Union Calendar No. 589

110TH CONGRESS *2d Session* | HOUSE OF REPRESENTATIVES | REPORT 110–914

REPORT ON CHALLENGES AND RECOMMENDATIONS FOR UNITED STATES OVERHEAD ARCHITECTURE

together with

MINORITY AND ADDITIONAL VIEWS

SUBMITTED BY MR. REYES, CHAIRMAN, PERMANENT SELECT COMMITTEE ON INTELLIGENCE

OCTOBER 3, 2008.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

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LETTER OF TRANSMITTAL

HOUSE OF REPRESENTATIVES,
PERMANENT SELECT COMMITTEE ON INTELLIGENCE,
Washington, DC, October 3, 2008.

Hon. NANCY PELOSI,
Speaker of the House of Representatives,
Washington, DC.

DEAR MADAM SPEAKER: On behalf of the House Permanent Select Committee on Intelligence, I am pleased to transmit to the full House of Representatives the Report on Challenges and Recommendations for United States Overhead Architecture authored by the Subcommittee on Technical and Tactical Intelligence. This report has been carefully reviewed in consultation with the appropriate agencies to insure that the contents are unclassified.

As the 110th Congress closes, I would like to thank you for your leadership and support of the work of the Committee. I look forward to continuing my work on behalf of the nation and the men and women of the Intelligence Community.

Sincerely,

SILVESTRE REYES,
Chairman.

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OCTOBER 3, 2008.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Mr. REYES, from the Permanent Select Committee on Intelligence, submitted the following

R E P O R T

together with

MINORITY AND ADDITIONAL VIEWS

The Permanent Select Committee on Intelligence submits the following report on challenges and recommendations for United States overhead architecture.

EXECUTIVE SUMMARY

The United States is losing its preeminence in space. A once robust partnership between the U.S. Government and the American space industry has been weakened by years of demanding space programs, the exponential complexity of technology, and an inattention to acquisition discipline. The U.S. Government created an environment that ensured the success of its space missions in the 1950s and 1960s. It provided appropriate funding and personnel needed to accomplish ambitious missions within a reasonable schedule. While the Government still has creative personnel, innovative ideas, and adequate funding, American dominance in space is diminishing. The purpose of this report is to find out why.

The House Permanent Select Committee on Intelligence Subcommittee on Technical and Tactical Intelligence (TNT or Subcommittee) has studied the problems with our nation's overhead satellite architecture. The perceived failure of the Intelligence Community and Department of Defense (DOD) to develop an integrated overhead roadmap or architectural plan for the intelligence mission in space is the principle motivation for this study. Recent organiza-

tional changes and inter-departmental agreements involving the Office of the Director of National Intelligence (ODNI), the Department of Defense (DOD), and the National Reconnaissance Office (NRO) have highlighted the question of leadership of space acquisition programs.

The Subcommittee produced this report to document the issues and challenges facing the development, acquisition, and execution of a space architecture to serve the demands of the U.S. Intelligence Community and DOD. This report examines the narrowing gap between U.S. capabilities and emerging space powers such as Russia, India, and China. Space continues to play an increasingly important role in supporting the national security interests of the United States. As the number and types of national security threats increase, the nation must continue to deliver space capabilities that provide policy-makers and the war fighter with the information they need.

The next few years are a defining moment for the United States. Experts in both industry and the executive branch were unanimous in their view that the United States is at an important crossroads with respect to its space architecture and that decisive action is required to chart a successful course to preeminence in space.

FINDINGS

This study resulted in a compilation of Subcommittee recommendations that, if implemented effectively, will help restore space acquisition excellence and maintain the United States' position as the world's leader in space. There are five key areas of concern.

First, there is no comprehensive space architecture or strategic plan that accommodates current and future national security priorities, DOD and Intelligence Community capability requirements, and budget constraints. The DNI and the Secretary of Defense need to develop this plan. The current trends with respect to the space constellation indicate that it will soon be incapable of satisfying the national security needs.

Second, programs jointly funded in the National Intelligence Program (NIP) and Military Intelligence Program (MIP), requiring joint decisions by the DNI and DOD, result in delayed program starts. While having an appropriate space architecture will clarify the desired capabilities, the acquisition process would benefit greatly by moving away from joint funding and by having more clearly defined authorities.

Third, research and development (R&D) receives inconsistent funding despite the link between many failed acquisition programs and insufficient upfront R&D investment. Research investments must be treated as a national security priority. Programs need to clearly define what needs to be accomplished in the R&D, pre-acquisition, and development phases in order to have a successful satellite program.

Fourth, the Government's expectations of the commercial data providers are inconsistent and ambiguous. The Intelligence Community and DOD must define more clearly the Govermment's expectation surrounding the use of commercial services and develop the systems needed to more easily access and deliver data to Government customers.

Finally, current statutes and regulations may negatively impact the U.S. space industry. The U.S. Government must review the impact on the space industrial base of the International Traffic in Arms Regulations and other statutes and regulations that restrict space commerce to ensure that the effort to protect U.S. national security interests does not unnecessarily hinder the success of U.S. industry.

This study is an important first step and the Subcommittee sincerely expresses its appreciation to the many experts that participated. The Subcommittee looks forward to continued support for space programs and to the implementation of changes that keep the United States preeminent in space.

SUMMARY OF KEY SUBCOMMITTEE RECOMMENDATIONS

Overhead Architecture/Roadmap

- The Director of National Intelligence (DNI) and Secretary of Defense (SECDEF) should develop a common architecture for all space-related systems (imagery, signals, communications, etc.) that supports prioritized national and military needs and takes into consideration budget constraints. Organizations proposing new satellites should demonstrate how their proposals fit into the architecture.
- The DNI and SECDEF should agree to the architecture and related funding decisions. The SECDEF's agreement ensures that the Under Secretary of Defense for Intelligence (USD(I)) and the Under Secretary of Defense for Acquisition, Technology and Logistics (USD(AT&L)) both agree with the strategy.
- The Office of Management and Budget (OMB) should carefully consider what space programs it recommends for funding until both the DNI and SECDEF agree on an architecture.

Authorities

- The executive branch should review and, as appropriate, recommend changes to the law and other authorities that clarify the DNI's role with respect to jointly funded programs.
- OMB should consider more closely what programs it decides to fund through the NIP and the MIP.

