, and protection cost as well as increased operational life of the circuits.

Beryllium Production

When this project reaches completion, the United Sates and its allies will be assured of an uninterrupted supply of primary (high purity) beryllium metal for defense and civilian utilization. Current inventories of National Defense Stockpile beryllium ingots are projected to be exhausted in the near future. Imports of beryllium cannot meet the purity levels required for many defense applications. Essential strategic uses, where there is no suitable substitute for high purity beryllium include: airborne Forward Looking Infrared (FLIR) systems for fighter aircraft and attack helicopters; guidance systems on existing strategic missiles; surveillance satellites; ballistic missile defense systems; and reflectors for high flux, nuclear test reactors. This cost share project with industry will create a new primary beryllium production facility and will ensure continuous availability of high purity beryllium metal.

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. The goal of this Title III effort is to expand the domestic production capability for coal-based carbon foam to meet DoD needs for blast mitigation, hot structure applications and for low-cost tooling.

Continuous Filament Boron Fiber

Boron fiber is an essential 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 were the focus 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 has emphasized leveraging

mature, proven commercial manufacturing processes to produce boron fiber of high quality, adequate volume, and at a reduced cost for DoD applications. This project was completed in calendar year 2008.

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 work on this project includes testing and qualification of the materials for potential applications, cost reduction and the establishment of a full scale, high volume production capacity for high temperature aerogels, which was achieved in 2008.

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 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

The Title III Program is supporting the development of a U.S.-owned domestic source for prismatic lithium-ion cells and 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 (NiCd) or Nickel Hydrogen (NiH) rechargeable batteries. The Li-Ion battery offers the highest energy/power package of the developed batteries today. Additional advantages include better recharging capability with no memory effect and increased temperature operating ranges. This technology offers designers a weight saving option when compared to other battery types for overall weapon systems performance.

Light-Weight Ammunition and Armor

The objective of this effort is to establish a domestic source for the production of light-weight ammunition cartridge casings using an ultra-high strength, melt-processible, isotropic, amorphous, rigid-rod, self-reinforcing polyparaphenylene material. Ammunition casings produced with this material provide significant advantages over traditional brass casings such as decreased combat carrying weight, increased muzzle velocities, improved weapons accuracy, better corrosion-resistance, lower cost and increased savings from production synergies as well as lower deployment and transportation cost.

Low Cost Military Global Positioning System (GPS)

Military GPS receivers are a vital piece of equipment for soldiers on the battlefield. GPS receivers allow the Warfighter to perform both strategic and tactical maneuvers with a high degree of confidence of success. Without GPS receivers, soldiers are at a loss for both their specific positioning on the battlefield and that of their fellow soldiers. The primary objectives of this project are to create domestic production capabilities for essential subcomponents for the Defense Advanced GPS Receiver (DAGR), and to pursue methods for reducing their weight, size, power-consumption and cost, while improving performance capabilities.

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 has developed low rate initial production capability, supporting increasing demand levels, and reducing cost through increased production efficiencies.

Military Lens System Fabrication & Assembly

The Title III Program is establishing a domestic resource for mono-spectral and advanced multi-spectral optical systems and lens components. This effort 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

Title III is currently supporting an enterprise that will establish a domestic low-volume production facility for mini-refrigerant vapor compressors. The Program's industry partner recently purchased a production facility, and Title III is assisting 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.

Photovoltaic (PV) Solar Cell Encapsulant

Photovoltaic Solar Cell Encapsulants are used to protect delicate PV modules and solar cells from natural elements while insulating the embedded electrical circuits. There has been 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. The Title III Program expanded domestic production of PV solar cell encapsulant material 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 DoD 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)

Title III resources are being utilized to establish 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. ROIC microelectronics are 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. The next generation imaging requirements are dependent on the availability of advanced ROICs that provide high density with analog components, smaller pixels (increased resolution), and increased functionality through on-chip processing. Additionally, ROICs need to be physically larger (enabled through stitching technology) for increasing focal plane array size requirements, reduction of particle counts that improve production yields, and improved fabrication cycle times. All of 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 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 Carbon Dioxide (CO_2) Absorbent

