The National Security Space Industrial Base

Understanding and Addressing Concerns at the Sub-Prime Contractor Level

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Overview

The Air Force, as the Department of Defense’s executive agent for space, is taking aggressive action to address many pressing national security space acquisition issues. However, both the Air Force and the prime national security space contractors have raised concerns about the viability and performance of sub-prime contractors in the space industrial base.

The Space Foundation, at the request of the DoD’s executive agent for space, convened an independent national security space senior executive working group to solicit suggestions from leaders in the space industry to address some of the problems. This group reviewed existing efforts to address some of the issues affecting the sub-prime level of the national security space industrial base. It also focused on areas that were not addressed in the other studies.

Background

The Department of Defense, in a February 2006 report to Congress, assessed the economic outlook of the aerospace sector of the defense industrial base as positive. This sector was portrayed as a bright spot in the economy, outperforming the S&P 500 and yielding a return that beats many major non-defense industrials. However, the prime contractors of the space industrial base are engaged in business that extends far beyond the national security space sector. When examining the performance of the sub-prime contractors of the space industrial base, the picture is very different. During the past several years, a number of factors have affected the ability of the sub-prime contractors to perform effectively. These have included mergers and acquisitions at the prime contractor level resulting in their divesting business units that were less profitable than the systems integration work on which they are increasingly concentrating. These less profitable, divested business units have become subcontractors to the primes. Today, by some industry estimates, the primes are sourcing up to 80 percent of new programs to the supply chain.

In addition, the broader markets for these subcontractors have shrunk as a result of the stagnation and decline of both the commercial satellite industry and the commercial launch business. Limitations imposed by export controls have severely constrained or precluded these subcontractors from participating in the global space market. Many of these lower tier contractors do not have the resources or expertise to deal effectively with the emerging supply chain.

All of these factors have contributed to low profit margins in this segment of the national security space sector, discouraging investment and new entrants. The DoD February 2006 report to Congress assessed U.S. aerospace/defense industry net profitability rising from 4.2 percent in 2004 to 5.2 percent in 2005. They project a net profit margin of 6.6 percent for 2006. However, these projections are for the overall defense and aerospace industry and are reported at the level of the prime contractors. For at least the last decade, the space industry has experienced high volatility, high risk, market bubbles and
financial losses. These factors have resulted in the space sector tending to under-perform the overall defense, and even aerospace, sectors. In addition, the profit margin at the level of the prime contractors tends to be greater than that of the lower tier contractors.

Therefore, because the market and margins are so small, the skills so specialized and the barriers to entry high, the base of these suppliers is small and dwindling. If these subcontractors cannot adjust to the current supply chain or survive market shocks, there is a danger that many may disappear. The Suppliers Excellence Alliance, a non-profit organization funded by both prime contractors and sub-primes to assist lower tier defense contractors, estimates that during the next five years, 50 percent of the suppliers in the sector will cease to exist. Compounding this problem is that small profit margins and high risk discourage the flow of financial capital into this sector at the lower tier levels.

The slim margins also drive a cycle where subcontractors can no longer afford to make sufficient investments in personnel, equipment and other essentials to be competitive. In addition, the subs are often under pressure from the prime contractors to reduce costs. The reduction in critical investments fuel an effect DoD refers to as “hollowing out the supply chain.” As the subcontractor fails to make the needed improvements in service levels and costs, they become less competitive and, therefore, win less business. As a result, there is less capital to cover overhead and less available to make necessary investments. The results of this process are manifest in substandard performance.

Currently, the prime contractors and the Air Force are observing problems with the performance of many sub-prime contractors. These problems manifest themselves in the areas of quality and the ability to meet schedule commitments. The limited business opportunities and low margins also have taken a toll on workforce quality as those with the education and skills needed in the space industrial base seek employment in other, more lucrative technology sectors.

Review of Current Efforts to Address Industrial Base Concerns

Currently there are a number of on-going initiatives from the Air Force as the DoD executive agent for space to address national security space industrial base concerns. A brief overview of some of the major efforts is provided below.