Requirements discipline

- Members of the DNI Mission Requirements Board (MRB) and the DOD Joint Requirements Oversight Council (JROC) should prioritize stakeholder needs and consider the impact of programmatic changes on cost and schedule.
- Program managers should ensure that stakeholders understand impacts of any change to program requirements. Program managers must be empowered and resourced to deny requests to change program requirements if their request would unacceptably impact cost, schedule, or system performance.
- Acquisition organizations should encourage less complex design solutions. If more complex technology or designs are needed, program managers should ensure that risk mitigation options are funded and captured in the schedule.

Research & Development

• The DNI and component agencies of the Intelligence Community should treat R&D as a national security priority and keep R&D funding stable. Agency leadership should protect long-term R&D funds from being used for immediate operational needs.

• The Deputy DNI/Acquisition and the DNI's Director of Science and Technology (DST) should define what technology maturation steps need to take place in an R&D phase as opposed to in a pre-acquisition or development phase. The DDNI/Acquisition should ensure the pre-acquisition phase gives ample consideration to defining technology and manufacturing maturity.

• Agencies should develop a technology transition roadmap to keep R&D projects from sitting unused after they have been demonstrated to provide utility.

• The DDNI/Acquisition and individual program managers should balance the risk of using unproven technologies by considering the option of using less-capable, but well-tested technology. The ODNI should develop policy governing the use of proven and immature technology.

• The DST should assess who in Government and in industry yield the best R&D results and determine whether similar models would work well for the Intelligence Community's space-related R&D programs.

Contracting and acquisition strategy

• The DDNI/Acquisition should examine the possible overuse of sole source contracting and its impact on the industrial base.

• The DDNI/Acquisition should explore the broader use of block buys where appropriate. This could mean having one vendor develop many systems, or it could mean having the Government play a larger role in acquisition by purchasing bulk parts on one contract and providing the parts as Government Furnished Equipment (GFE) to another contract. Sufficient information should be provided to Congress to allow it to assess the funding commitment required for a block buy and determine the feasibility of authorizing and appropriating funds in this way.

• The DDNI/Acquisition should work with Congress to determine the best way to structure a Nunn-McCurdy threshold for major systems acquisitions in the Intelligence Community in order to keep Congress better informed of acquisition cost growth.

Program management

• Acquisition organizations should embrace acquisition reform that develops and maintains qualified Government acquisition personnel while reducing dependence on systems engineering/technical assistance (SETA) contractors.

• The DDNI/Acquisition should mandate that sufficient margin is built into overall program cost during initiation of a complex program. The DDNI/Acquisition should review the track record of Intelligence Community independent cost estimates (ICEs) to determine if they have been providing adequate margin or if the risk assessment methodology needs to be adjusted.

• The DDNI/Acquisition should mandate longer tours for acquisition personnel supporting high priority, multi-year projects. If rota-

tions are necessary, program offices should provide sufficient time for overlap and transition of responsibility.

Workforce development

- The DNI and SECDEF should address near-term workforce issues given the number of retirements that may occur in the next two to five years. The DNI should consider developing incentives to keep skilled, retirement-eligible workers on the job until new recruits can replace them; and determining to what extent security clearance and other hiring policies and practices are unnecessarily hindering the hiring of first- and second-generation scientists and engineers.
- Industry and Government should work together to encourage students to pursue science and engineering careers and ensure that there are ample opportunities for diverse experiences and growth. Recommended steps include:
    - Enhancing partnerships with K–12 institutions to improve math and science education. For example, the DNI should review and build upon the National Security Agency (NSA) program that partners employees with students from the local community to enhance math, science, and foreign language training; and
    - Partnering with universities to prepare students for space careers and working with universities to align curriculum with future space needs.
- Aerospace workforce trade groups should review whether retirement and other benefits could be more easily portable across the aerospace industry. This would help encourage contractors to view each other as partners in support of national security instead of as competing business interests.
- A joint panel comprised of employees from NRO and ODNI should assess the benefits and challenges of establishing a limited NRO career service. The panel should explore the viability of recruiting civilian program managers and system engineers to fill key leadership and program management roles, and offering mid-level to senior-level military officers with program management and system engineering experience an opportunity to join the career service.

Commercial space services

- A joint panel of the DDNI/Collection, NRO, National Geospatial-Intelligence Agency (NGA), and commercial data providers should assess whether any barriers impede the tasking or delivery of commercial imagery to potential users. If the panel identifies any technical barriers it should perform a cost-benefit analysis of removing those barriers. The panel should also seek to eliminate policy barriers that unnecessarily impede the use of commercial imagery services. The DNI and SECDEF should approach the use of other commercial services that serve Government, such as communications or other applications, in the same way.
- The DNI and SECDEF should recommend to the next President whether to strengthen or clarify National Security Presidential Directives 27 and 49 so that all acquisition organizations understand their responsibilities under these directives with respect to using commercial services.

Government restrictions on space-related commerce

• The DDNI/Acquisition should assess the impact that current laws and regulations, including International Traffic in Arms Regulations (ITAR), are having on the space industrial base, and it should report recommended changes to Congress.

• NGA, as the action agency for commercial remote sensing data to the DOD and Intelligence Community, should help ensure that the rules governing how commercial remote sensing is regulated do not impede the ability of this commercial industry to compete in international markets.

INTRODUCTION

During the 110th Congress, the Committee held several hearings and numerous briefings to address the challenges associated with the nation's space architecture. Given the recognized importance of satellites for information and intelligence gathering, and the need for a healthy space constellation, the Subcommittee further explored space issues during a series of roundtables on the overhead architecture. Details of the roundtable methodology are provided in a subsequent section.

The goal of this report is to capture the observations and recommendations obtained from participants and set forth Subcommittee recommendations on issues affecting the space architecture. Discussions with industry were previously documented in an interim report that was shared with industry participants and executive branch officials in February 2008. The interim report served as the basis for additional questions that were posed to the executive branch during their roundtables.

The Committee has raised many of these issues before. In spite of bipartisan engagement within the Committee, the Administration appears to have ignored the language in multiple intelligence authorization bills, which identified the need to ensure longer tours for acquisition personnel, assess the use of advisory contractors, and develop a comprehensive architecture for space. The nation cannot afford to continue to ignore the issues that hamper the effective development and management of an integrated space architecture.