Reactive plastic CO_2 absorbent material is a technology that secures the CO_2 absorbing material to a plastic sheet in a polymer matrix bond. This material is an important resource for national defense. It is utilized primarily in military scuba, submarines, and an array of homeland security applications to “clean” CO_2 from air needed for breathing. This technology is driven by the Navy, which seeks to utilize the advantages of reactive plastic CO_2 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 CO_2 exists. Title III is supporting efforts to increase the domestic production capacity of reactive plastic CO_2 absorbent material.

Silicon Carbide Monolithic Microwave Integrated Circuit (SiC MMIC) Devices

The goal of the SiC MMIC project is to establish a domestic supplier of low cost, high performance silicon carbide that can satisfy military requirements for advanced

radar systems. The project will 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. SiC MMICs can significantly enhance the information gathering capabilities of next generation military radar systems.

Silicon Carbide Powder Production and Ceramic Armor Manufacturing

High purity silicon carbide (SiC) powder, specifically submicron alpha SiC powder, is a critical item for national defense. This refined form of SiC powder is the key ingredient required to produce high quality, light weight, and cost effective SiC ceramic armor for the Warfighter. Primary applications include armor for land and air vehicles associated with the Army's Future Combat Systems program, armor for naval ships, lightweight armor for helicopters and other aircraft, and lightweight body armor. This Title III project is increasing the domestic production capacity for both submicron alpha SiC powder and SiC ceramic armor.

Thermal Battery Production

The objective of this Title III initiative is to 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. The Title III Program is incentivizing a domestic company for production scale up and capacity expansion efforts. The applicability of these 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 Silicon-on-Insulator (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)

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 U.S. air superiority margins over opposition forces by increasing lethality for U.S. munitions, increasing survivability for the Warfighter, and ultimately increasing mission success rates. Title III funding will enable expansion of the domestic production capacity of TiMMCs to support the Warfighter and assist the development of a database of TiMMC material characteristics and the processes required to produce TiMMCs.

Traveling Wave Tube Amplifiers (TWTAs) for Space

This Title III initiative is focusing on leveraging proven manufacturing processes to produce K-band 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.

Vacuum Induction Melting, Vacuum Arc Remelting Furnace Capacity

Low alloy Vacuum Induction Melting, Vacuum Arc Remelting (VIM/VAR) steel is a highly refined steel that is processed through multiple melts under vacuum in order to reduce excess gases and other impurities. VIM/VAR alloy steel is essential for many military applications including engine bearings, helicopter rotor shafts, transmission gears and engine mounts. This initiative to increase VIM/VAR capacity will reduce the order lead times and ensure the domestic supply of clean alloy steels for critical military components.

Yttrium Barium Copper Oxide (YBCO) High Temperature Superconductor

This Title III venture is aimed at establishing large volume, high quality, domestic production capacity for second-generation High Temperature Superconductor (HTS) coated conductor. Second-generation HTS coated conductor is the key 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. The project has established 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 2008, the PAIR forecasted Department-wide driver vision equipment, axle bearings and synthetic ballistic yarn requirements and coordinated with affected U.S. and coalition partner buying activities 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.

ODUSD(IP) executed 19 SPA related actions as depicted in the following table. Seven of these addressed the needs of U.S. forces, and the remaining 12 accommodated the needs of foreign allies, many of whom are engaged in Operation Iraqi Freedom or Operation Enduring Freedom. In addition, ODUSD(IP) proactively

engaged with industry to address numerous delivery issues on behalf of an OSD Task Force expediting the fielding of Intelligence, Surveillance, and Reconnaissance systems in Iraq and Afghanistan.