Space Industrial Base Council

The Space Industrial Base Council (SIBC) was established by the DoD executive agent for space to identify and address national security space industrial base concerns. It is co-chaired by the under secretary of the Air Force and the director of the National Reconnaissance Office and consists of a National Security Space Industrial Base Council and working groups comprised of senior national security space, civil and government leaders with solicited input from industry. The recently chartered Council includes approximately 10 senior government officials and invited guests to facilitate communication with industry leaders and timely decision-making and direction.
The focus of the SIBC is to identify real improvements the government can implement. It monitors and assesses the health of the national security space industrial base (government, civil and military) as it relates to national security. The SIBC directs working groups to explore areas for semi-annual meetings. The agenda for these meetings is designed for the SIBC to get a status update and be able to make timely decisions with the aid of multiple senior government officials and selected industry representatives. To date they have held two meetings, in March and December 2005. The next planned meeting is in June 2006.

Current projects of the SIBC include:

**SIBC directed Industrial Base study**

The Government Business Practices working group recommended at the December 2005 SIBC meeting that the SIBC undertake a study of the impact of International Traffic in Arms Regulations (ITAR) on the Space Industrial Base. Department of Commerce (DoC) Bureau of Industries and Securities (BIS) agreed to take the lead on this with the NSSO as the coordinator. Based on the working group’s recommendation, the under secretary of the Air Force has requested BIS conduct an overall industrial base study, one portion of which is the impact of export controls. The initial look, due in June 2006, will focus on lower tier suppliers, specifically key critical suppliers. The full report should be complete by December 2006. The detailed terms of reference for this study can be viewed at Attachment 1.

**SIBC Critical Technologies Working Group**

This action was a follow-up to the December 2005 SIBC meeting. The way ahead is to schedule a meeting with AT&L and the under secretary of the Air Force to explore future fiscal year funding lines to set aside funds that will be needed for critical technologies.

**Other Government Studies**

**Office of Science and Technology Policy study**

The Office of Science and Technology Policy solicited the Science and Tech Policy Institute (FFRDC) to conduct a space industrial base study to include academia. This is due in June 2006 and is primarily a fact finding study. It has been deconflicted with the NSSO/BIS ITAR study.

**DUSD(IP) Export Controls and U.S. Defense IB study**

DUSD/IP asked for and is executing a study with the Institute for Defense Analysis (FFRDC) on the impact of export controls on the overall defense
industrial base. The start date for this study was September 2005, and the full report is due in October 2006. This study is not space specific.

**SECDEF-level directed PDM-1 workforce study**

This study directs USD (AT&L) to continue investigation of the state of the space industrial base and government oversight capabilities. It also directs DoD to work with industry leaders to identify business incentives, training opportunities and actions needed to attract and sustain engineering and scientific personnel in this industrial sector. In addition it directs government leaders to develop a strategy to increase the number of experienced/qualified military, government civilian, FFRDC, and support contractor staff to fulfill government oversight responsibilities. AT&L DDR&E has delegated the workforce study to NSSO.

PDM-1 also directs the DoD Director of Programs and Analysis to use results of the space industrial base study presented to the deputy secretary of defense 1 November 2005 to develop a strategy and execution plan for existing and new space acquisition programs to ensure that the DoD investment in this mission area will deliver the desired capabilities. It further directs them to provide a report on this acquisition strategy for the space mission area for consideration and implementation in the FY08 President’s Budget and the FY 08-13 FYDP.

**Space Quality Improvement Council**

The Space Quality Improvement Council (SQIC) is an industry forum established to cooperatively address critical issues in the development, acquisition, and deployment of national security space systems. It is a unique meeting of executive-level engineering and quality control leadership from the national security space contractor community, mutually interested in affecting mission assurance, product quality, and acquisition policy consistent with the national security priority of their products.