The Subcommittee further notes the August 2008 release of the National Space Strategy Independent Assessment Panel Report, also known as the Allard Commission report. Subcommittee observations were previously shared with Independent Assessment Panel (IAP) members and are reflected in the Allard Commission report. The Subcommittee observes that many of the IAP's findings and some of the IAP's recommendations are similar to those captured in this report.

METHODOLOGY

To address critical issues with the overhead architecture, the Subcommittee chairman chose to use a roundtable format to supplement the traditional format of hearings and briefings. The roundtable approach facilitated more open-ended discussions between members, outside participants, and staff. In contrast to a formal hearing, there were no time limits on questions or responses. Most importantly, views shared during the roundtables

were not for attribution. As such, comments captured in this report are attributed to either "industry participants" or to "executive branch participants" rather than to the companies or individuals who made the statements.

Industry participants included senior management from five U.S. satellite prime contractors, including Boeing, General Dynamics, Lockheed Martin, Northrop Grumman, and Raytheon. In addition, two U.S, commercial imagery providers, Digital Globe and Geo Eye, participated. Other input was received from Ball Aerospace, ITT Corporation, Orbital Sciences, and representatives from the Satellite Industries Association. In order to encourage open dialogue with industrial partners, the Subcommittee did not invite representatives from the executive branch to participate in the industry sessions.

Two roundtable sessions were held with executive branch participants. The first roundtable included the Director of NGA and the Director of NRO. The second roundtable included the DNI, the USD(I), the Deputy Director of the NGA, the Deputy Director of National Intelligence for Acquisition (DDNI/Acquisition), and the Deputy Director of National Intelligence for Collection (DDNI/Collection).

The roundtable discussions were structured around questions provided to participants in advance of meetings (see Appendix B). These questions provided a framework for discussions without limiting the topics of conversation. The overarching goal was to elicit recommendations to develop an enduring overhead constellation, and to maintain a healthy aerospace industrial base and Government workforce.

Executive branch participants were asked to comment on industry's findings and recommendations, in addition to offering their own recommendations. They were also asked to comment on whether any existing policies or laws were impeding their ability to accomplish their mission.

Participant comments from each roundtable were analyzed by the Subcommittee to develop the findings and recommendations presented in this report.

COMPARISONS TO THE PAST

Throughout the roundtable discussions, participants made repeated references to the way programs were managed in the past, drawing a comparison between what worked and what did not. These discussions made obvious reference to the national security environment of the Cold War period when a well-focused national security strategy existed to meet the Soviet nuclear threat. There was consensus that the Cold War threat, because of its intense focus, was in some regard easier to meet than today's multi-polar, asymmetric threat.

In 1958, Congress passed the National Defense Education Act (NDEA) providing funding and motivation for U.S. colleges and universities to improve their technical curricula and produce more graduates. Today, many of the leading engineers who benefited from the NDEA are nearing retirement. Many roundtable discussions centered on the need for a new initiative, like the NDEA, to stimulate technology-related education.

The threat of the Cold War created an environment of urgency within the space industry. Roundtable participants cited the passion of this era and the dedication to success that developed within the space industry. One participant stated, "No one dreamed of slipping a schedule. We worked weekends, holidays and made important system decisions based on maintaining our launch date. Today, many program managers do not hesitate to slip a program milestone." This sense of urgency, coupled with more effectively defined requirements, well-defined decision authorities, strong program management, and effective contract management, will be necessary if the United States is to succeed.

KEY DETAILED ROUNDTABLE FINDINGS AND RECOMMENDATIONS

The following section captures the views of both industry roundtable participants and executive branch roundtable participants on topics relating to the development and acquisition of a space architecture. Where differences exist, they are noted. Subcommittee views are derived from analysis of roundtable participant input and independent research and are presented as a series of recommendations to the executive branch and to industry.

OVERHEAD ARCHITECTURE

The need for an integrated overhead architecture has been articulated by Congress, the executive branch, and industry. Members of Congress have repeatedly expressed their disappointment that no architectural plan exists, and have repeatedly asked the Administration for the plan. The lack of an integrated architecture was one of the first issues to face the DNI after the office was established in 2005. The frustration has continued to this day, and many believe that the nation is no closer to having a clearly defined plan than it was three years ago.

Although the executive branch participants believe that they have provided a plan for a future architecture, members of the Subcommittee disagree. Similarly, industry participants expressed frustration that the Administration has not provided a plan with sufficient detail to enable them to effectively focus their internal investments or align their business plans to meet Government's future needs.

To better understand this difference of opinion, it seems prudent to address what Members expect from the Administration. The architecture must include four well-defined elements:

- A problem-driven approach that is based on securing prioritized, well-defined national security interests;
- A comprehensive solution that balances the financial investment against the overall risk to national security;
- A realistic delivery schedule that meets the defined timeline that in many cases must be flexible and updated against the risk; and
- A plan to migrate from a requirements-based acquisition approach toward a capabilities-based strategy, with the proviso that a purely capabilities-based approach could introduce additional challenges.

Both industry and executive branch participants stated that the most important characteristic of the architecture is for it to include

satellites owned by both DOD and the Intelligence Community. However, many participants expressed concern that some DOD personnel believe DOD needs its own space architecture to meet the needs of the war fighter. In response, executive branch participants stated several times that it is not in the best interest of the country to pursue separate national and military space architectures.

Some executive branch participants suggested that space systems may not be best suited to meet the needs of the war fighter, but that space can still support the fight. It was suggested that advanced airborne capabilities best address the war fighters' needs and high resolution capabilities from space best address strategic intelligence needs. Based on current DOD plans, it is clear that DOD acquisition decision-makers do not agree. Recent funding decisions and the shifting of space programs from the NIP to the MIP exacerbate the issue. This specific issue is further discussed in the section on Authorities.

Recommendations on the Architecture

- The DNI and SECDEF should develop a common architecture for all space-related systems (imagery, signals, communications, etc.) that supports prioritized national and military needs and takes into consideration budget constraints. Organizations proposing new satellites should demonstrate how their proposals fit into the architecture.
- The DNI and SECDEF should agree to the architecture and related funding decisions. The SECDEF's agreement ensures that USD(I) and USD(AT&L) both agree with the strategy.
- OMB should carefully consider what space programs it recommends for funding until both the DNI and SECDEF agree on an architecture.