DEFENSE PRIORITIES AND ALLOCATIONS SYSTEM/ SPECIAL PRIORITIES ASSISTANCE CASES – 2008			
Date(s)	**Item**	**Assistance for**	**Summary**
01/08, 03/08, 08/08	Helicopter Parts	United Kingdom	Sponsored priority rating and expedited delivery
02/07, 08/08	Machine repairs for armor production	U.S. Steel Mill	Provided rating authority to expedite repair and resume production
03/08	Helicopter Ammunition	United Kingdom	Sponsored priority rating
03/08, 05/08, 07/08	Night Vision Equipment	United Kingdom	Sponsored priority rating and expedited delivery
07/08	Night Vision Equipment	Republic of Korea	Sponsored priority rating
07/08	Vehicle Composite Armor	United Kingdom	Sponsored priority rating and expedited delivery
07/08	Counter Radio Controlled Improvised Explosive Device	Joint IED Defeat Organization	Prepared justification and obtained SECDEF approval to extend DX authority
08/08	Helicopter Parts	Germany	Resolved delivery issue
08/08	Radios	Belgium	Resolved delivery issue
06/08, 09/08	Mine Resistant Ambush Protected Vehicle & Route Clearance Vehicle(s)	Joint MRAP program, Army programs, & UK program	Engaged multiple industries to resolve capacity constraints.
08/08	Night Vision Equipment	Greece	Sponsored priority rating
09/09	New Orleans Levees	U.S. Army Corp of Engineers	Prepared priority rating justification and secured DHS sponsorship and DOC approval
10/08	Intelligence, Surveillance, Reconnaissance Systems (ISR)	ISR Task Force	Engaged multiple industries to resolve capacity constraints.

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. It remains imperative to ensure that technology is affordable and producible in order to make our forces more agile, deployable, sustainable, lethal, and dominant anywhere in the world. The 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. The following five manufacturing technologies and processes represent affordable technology transitioned to the Warfighter as a result of DoD ManTech advancements.

ManTech Strengthens Industrial Base in High Power Density Lithium-Ion Batteries for Multi-Service and Commercial Applications

The military needed improved batteries with more power density, lighter weight, longer life, and that required less maintenance. By leveraging consumer electronic and commercial energy storage advancements of the Li-Ion battery industry, the Army, Navy, and Air Force ManTech Programs successfully laid the groundwork for advancing the manufacturing capability to ensure an affordable domestic source of Li-Ion batteries for military use. The Navy met the challenge to safely and economically package Li-Ion batteries and battery monitoring electronics into an energy storage system to withstand the rugged environmental conditions encountered in Special Operations missions. Navy ManTech developed a replacement energy storage system for the MK8 Mod 1 SEAL Delivery Vehicle (SDV) that was deployed by the Naval Surface Warfare Center, Panama City for $1.2M. The improved batteries provide increased mission capability with extended battery cycle life (seventeen times that of existing electrolyte batteries) and cost savings of $18M to the Navy due to less maintenance with Li-Ion batteries. Army ManTech invested $23.6M to reduce the labor hours and improve manufacturing processes of high power Li-Ion batteries for use in the FCS Systems Development and Demonstration prototype production vehicles. The cost of Li-Ion battery packs (for full production) is expected to be reduced from $115K per pack to $58K per pack for total Army cost avoidance of $121M. The Air Force also plans to use lower cost, higher reliability Li-Ion batteries in its Joint Strike Fighter. The Li-Ion battery ManTech advancements prompted a follow-on joint venture between the battery manufacturer (Saft America) and Johnson Controls to reduce manufacturing cost and mass produce batteries for the commercial hybrid electric vehicle market which will help strengthen the overall Li-Ion battery industrial base.

DLA ManTech Improves Rations Production for Our Warfighters

Meal-Ready-to-Eat (MRE) entrees are contained in hermetically-sealed multi-laminate foil pouches. The filling process occasionally leaves entrapped matter in the seal area which prevents the pouch from being reliably sealed with traditional heat sealing methods. The DLA ManTech Program developed new MRE pouch-sealing production methods to reliably seal MRE pouches under its DLA Combat Rations Network (CORANET) program. The new production method leverages commercially-available ultrasonic technology and is retrofitted to existing MRE production equipment. The ManTech investment was $686K and resulted in cost savings of $3.7M due to a 78 percent decrease in rejected product and 40 percent increase in production throughput (from 32 to 45 pouches per minute). The improved rations production provides improved food safety with few seal defects for the Warfighter. The rations industrial base was greatly improved as a result of ultrasonic technology production lines that were implemented at SOPAKCO, Ameriqual, and Wornick – that represents a significant portion of the entire MRE industrial base.