It is facilitated independently by The Aerospace Corporation and provides an opportunity to non-attributively identify and carry forward consensus industry positions, feedback, and recommendations with national security space acquisition leadership.

**SQIC Members include:**

The Aerospace Corporation
ATK
Ball Aerospace & Technologies Corp.
Boeing Integrated Defense Systems / Mission Assurance
Boeing Integrated Defense Systems / Space & Intelligence Systems
General Dynamics
ITT Industries
Jet Propulsion Laboratory
Lockheed Martin Space Systems / Engineering
Lockheed Martin Space Systems / Mission Success
Northrop Grumman Space Technologies
Orbital Sciences Corporation
Pratt & Whitney Space Propulsion
Raytheon Company
Space Systems / Loral

Sponsors Include:

Lt Gen Michael A. Hamel
Commander, Space and Missile Systems Center
USAF Space Command

Lt Gen Henry A. “Trey” Obering, III
Director
Missile Defense Agency

Maj Gen Robert H. Latiff
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National Reconnaissance Office

Maj Gen James B. Armor, Jr.
Director
National Security Space Office

Mr. Bryan D. O’Connor
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National Aeronautics and Space Administration
SQIC meetings have focused on the following topics surfaced by the industry participants:

- Lessons learned
  - Industry practices and information sharing
- Systems engineering best practices
  - SMC Systems Engineering Revitalization
- Quality processes and initiatives
  - Independent internal reviews and program baseline reviews
  - National security space development and test practices
- Parts, Materials and Processes (PMP)
  - Space parts qualification and alerts
  - New SQIC/GIDEF NSS Failure Advisory System
- Data sharing during anomaly investigations
  - Trusted relationships and collaborative resolution
- Specs & standards reintroduction
  - Industry reviews and prioritization
- NSS industrial base issues
- Subcontractor/supplier management
- Space technology insertion
- Mission assurance processes

It is worth noting that the SQIC meetings have been a forum where the primes have surfaced many of the problems previously discussed that they have experienced with sub-prime contractors.

**Industry Initiatives**

Supplier Excellence Alliance (SEA) is a nonprofit organization founded in 2003 and funded primarily by prime contractors and some state governments to improve supply chain performance. SEA’s primary focus is to assist suppliers at all levels implement lean enterprise management systems to enhance performance, quality and profitability.
Discussion and Space Foundation Recommendations

The Space Foundation has identified other actions in addition to the official Air Force and DoD initiatives to address problems with the national security space industrial base to help restore the health of this sector at the sub-prime contractor level. First and foremost, it is essential to understand the current actual status of the space industrial base and devise a comprehensive strategic plan for managing it. Improving the viability and performance of the lower tiers of the national security space industrial base requires, more than anything else, improving the profit margins for these businesses. Achieving this mandates a more stable environment, increasing overall market opportunities, reducing overhead and providing incentives. Recommendations for addressing each of these are discussed below.

Assessment and Management

Recommendation: The Air Force undertake a comprehensive assessment of the state of the space industrial base at the sub-prime level.

Currently there is no accurate comprehensive assessment of the state of health of the space industrial base at the sub-prime level. An abundance of anecdotal information provided from the prime contractors and government agencies indicates that serious erosion may be occurring at this level. But reliable and comprehensive quantitative data does not exist and is required to calibrate the extent of the problems fully. The proposed Space Industrial Base Council-directed Industrial Base survey (Attachment 1) being conducted in conjunction with the Department of Commerce (DoC) Bureau of Industries and Securities (BIS), offers the potential to accomplish this while also furnishing critical data on the impact of export controls. However, at the time this paper was finalized, that study was put on hold. **Recommend DoD, at the most senior level, strongly advocate for the completion of that study on the existing schedule.** While the SIBC/DOC study offers the prospect of getting the best data, if it is not possible to complete that study for whatever reasons, **recommend DoD fund a similar study from an outside organization.** This can be accomplished under the auspices of an FFRDC such as The Aerospace Corporation, or an independent think-tank or association.