AUTHORITIES

Executive branch participants stated their concern over the dilution of authorities and accountability for acquisition decisions. Their concern focused particularly on programs funded jointly by the NIP and the MIP. The DNI tried to improve coordination with the DOD by creating a position for the USD(I) as Director of Defense Intelligence under the DNI.[1] Although the USD(I) advocates for intelligence, the USD(I) does not have acquisition decision authority within the DOD. The USD(AT&L) decides all acquisition matters. So for example, even if the USD(I) and the DNI decided on a single system that balanced both military and national users' needs, the USD(AT&L) could decide on a different system that better served DOD needs (as interpreted by USD(AT&L)). The inability of the USD(I) to control the final acquisition decision for a program can lead to decisions over jointly funded programs that do not equally benefit the national and military customer. Participants suggested that accountability and responsibility are dispersed when multiple individuals make decisions and that success is more easily achieved when it is clear who is in charge.

[1] "Under Secretary of Defense for Intelligence to be Dual-Hatted as Director of Defense Intelligence." U.S. Department of Defense News Release No. 637–07. May 24, 2007.

The Subcommittee notes that space is only one area in which there are potential authority conflicts. Public law currently requires shared decision authority for all national intelligence systems whose acquisition is managed by a DOD agency or office (NGA, NRO, NSA). To date, issues have been avoided because funding mainly comes from the NIP for many of these development activities. In the future, should other non-space programs be jointly funded between the NIP and MIP, similar authority-related problems could be expected.

Recommendations on authorities

- The executive branch should review and, as appropriate, recommend changes to the law and other authorities that clarify the DNI's role with respect to jointly funded programs.
- OMB should consider more closely what programs it decides to fund through the NIP and MIP.

REQUIREMENTS DISCIPLINE

Roundtable industry participants suggested that current satellite programs regularly fail to demonstrate requirements discipline. The inability of Government program managers to constrain requirements as satellite programs develop results in excessive cost increases, schedule delays, and performance compromises. Program managers, unwilling to deny requests to add previously unplanned capabilities to a satellite, will continue to expand the operational performance specifications of the satellite. They are further motivated to accept additional requirements because those advocating for the new requirement usually bring additional funding that is mistakenly believed to be an overall benefit to the program. This lack of dedication to the original program requirements increases program cost, delays the program's schedule, and degrades program performance.

The Subcommittee identified four specific stumbling blocks to an efficient and effective requirements discipline.

First and foremost, overhead programs lack adequate requirements definition. With so few satellites being launched, many Government organizations seek to add capability to a spacecraft well after the base requirements have been established and developed. This leads to a constantly evolving set of requirements that cannot be managed within current acquisition guidelines. Satellite requirements develop among multiple constituencies, without disciplined management to review and adjudicate potential change orders to programs. This "requirements creep" costs millions of dollars and delays programs in a seemingly never-ending cycle of requirements review and engineering modifications.

The undisciplined requirement phenomenon is discussed in the Report of the Defense Science Board/Air Force Scientific Advisory Board Joint Task Force on Acquisition of National Security Space Programs. According to that report, there was an increased use of space assets during the 1990s. Currently there are large numbers of operational users, including some with regional interests and niche missions. The user base continues to expand in response to the war on terrorism, bringing with them new requirements. For many programs, the net result has been dramatically increased requirements with ineffective systems engineering, insufficient finan-

cial impact assessments, or both, which in turn overwhelm the existing requirements management process.[2]

Second, the Intelligence Community and DOD seem at odds with each other over satellite program requirements. Without adequately defining the requirements of the combatant commanders, the Air Force and Intelligence Community are forced to hit an ever-moving or invisible target in managing overhead program requirements. When asked to list requirements that have not been satisfied by current systems, DOD did not identify a single unsatisfied intelligence need to the Committee.[3] The competition between DOD and the Intelligence Community for mission-specific requirements must be better coordinated by the ODNI, USD(I) and USD(AT&L).

Third, requirements for satellite programs are not developed in a manner consistent with technological maturity. Whatever the mechanism to bring more discipline to the satellite program management, it must acknowledge the limitations of technology. The powerful constituencies behind program requirements seek to capitalize on technology that is on the very leading edge of development. This increases both risk and cost, often without any significant enhancement in capability. Future programs must improve the management of untested technology with evaluations by known experts, not by those with a vested interest in the cost of the program. Additional information on this issue is captured under the research and development section.

Fourth, the selection of complex system designs contributes to program risk without the benefit of enhancing system capability. Its impact is similar to the incorporation of immature technology. Technical experts and systems engineers must be consulted regularly in order to reduce the risk of system integration issues. The integration of immature technology into an overly complex system design is a recipe for failure.

Recommendations on requirements discipline

- Members of the DNI Mission Requirements Board (MRB) and DOD Joint Requirements Oversight Council (JROC) should prioritize stakeholder needs and consider the impact of programmatic changes on cost and schedule.
- Program managers should ensure that stakeholders understand impacts of any change to the requirements. Program managers should be empowered and resourced to deny requests to change program requirements if their acceptances would unacceptably impact cost, schedule, or system performance.
- Acquisition organizations should encourage less complex design solutions. If more complex technology or designs are needed, program managers should ensure that risk mitigation options are funded and captured in the schedule.

RESEARCH AND DEVELOPMENT

R&D was raised as an issue during nearly every roundtable. There is consensus among participants that more R&D needs to be

[2] Report of the Defense Science Board/Air Force Scientific Advisory Board Joint Task Force on Acquisition of National Security Space Programs, May 2003, p. 19.

[3] The Subcommittee acknowledges that some imagery products from the current national systems may be more difficult to share with DOD partners, but that is a policy failure, not a failure of the national systems to meet warfighter intelligence needs.

conducted and that the level of R&D funding needs to be increased. Some participants suggested that as a goal, 10 percent of an organization's budget, instead of the typical three to four percent, should be devoted to R&D. Both industry and executive branch participants agree that competing programmatic challenges often make the 10 percent goal unreachable but a more realistic funding level may exist. Examples were given describing how challenging it is to fund space R&D while the country is recovering from past space failures and also fighting two wars.

The issue of inadequate R&D maturation was raised by both industry and executive branch roundtable participants. Acquisition programs have suffered when they depended upon technologies that had not been fully matured prior to program initiation. There were diverging viewpoints regarding the integration of R&D into ongoing program developments. Some participants suggested not allowing unproven technologies to be included within a program development; other participants suggested requiring technology insertion points, such that if a new technology is not ready by the time the insertion milestone is reached, that a proven technology be used instead.