Navy ManTech Contributes to VIRGINIA Class Submarine Affordability with Laser Image Projection Technology

Reduced cost is a key driver in Navy shipbuilding. Navy ManTech provides manufacturing technology advancements to assist in improving the affordability of the VIRGINIA Class submarine (VCS). The Navy's newest attack submarine, the New Hampshire, a VIRGINIA Class Submarine, was delivered on August 3, 2008. Along with her sister ships, the New Hampshire will provide the Navy with the capabilities required to maintain U.S. undersea supremacy. This 7800 ton vessel that can operate at greater than 25 knots when submerged was delivered eight months ahead of schedule and $54M under budget. A specific example of how a Navy ManTech investment helped reduce shipbuilding costs is in the adaptation of laser image projection technology for locating attachments and penetrations on the interior hull of the submarine. Until this development, this was a labor-intensive process using paper templates and string measurements. Based on attaching 2,300 hangers and installing 4,500 studs in 13 hull cylinders in a pilot demonstration, a savings of 7700 labor hours per ship is now being realized – reducing labor by 85 percent compared to the previous method. Relying on digitized CAD model design information, a small computer controlled projector is used to visually mark locations on the inside cylinder wall where attachments are required. The only hand labor required is the actual shooting of the welding stud. This manufacturing technology is one of many Navy ManTech efforts to help achieve the goal of building each VIRGINIA Class submarine for under $2B.

Air Force ManTech Implements Non-destructive Inspection Techniques to Reduce Sustainment Costs

The sustainment costs of aerospace gas turbine engines can be prohibitive due to the high costs of inspection. ManTech helped reduce the Air Force’s sustainment burden by implementing advanced non-destructive inspection techniques for F100 and F110 gas turbine engines at the Oklahoma City Air Logistics Center (OC-ALC). Under the Engine Rotor Life Extension (ERLE) program, ultrasonic inspection techniques were developed that permit safe life extension of engine components for seven to ten years of additional service. The Air Force ManTech investment was $22.5M, and the cost avoidance is projected to be $300M by eliminating replacement of multiple components plus additional $250M cost avoidance by extending the life cycle time of both types of F100 and F110 engine components. Military aerospace contractors, General Electric Aircraft Engines (Evendale, OH) and Pratt and Whitney (Hartford, CT), have both implemented ERLE methodologies as a standard in the analysis of engine disk loading of military airframes. The Manufacturing Readiness Level (MRL) generally increased from MRL 4 to MRL 6+ (e.g., able to be manufactured in a production-relevant environment) during this project. The ERLE program will reduce the engine life-cycle cost of the F-15, F-16, B-1, and B-2 fleets which will free significant resources for other Warfighter priorities.

Army ManTech Develops Composite Overwrap Process for Lightweight Cannons

Future Combat Systems (FCS) requires light weight, high performance materials to meet its size and weight objectives. The Army ManTech Durable Gun Barrels and Armaments Manufacturing Technologies project developed and transitioned production-capable large caliber FCS cannon manufacturing processes for composite barrel overwrap used in high performance FCS cannons. The baseline FCS Mounted Combat System 120mm XM360 cannon design incorporated the composite overwrap gun barrel providing over 200 lbs in weight savings. Developmental Electro-magnetic (EM) gun launchers for the Army EM Gun program were produced utilizing the composite overwrap technology as well. This composite technology transitioned to both the Army and Navy's EM gun programs. Army ManTech participants were the Army RDECOM ARDEC (Picatinny, NJ), Benet Labs (Watervliet Arsenal, NY) and Automated Dynamics (Schenectedy, NY). This project was conducted from December 2003 – February 2007, and the total Army ManTech funding was $16.5M. Cost benefits of this project are projected at $37M. Army ManTech investment matured the manufacturing readiness level to MRL 8 for this material. Once qualified for use on FCS, the industrial base will have in place a mature manufacturing process for full rate production.