Recommendation: The Air Force create a management plan for the space industrial base, particularly at the sub-prime level.

A management plan for the space industrial base does not exist. The national security space industrial base is a relatively narrow niche of our economy yet is essential to our national security. As such it must be maintained regardless of free market dynamics. Recognizing that all policies are, in essence, management decisions, they should be consciously designed to maintain and encourage the necessary health of the national security space industrial base while preserving the free market values that foster initiative, innovation and competition. Not having a comprehensive management plan for this specialized sector of the economy runs the risk of uncoordinated, conflicting and
potentially counterproductive policies fraught with unintended consequences. Many of the following recommendations can be part of a comprehensive management plan.

**Stability**

**Recommendation: Fully and expeditiously implement the “block acquisition approach” to increase stability and decrease volatility in the national security space acquisition environment.**

The national security space sector has been characterized by extreme volatility, high risk, and financial losses. This has been particularly challenging for the sub-prime contractors who operate on slim margins. Reducing “churn” by disaggregating some of the larger complex systems and acquiring more smaller systems using an incremental or spiral development approach offers several benefits. It would reduce the infrastructure and capital investment required to work on any given system, maintain a steadier pipeline of work, reduce risk associated with conducting research and development in the critical manufacturing path, and make the market more accessible, fostering competition. It also offers a number of workforce benefits, including greater job security and satisfaction and better opportunities for building critical skill sets.

The “block acquisition” approach recently introduced by the Air Force and the stated intent of the Air Force to develop more, smaller launch vehicles and satellites using an incremental, or spiral development approach, offers promise for making progress in addressing this issue.

**Recommendation: Disperse research and development funding to multiple contractors and award subsequent contracts for developing those technologies demonstrating the most promise.**

Dispersing early stage research and development funding to multiple contractors would provide a more stable funding stream to a wider base of small contractors while encouraging greater innovation. In addition, helping ensure a more stable workflow would facilitate maintaining a broader base of suppliers while also addressing workforce issues such as recruiting, skill development and retention. Further recommend using research and development tax incentives to make the margins more attractive and to encourage greater participation.
Increase Market Opportunities

**Recommendation:** Address export controls as a national security industrial base concern.

The domestic space market for all space sectors -- national security, civil and commercial -- is relatively limited with slim prospects for improvement. Export controls, instituted to safeguard sensitive national security technology, have had significant unintended negative consequences for the domestic space market. In particular, these restrictions have constrained the ability of domestic space contractors to acquire global business, created foreign competition, restrained an international customer base due to a reluctance to do business with U.S. companies for fear of being bound by export control restrictions, and inhibited foreign investment. Authoritative quantitative data is currently lacking as to the actual impact and costs of export controls to the U.S. economy. This has constrained discussion on the actual effect of export controls on the national security space industrial base, and more broadly, on national security in general. The SIBC-directed industrial base study, previously referenced, offers an opportunity to provide the necessary data. Once data is available, and, if that data, as anecdotal evidence would indicate, reveals a significant impact on the national security space industrial base, recommend the national security impacts of export controls on the national security space industrial base be considered in a cost-benefit analysis as a means of potentially providing greater access to global markets, while still protecting the most sensitive national security technology.

**Recommendation:** DoD work with the Departments of State and Commerce to conduct a wide-scale review of the list of technologies on the export control list and remove those that are not necessary.

Although DOS conducts reviews on a case-by-case basis, industry still reports that a number of technologies on the export control list are widely available internationally. These should be broadly re-examined to see if they can be de-listed, allowing U.S. suppliers to compete on the global market.

**Recommendation:** DoD work with the Congress to revamp and modernize the export control system.

Currently, to sell items on the export control list requires companies to receive an export license from the State Department. Reports from industry reveal that the bureaucratic process required to obtain export licenses, even for products widely available on the international market, impedes U.S. competitiveness. Most invitations to bid for contracts that involve foreign sales have a response time of 30 or 60 days. Most small U.S. companies are unable to get export licenses in that timeframe.
Recommendation: Provide assistance to small national security space businesses seeking export licenses.