According to roundtable participants, a program acquisition cycle has three distinct phases: R&D, pre-acquisition, and development. The purpose of R&D is to show a path to the future and to allow mistakes to be made prior to entering the pre-acquisition or development phase. It is too costly to encourage mistakes to be made once a program has committed to moving into development. The purpose of the pre-acquisition phase is to drive out risks and determine if a program is ready to enter full development. The Subcommittee observes that many of the current and historically troubled development efforts bypassed some of these steps, gave far less attention to early steps, or tried to rush the amount of time that steps were given.

According to some participants, the space community stopped following this acquisition model due to political, budget, and schedule pressures. Participants cited examples of programs that did not spend enough time in the pre-acquisition phase before going into full development. When program managers discovered that significant technology development was needed, schedule and funding plans should have been addressed. Lower risk technology options should have been chosen, or should have been developed in parallel. As a lesson learned, executive branch participants now recommend using both Technology Readiness Level (TRL) and Manufacturing Readiness Level (MRL) metrics to determine the maturity and manufacturability of the technology. These metrics are reviewed at the senior Acquisition Readiness Boards where a decision is made to move forward in each acquisition phase.

Some industry participants countered that many risks could be eliminated by choosing only mature technology and holding requirements firm. This group offered examples of successful satellite development efforts that used only parts with high TRLs and MRLs. Many of these examples were from companies providing commercial services, where cost overruns more directly impact company profit. Some industry participants suggested that contract proposals should be evaluated and awarded based on current capabilities, not assertions of future capabilities, unless the Govern-

ment can tolerate the risk. Other industry participants countered that the nation has only excelled to date because it took risks with leading edge technologies. Both industry and the executive branch agreed that the high risk technology model can work, but the Government must invest sufficiently and provide enough schedule margin to manage the risk.

There is a perception by some industry participants that the Intelligence Community has become risk averse because of the way the Government chooses to invest in technology. They suggested that typically, by the time a contract is awarded for a new system, the customer's needs have become time critical. As a result, schedules are often compressed to a point that no failure can be tolerated.

Both groups stated that in some cases it makes sense to demonstrate a technology and validate that it meets customer requirements prior to requiring its use in an operational system. Executive branch participants noted that while demonstrations are useful for some technologies, not every system needs to be demonstrated. They also noted that when it comes to funding operational systems and demonstrations, demonstrations often lose in the battle over funding.

Participants gave examples of organizations that simultaneously support both evolutionary and revolutionary technology improvements. They described how evolutionary changes build upon the success of operational systems, while revolutionary changes pave the way for future operational programs. Industry participants further noted that by having more R&D in the pipeline, not only is there room for failure, but there is added stability for industry. They noted that having more projects supports having more technology options from which to choose future operational systems.

Some industry participants noted that the Intelligence Community would benefit from allowing more organizations to participate in Government R&D efforts, specifically by allowing multiple contractors to work on the same R&D projects. The government would then have the ability to choose the best option while giving more than one company an opportunity to win future bids to manufacture the delivered prototype. This option boosts competition by not giving one company a competitive advantage.

Some industry participants suggested that the Intelligence Community can learn from organizations like the Defense Advanced Research Projects Agency (DARPA) that specialize in R&D and technology transition. They state that the DARPA model has worked well for leading-edge military technology. It encourages a "spirit of innovation" by providing a statement of concept rather than set requirements. DARPA often funds multiple contractors, selects the best prototypes, and works to transition the technology to a partner/sponsor.

The Intelligence Community recently formed the Intelligence Advanced Research Projects Activity (IARPA). Industry participants stated that the success of IARPA will ultimately depend upon several factors which include, but are not limited to, a continued focus on leading-edge, intelligence related R&D; good leadership; effective cross-community coordination; and a sustained funding commitment. Executive branch participants suggested that IARPA can play a role in ensuring that R&D is a priority in the Intelligence

Community. They also noted that there will be tension between the agencies and IARPA, much like between the military services and DARPA, but the DNI must continue to work toward effective communication between IARPA and the rest of the Intelligence Community.

Recommendations on R&D

- The DNI and component agencies of the Intelligence Community should treat R&D as a national security priority and keep R&D funding stable. Agency leadership should protect long-term R&D funds from being used for immediate operational needs.
- The DDNI/Acquisition and the DNI's Director of Science and Technology (DST) should define what technology maturation steps need to take place in an R&D phase as opposed to a pre-acquisition phase or development phase. The DDNI/Acquisition should ensure the pre-acquisition phase gives ample consideration to defining technology and manufacturing maturity.
- Agencies should develop a technology transition roadmap to keep R&D projects from sitting unused after they have been demonstrated to provide utility.
- The DDNI/Acquisition and individual program managers should balance the risk of using unproven technologies by considering the option of using less-capable, but well-tested technology. The ODNI should develop policy governing the use of proven and immature technology.
- The DST should assess who in the Government and in industry yield the best R&D successes and determine whether similar models would work well for the Intelligence Community's space-related R&D programs.

CONTRACTING AND ACQUISITION STRATEGY

Once all the other necessary components such as defined requirements, R&D and pre-acquisition efforts are in place, all participants agreed that the choice of contract vehicle, the method of competition and source selection, and the acquisition strategy will all have an impact on space systems acquisition.

When little development work is needed and the requirements are clear, a firm, fixed price contract should be considered. For a higher risk development, reimbursing for cost while providing performance, cost, or schedule incentives would be a better option (i.e., cost plus award or incentive fee contract). Participants cited examples of both successful and unsuccessful fixed price and cost-plus contracts. Fixed price contracts are used by both larger defense contractors and by commercial data providers (CDPs) who purchase their own satellites to sell imagery products to the Government. Participants noted that CDPs tend to use this contracting strategy more often.

One element of the acquisition strategy that can significantly impact efficiency and cost effectiveness is the buying strategy. Industry participants note that the Government often does not employ efficient buying strategies. It is clear that greater savings can occasionally be realized by purchasing multiple satellites on a single contract, also known as a "block buy." In these cases, the pass-through cost charged by the prime contractor to procure sub-compo-

nents could be reduced.[4] Block buying is a method of contracting which covers more than one year's requirements as an alternative to a series of annual contracts. Block buying frees manufacturers from having to make smaller, more costly piecemeal buys and thus promises to reduce overall costs.[5] Industry participants note that past use of this acquisition strategy benefited the Government by saving money and improving contractor productivity.