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7. Programs and Actions to Sustain Capabilities

In 2008, the Department acquired and/or maintained facilities, equipment, or components, or took other actions needed to meet projected and actual military contingency requirements.

- An Army assessment of ammunition production capability determined it was necessary to restrict competition for over $1.5B in ammunition procurement for 20 and 30 millimeter, 120 millimeter tank ammunition, and mortar cartridges in order to preserve the industrial base. These procurements will be executed in 2008 and future years in order to ensure adequate ammunition production capability in case of emergency.

- DLA - Defense Supply Center Philadelphia (DSCP) has contracts in place that guarantee immediate availability of up to $375M in medical materiel for Surge and Sustainment (S&S). This coverage increases to a total of $670M 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 $670M 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.

- The Army reviewed and approved $268.7M in direct facility investments at six government owned, contractor operated ammunition manufacturing facilities. These investments were determined critical to maintaining essential mobilization capabilities.

- DLA completed an industrial base study on the Joint Service Lightweight Integrated Suit Technology (JSLIST) in 2008 to assess the industrial base capability of the supply chain. The study indicated a significant risk for sustainment in the filter fabric portion of the supply chain. DLA submitted an issue paper in the President's Budget Review 2010 to address the continued sustainment of this critical industrial base. An investment in CY08 included $26M in Minimum Sustaining Rate (MSR) contracts for the JSLIST chemical protective suit.

- The second year of funding for tent MSR contracts was completed in 2008 with $23.5M provided to maintain that industry. 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 and its Defense Supply Center Philadelphia (DSCP), industry, government, and academia to ensure the availability of tents and shelters. This collaboration focused on

enhancing the supply chain to reduce cost, improve surge capability, and reduce production lead-time while providing products with the same or better quality.

- DLA invested $8.1M during FY08 for an Industrial Base Maintenance Contract (IBMC) to Meridian Medical Technologies (MMT) to retain a capability to satisfy the Services' wartime requirements for Nerve Agent Antidote Autoinjectors (NAAA). MMT, the sole U.S. Food and Drug Administration approved manufacturer of NAAA, produces five types of NAAAs which fall under the NBC Defense Program. NAAAs are military-unique items designed for rapid self-administration through clothing upon exposure to a nerve agent. The IBMC pays MMT to maintain a warm base and to rotate prepositioned components in order to increase production capacity to satisfy the Services' wartime requirements for NAAA.

- DLA transferred management of the BA-5590 family of batteries with the award of a multi-year contract to SAFT America. During the long acquisition process, normal demands did not justify placing orders with either of the current suppliers (SAFT or Eagle Picher). Without Minimum Sustaining Rate (MSR) support, capability at Eagle Picher would have been lost, and SAFT's capability would be degraded in the short term and at risk of loss if the acquisition was significantly delayed.

  By engaging MSR support, both suppliers were able to retain a minimum core of experienced employees and sub-tier suppliers. At SAFT, the BA-5590 (with Status of Charge Indicator) was produced at an MSR of 10,000 batteries a month but within a two-week/month time window. At Eagle Picher, minimum production was at a rate of 7,500 batteries per month. An early award of the multi-year SAFT contract allowed shutting down the MSR monthly production (totaling $6.5M) with only a little over half of the total MSR funding expended.

  Concurrently with their contract award, SAFT received sustaining orders enabling their continued viability. Eagle Picher will be offered a controlled shut down of their facility using an IBMC, projected for award in early FY 09. The IBMC would maintain them as a viable back-up source for the BA-5590, should a catastrophic loss occur elsewhere within this critical industry.

- DLA obtained "no charge" surge coverage on 1,288 contracts. This coverage represents a cost avoidance of $32,707,035 that neither DLA nor the Services will have to expend for supplies to ensure that critical war/contingency items will be available.