In the absence of relief from current export control licensing regulations, the Air Force should consider providing some assistance to small national security space businesses to help them obtain licenses on a timeline that would allow them to compete for international business. This can be done by sponsoring centers of expertise that would help small national security space contractors with the process. This can be accomplished indigenously by DoD, an FFRDC, or by contracting for the service, or otherwise subsidizing it, within existing organizations assisting sub-prime contractors.

Reduce Overhead Costs

Recommendation: Provide incentives to establish business services support and centers of expertise to assist lower tier suppliers.

Currently the level of overhead costs required to meet a number of non-programmatic requirements for national security space programs serves as an impediment to bid on these contracts or significantly undermines profit margins. In addition to routine business functions such as human relations, legal, accounting, and administrative support, the nature of national security space business imposes specialized requirements for expertise that are not resident in smaller companies. For example, industry groups report that many smaller suppliers do not bid on opportunities that require participation in an auction, or other competitive bidding activities, because they are unable to understand or implement the standards required, determine whether they meet these, and still ensure they would be profitable if they do bid. Since these companies do not need this type of expertise or support on a full time basis, it is not feasible for them to hire personnel to accomplish it, and it is not available from other agencies or industry groups.

In addition to the specialized expertise required for items like standards adoption, many suppliers maintain unnecessary overhead in meeting more routine business services. **Recommend providing incentives such as direct funding, grants, tax incentives or other mechanisms to finance specialized overhead requirements, to encourage the establishment of business services centers and centers of expertise to support lower tier national security space contractors.** This can be accomplished by providing incentives to establish for-profit enterprises or nonprofit cooperative ventures run by the suppliers themselves.
Incentives

Recommendation: Use tax incentives and direct cash infusions for suppliers of products on the Critical Technologies List.

There are several areas where the domestic supplier base has dwindled to critically low numbers, some to single suppliers. In these areas, providing tax incentives and cash bonuses or grants may help revive supplier interest in entering the market. The consensus of the Space Foundation Senior Executive Working Group was that profit margins would need to at least double before they would be sufficiently attractive to incent new entrants.

Recommendation: Provide grants to assist suppliers with workforce and business practice development.

Many small suppliers are operating on such tight margins that they cannot invest in workforce development and a number of innovative business practices. Providing targeted grants either directly or working with nonprofit industry groups and state governments, can significantly help small suppliers improve the efficiency of their operations while also boosting their competitiveness. The Supplier Excellence Alliance, working with state governments who have provided funding for similar initiatives, reports direct returns on investment of 5 to 1 within six months, and indirect economic returns of 200 to 1. These incentives have stimulated investment that has dramatically increased the sub-prime contractors’ competitiveness. Incentives of this nature are widely available in other government sector such as in the Agriculture Dept. and the Small Business Administration and could possibly be applied in this sector.

Conclusion

The national security space industrial base is a critical component of the overall defense industrial base. The sub-prime contractors who comprise this sector have exhibited a number of warning signs that they are in trouble. In today’s environment, this sector is indispensable to U.S. national security and must be maintained. The Air Force and prime contractors have undertaken a number of initiatives to understand and address the challenges of the sub-primes. However, much still needs to be done to restore this sector to a state of health where it can once again be competitive and achieve growth. This sector is critical to future national defense capabilities as it has been a fundamental crucible for innovation and development of the leading-edge technologies that have proven the hallmark of our asymmetrical advantage in the national security environment. A coordinated and concerted effort by government and industry is needed to help restore the profit margins and health of these sub-prime contractors. This white paper has offered a number of recommendations that could help achieve this.
Sources

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Terms of Reference

Industrial Base Assessment of the U.S. Defense & Commercial Satellite Industry

MISSION: Quantify the national security impact of existing U.S. export control regulations on the U.S. Space Industrial Base.