The satellite business is, however, not a volume business; it does not produce thousands of copies to reduce manufacturing costs. Nevertheless, industry and executive branch roundtable participants maintained that there were potential cost savings and benefits, and were strongly in favor of using block buys whenever possible. They cited examples of programs that use this strategy to reduce costs, limit risk, and stabilize the subcontractor base.

Some industry participants complained that recent satellite acquisitions had not been chosen through a competitive selection; rather, they had been sole sourced to a subset of contractors frequently used by satellite acquisition organizations. Given this lack of competition, these industrial participants suggested that upcoming contract decisions may determine the number of satellite prime contractors that survives into the future. These same contractors stated that limited experience should not be used to keep qualified contractors from winning contracts. The counterargument was also offered that significant past performance should enable the use of sole source contracting when evolved versions of current systems are being procured. These participants suggested in these cases that sole source contracts save the Government both time and money.

Executive branch and some industry participants provided examples of programs that ran into challenges because a contract was awarded to a company that had little experience building the type of system desired by the Government. If the executive branch chooses to issue contracts to companies without demonstrated successes with similar technology, it must improve the initial assessments of the technology maturity and manufacturability (as described in the R&D section). The executive branch must also ensure that sufficient resources are applied and that realistic milestones are set.

The Defense Science Board previously reported that the "space acquisition system is strongly biased to produce unrealistically low cost estimates . . . [that] lead to unrealistic budgets and unexecutable programs."[6] Roundtable participants agree that this still appears to be an issue that must be addressed. The firm, fixed price approach to satellite development with well-defined system requirements has become a very attractive approach for the Government to consider as a way to avoid low cost estimates. Because the contract price directly impacts company profits, realistic proposals are more likely to be received.

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[4] The history of block buys dates back to the 1960s. However, several cancellations and funding overruns during the 1970s caused this strategy to fall out of favor with Congress. In the early 1980s, with the passage of section 909 of the Department of Defense Intelligence Authorization Act for Fiscal Year 1982 (Public Law No. 97–86), this acquisition approach became viable once again.

[5] Multi-year Procurement, A Desktop Guide, David R. Sutton, June 1997.

[6] Report of the Defense Science Board/Air Force Scientific Advisory Board Joint Task Force on Acquisition of National Security Space Programs, May 2003, p. 19.

The Subcommittee finds that while the way a contract is selected is important, the oversight of the contract will also affect the contract's success. The Intelligence Community can potentially learn from the implementation of the Nunn-McCurdy Amendment as a mechanism to reign in cost-overruns at DOD.[7] The Nunn-McCurdy Amendment requires DOD notification of the SECDEF and Congress if costs increase by a threshold of 15 percent over current baseline estimates or 30 percent over original baseline estimates. Additional financial repercussions exist if the higher threshold of 25 percent and 50 percent to the aforementioned baselines is reached. The DNI has implemented policy within Intelligence Community Program Guidance 105.1[8] that requires notification to the OMB and to the ODNI for growth over 15 percent.

Since the Intelligence Community has no similar statutorily mandated cost growth threshold requiring notification to Congress, the House and Senate agreed to include a provision similar to Nunn-McCurdy in the Intelligence Authorization Act for Fiscal Year 2008. More recently, the House version of Intelligence Authorization Act for Fiscal Year 2009 required the DNI to work with Congress to tailor threshold legislation for the Intelligence Community in order to rectify the differences in DOD and Intelligence Community acquisition regulations.

Recommendations on contracting

- The DDNI/Acquisition should examine the possible overuse of sole source contracting and its impact on the industrial base.
- The DDNI/Acquisition should explore the broader use of block buys where appropriate. This could mean having one vendor develop many systems, or it could mean having the Government play a larger role in acquisition by purchasing bulk parts on one contract and providing the parts as Government Furnished Equipment (GFE) to another contract. Sufficient information should be provided to Congress to allow it to assess the funding commitment required for a block buy and determine the feasibility of authorizing and appropriating funds in this way.
- The DDNI/Acquisition should work with Congress to determine the best way to structure a Nunn-McCurdy-like threshold for major Intelligence Community systems acquisitions, to better keep Congress informed of acquisition cost growth.

PROGRAM MANAGEMENT

Roundtable participants suggested that a well-managed program displays several common characteristics, including an experienced Government team led by an experienced program manager; an experienced industry team led by an experienced program manager; open communication between the two teams; ample resources; sufficient margin; and clear lines of authority and accountability within each team.

Both industry and Government roundtable participants noted that the ranks of experienced Government program managers

[7] The threshold was named after Senator Sam Nunn and Representative David McCurdy, who proposed cost growth control legislation as an amendment to the Department of Defense Authorization Act for Fiscal Year 1982 (Public Law No. 97–86). It was later made permanent in the Department of Defense Authorization Act for Fiscal Year 1983 (Public Law No. 97–252).

[8] IC Program Guidance 105.1 on Acquisition was released on July 12, 2007.

began to decrease in the 1990s with the downsizing of the defense budget. Simultaneously, there was a push to accomplish more with less resources; this included a push to rely more on contractors and less on Government expertise. The result was Contractor Total System Performance Responsibility (TSPR).[9] TSPR was "originally used as a contract condition for the acquisition of new systems that obligated the prime contractor to be totally responsible for the complete integration of an entire weapon system. The idea of contractor TSPR was to ensure that the Government received an integrated system that would meet the performance requirements as defined in the system specification."[10]

Both the industry and executive branch participants agreed that during this TSPR period, reliance on support contractors, also known as systems engineering/technical assistance (SETA), increased dramatically. Both groups agreed that Government personnel became less able to make technical decisions on their own. The desire to build "faster, better, cheaper" systems led the Government down a path that required the contractor to oversee itself and make decisions that were better suited to Government personnel. Participants stated that this dependence has become a source of frustration for both the satellite developers and the Government. From the satellite developers' perspective, the Government's domain expertise and technical qualifications were replaced by an overly bureaucratic process and increased paperwork. Executive branch participants stated that many experienced program managers left the Government because their skills were no longer valued. Many employees left aerospace altogether.