SCOPE: The study will assess both the government and commercial sectors of the U.S. Satellite Industry within the overall Global Satellite Market with focus upon the years 1995 to 2005. The products studied will range from technologies to entire satellites. This includes components, subsystems, and systems. Survey participants will include industry associations (as advisors) as well as U.S. prime, second, and lower tier suppliers.

OBJECTIVES:
1. Short term (June 2006): Collect objective economic data of the impact of export controls on the national security of the current and future domestic production of critical space products and technologies.
2. Long term (December 2006): Collect objective economic data of the impact of export controls on the national security of the U.S. Space Industry to provide insights into the:
   - Health and Competitiveness of U.S. Industry at Prime and Subcontractor Level
     - Current and Long-term
   - Foreign Duplication of U.S. Space Industrial Base
   - Offshore Development of Satellite Industry

STUDY TEAM MEMBERS:
NSSO, NRO, ATL, BIS, DSB, SAF/UST (AQR), DTSA, OSD (P), NASA, DoS, and Joint Staff.

APPROACH:
- Form sub-team to work with BIS to create questionnaire and a list of prime contractors and potentially vulnerable and/or critical lower tier suppliers.
- BIS will conduct industry survey of select subset of companies with technical support from the sub-team.
- Sub-team will analyze survey results and develop recommendations.
- Sub-team will create list of remaining companies for further study.
- BIS will survey remaining list of companies with previous questionnaire.

SCHEDULE:
- Feb. - June 2006: Study team will conduct round table meetings to develop list of critical technologies and selected companies. Site visits and surveys will be used to collect objective data on the national security impact of existing export controls.
on critical space technologies and products. Conclusions and recommendations will be presented at the June Space Industrial Base Council meeting.

- July - Dec 2006: Study team will conduct round table meetings to expand the original list of companies. Site visits and surveys will be used to collect objective data on the national security impact of existing export controls on the overall space industrial base as outlined in long term objectives. Overall conclusions and recommendations will be presented at the December Space Industrial Base Council meeting.

**PRODUCTS:**
- December 2006: Final report on export regulations’ impact on the broader space industrial base as outlined in long term objectives.

**DATA:**
The data to be collected include company specific and product specific information. For each product (i.e., satellite, system, subsystem, and/or component), the company should indicate the associated sector/market: Government, Commercial, or Dual Use, as well as whether the product is sold domestically or internationally.

The company specific data include:

- Annual Space Related Technical Employment
  - Job Function
  - Government or Commercial
  - Number of security clearances
  - Program or product
- Technical core competencies
- Relevant subsidiaries that provide lower level systems, components, and/or technologies

The data that should be collected for each product on an annual basis include:

- Products
  - List of products
    - Indicate whether a product/technology is readily available on the open market or dual use
  - Production Levels
  - Production Capacity
  - Market Share
  - Parts Sourcing
    - List of sub-prime contractors together with the technology/product that they are providing
    - Country of origin
- Key satellite components without U.S. source

- Financials
  - Sales
    - Product
    - Sector
  - Expenses
    - R&D
      - Indicate whether or not it is government funded
    - Cost of goods sold
    - Administrative

Export Control Specific

- For each of the items below, the contractor must list specific instances and provide details, e.g., outcome of sales opportunity or reason for export license denial.
  - Lost sales due to export regulation restrictions or delays
  - Lost sales due to foreign duplication of space industrial base due to U.S. export controls (e.g., “ITAR free” products)
  - Lost revenue or expenses due to delays
  - Overhead: e.g., administration, lawyers, etc.
  - Increased R&D costs
  - Increased production costs
  - Number of licenses applied for and granted
  - Opportunity cost if export restrictions discourage product development due to high overhead or lack of global market
  - Opportunity cost if excluded from international projects
  - Personnel costs due to inability to hire foreign workers
  - Increased component costs
  - Subsidies needed to maintain U.S. domestic production
  - Foreign import restrictions