The DNI created the DDNI/Acquisition position to reestablish program management skills, stabilize funding, and manage requirements within the Intelligence Community. The Subcommittee believes that efforts must continue to reestablish acquisition excellence, such as the enforcement of acquisition Intelligence Community Directive (lCD) 105[11] and Intelligence Community Program Guidance (ICPG) 105.1, and the annual report to Congress of acquisition program management plans.

Both groups complained that executive branch and industry program managers do not have adequate funding margins to accommodate unexpected problems that typically arise during the course of a complex development effort. They described how this sometimes results in program managers having insufficient funds to address these unanticipated challenges and choosing not to communicate problems to senior leadership in an attempt to "keep the program going" with the faint hope that things will work out over time. Some participants recommended maintaining up to a 20 percent margin to protect against unexpected issues and to further motivate program managers to communicate problems to leadership.

The Subcommittee observes that the Intelligence Community has only been consistently funding the DNI's Independent Cost Estimates (ICE) for a few years; the cited instances of insufficient mar-

[9] "Reexamining Military Acquisition Reform: Are We There Yet?" C. H. Hanks, E. I. Axelband, S. Lindsay, M. R. Malik, B. D. Steele. Prepared for the United States Army by the RAND Corporation, 2005.
[10] Ibid.
[11] IC Directive 105 on Acquisition was released on August 15, 2006.

gin may pre-date this practice. However, the component agencies of the Intelligence Community should be compiling a track record of its ICEs compared to actual program costs and making appropriate adjustments. In particular, the DNI should ascertain whether its ICEs are making sufficient provision for risk and "unknown unknowns." If not, and the cause is not determined to be an underlying issue such as the previously discussed rush of immature technologies into acquisition, then the methodology must be adjusted or the programs must be formally allowed to program additional margin. The results of the track record comparisons and any adjustments that have been made should be briefed to the congressional oversight committees at least every five years.

Industry participants further observed that Government acquisition personnel frequently rotate during the life of the average satellite development program, They note that most personnel changes involve loss of program knowledge and often require the new employee to come up to speed very quickly. Continuity benefits both the Government team and the industry team that supports them; an effort is needed to maintain personnel on programs or ensure that continuity is maintained.

Recommendations on program management

- Acquisition organizations should embrace acquisition reform that develops and maintains qualified Government acquisition personnel while reducing dependence on systems engineering/technical assistance (SETA) contractors.
- The DDNI/Acquisition should mandate that sufficient margin is built into overall program cost during initiation of a complex program. The DDNI/Acquisition should review the track record of Intelligence Community ICEs to determine if they have been providing adequate margin or if the risk assessment methodology needs to be adjusted.
- The DDNI/Acquisition should mandate longer tours for acquisition personnel supporting high priority, multi-year projects. If rotations are necessary, program offices should provide sufficient time for overlap and transition of responsibility.

WORKFORCE DEVELOPMENT

Roundtable participants agreed that the influence of the United States in world affairs is supported by its leadership in space. In order to maintain its standing, the United States must overcome three significant challenges relating to the development of the aerospace workforce. First, space systems are becoming ever more complex with new technologies posing engineering and scientific challenges; employees must be trained to understand the new challenges. Second, the space workforce is facing a significant loss of talent and expertise due to pending retirements and the challenge exists to smoothly transition to a new space workforce. Third, colleges and universities are graduating fewer scientists and engineers who are U.S. citizens. Creative solutions are needed to encourage more graduates and to recruit those who are already trained but who are not supporting the Intelligence Community.

Experts in the field of space leadership suggest that an important element is education and training. This is a foundational issue for anything the United States wants to do in space now and in the

future.[12] A healthy industrial base depends on a capable workforce that can take on increasing engineering and scientific challenges. The Subcommittee believes that both industry and the U.S. Government must ensure that adequate employee development and continuing education opportunities exist to keep all personnel abreast of new technology.

Subcommittee research shows that while engineering and scientific challenges are ever present, current losses of talent and expertise require immediate attention and directly affect development of the space workforce. In 2007, an analysis completed by Aerospace Corporation concluded that the national security space workforce has eroded significantly over the last decade. They found that employment in the U.S. aerospace and defense industry totaled 1.1 million employees in 1990 but dropped to 584,000 by 2003.

Compounding the loss of personnel is the fact that much of the aerospace and defense industry workforce is nearing or has reached retirement age. According to the Aerospace Industries Association, the average aerospace/defense engineer in the United States is nearly 60 years old. Today, approximately 27 percent of employed engineers are eligible for retirement and the number of employees with science and engineering degrees reaching traditional retirement age will triple during the next decade. This demographic shift in the aerospace/defense population, coupled with increased research, development, and procurement spending, has led to the most fundamental industrial base concern for the defense industry: a lack of skilled and experienced scientists and engineers.[13]

An additional complicating factor in the development of the U.S. space workforce involves the number of American students receiving engineering and scientific degrees. A senior Defense Acquisition University (DAU) official stated that the acquisition community as a whole is facing a serious demographic problem. Other sources suggest that close to 30 percent of all graduate students in science and engineering disciplines at U.S. universities and colleges are foreign nationals. At the post-doctorate level, the percentage of foreign nationals in science and engineering disciplines climbs to 60 percent.[14]

Long-term trends show that fewer U.S. students are entering engineering programs. Although college attendance is increasing, the interest U.S. high school seniors express in engineering has remained flat in recent years. There will be more jobs available than candidates because of the strict security clearance requirements mandated for national security employment and the general lack of available students graduating with technical degrees. New initiatives are needed to increase graduation rates in science, technology, engineering, and mathematics (STEM) fields. New policies are needed to better recruit citizens with technical degrees that have had difficulty entering the Intelligence Community.

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[12] "Space policy questions and decisions facing a new administration," The Space Review, Eligar Sadeh, June 9, 2008.

[13] Crosslink, The State of the National Security Space Workforce, Patricia Maloney and Michael Leon, Spring 2007.

[14] The Space Review, Essays and Commentary about the final Frontier, Eligar Sadeh, June 9, 2008.

NRO has its own unique workforce development issues. Programs initiated in the 1990s "outsourced Government oversight," [15] which resulted in a loss of talent and experience and removed the Government program offices from day-to-day program management. Roundtable participants discussed the fact that the NRO does not have its own workforce. Some executive branch participants suggested that the NRO may need a small but dedicated workforce, such as an NRO career service, to provide stability.

Roundtable participants also noted other factors affecting workforce development. They stated that many engineers find that the work in the satellite industry is repetitive and sporadic. New engineers who choose aerospace careers are not attracted to building identical models of existing satellites. Because new engineering graduates perceive the space industry as very cyclical, they enter the industry already looking for frequent career changes. Long program timelines prohibit some engineers from ever seeing a completed mission. In addition, the participants stated that current relationships between satellite developers are very competitive. Limited budgets supporting multiple large projects drive companies to believe that they must win business at all cost. Participants gave examples of how limited pools of talented personnel are sometimes lured from one company to another depending on who wins a contract; the Government usually has to pay the added salary costs.

However, the majority of the workforce is left to their own devices when contract work shifts between companies. Many workers lose valuable benefits and become frustrated when forced to move. The Subcommittee believes that portable benefits could minimize the frustration for employees who must move between companies due to a loss of a contract or other downsizing,

Recommendations on workforce development

- The DNI and SECDEF should address near term workforce issues given the number of retirements that may occur in the next two to five years. The DNI should consider developing incentives to keep skilled, retirement eligible workers on the job until new recruits can replace them; and determining to what extent security clearance and other hiring policies and practices are impacting the hiring of first- and second-generation scientists and engineers.
- Industry and Government should work together to encourage students to pursue science and engineering careers and ensure that there are ample opportunities for diverse experiences and growth. Recommended steps include:
    - Enhancing partnerships with K–12 institutions to improve math and science education. For example, the DNI should review and build upon the National Security Agency program that partners employees with students from the local community to enhance math, science, and foreign language training.
    - Partnering with universities to prepare students for space careers and working with universities to align curricula with future space needs.
- Aerospace workforce trade groups should review whether retirement and other benefits could be more easily portable across

[15] "Reexamining Military Acquisition Reform: Are We There Yet?", 2005, C. H. Hanks, E. I. Axelband, S. Lindsay, M. R. Malik, B. D. Steele. Prepared for the United States Army by the RAND Corporation.

the aerospace industry. This would help encourage contractors to view each other as partners in support of national security instead of as competing business interests.

• A joint panel comprised of employees from the NRO and ODNI should assess the benefits and challenges of establishing a limited NRO career service. The panel should explore the viability of recruiting civilian program managers and system engineers to fill key leadership and program management roles, and offering mid- to senior-level military officers with program management and system engineering experience an opportunity to join the career service.

USE OF COMMERCIAL SPACE SERVICES

The inclusion of industry representatives from both traditional defense contractors and commercial service providers ensured that the Intelligence Community's use of commercial services was addressed extensively. The Government purchases services from both commercial communications (both space and ground based) and commercial remote sensing companies.

National Security Presidential Directive (NSPD) 27: "U.S. Commercial Remote Sensing Space Policy" (2003), and NSPD 49: "U.S. National Space Policy" (2006) both dictate that commercial imagery services must be used where applicable and affordable. NSPD 49 states:

> Use U.S. commercial space capabilities and services to the maximum practical extent; purchase commercial capabilities and services when they are available in the commercial marketplace and meet United States Government requirements; and modify commercially available capabilities and services to meet those United States Government requirements when the modification is cost effective.

On the surface, this guidance is clear. In practice, the Commercial Data Providers (CDPs) suggest that they often struggle for inclusion in the Intelligence Community's pool of satellite imagery providers. They state that Government investment in commercial services, as opposed to Government purchase of Government-owned high-resolution systems, has been limited.

Participants agreed that commercial imagery services are a complementary capability that contributes substantially to national security. Despite this acknowledgement, executive branch participants suggested that commercial services had significant limitations that prevented them from being used more frequently to satisfy Government needs.

CDPs state that one reason given by Government customers for their reluctance to rely on commercial imagery is the lack of "assured access." Assured access is loosely defined as the ability of the customer to collect and receive data whenever it is needed, including the ability to be prioritized over other customers. Executive branch participants seem to believe that the Government is only assured access to systems that it physically owns. The commercial providers believe that a contractual agreement would afford the same assurance.

Commercial providers have heard that potential customers believe that it takes longer to task and receive imagery from commercial systems. The executive branch is responsible for both the

tasking and dissemination of commercial data to Government customers. They are also responsible for the requirements levied on CDPs that enable the dissemination of their data to those customers. Given where the control lies, Subcommittee members question whether CDPs' inability to satisfy all users is driven more by the constraints imposed on them, rather than by anything inherently related to a commercial service. To eliminate the argument, tasking and dissemination systems will need to improve to enable commercial providers to better support DOD and customers in the Intelligence Community.

CDPs report that some Government agencies have not invited them to bid on high resolution systems. At times these Government agencies have restricted proposals to Government-owned systems and not considered whether a commercial service can satisfy the need. Agency general counsels should review the legality of this limitation. Members question why the best solution would not become apparent after an open competition. A decision based on a balance between the proposed technology, the total cost (including Government personnel in the case of a Government-owned solution), and the past experience of the bidder in developing a system of the same caliber, should provide the best outcome.

Recommendations on the use of commercial space services

- A joint panel of the DDNI/Collection, NRO, NGA, and commercial data providers should assess whether any barriers impede the tasking or delivery of commercial imagery to potential users. If the panel identifies any technical barriers, it should perform a cost-benefit analysis of removing those barriers. The panel should also seek to eliminate policy barriers that unnecessarily impede the use of commercial imagery services. The DNI and SECDEF should approach the use of other commercial services that serve Government, such as communications or other applications, in the same way.
- The DNI and SECDEF should recommend to the next Administration whether to strengthen or clarify NSPD 27 and 49 so that all acquisition organizations understand their responsibilities under these directives with respect to using commercial services.

GOVERNMENT RESTRICTIONS ON SPACE-RELATED COMMERCE

The Subcommittee was surprised by the frequency with which the International Traffic in Arms Regulations (ITAR) were identified by both industry and the executive branch as an impediment to technology development. ITAR, which is managed by the State Department, is intended to protect sensitive technologies and information from being transferred to nations deemed a potential security risk. Government and industry participants described how ITAR has motivated European companies to establish an international (non-U.S) collaborative R&D environment where ITAR-banned technologies are produced indigenously, thereby defeating the premise of ITAR.[16]

Government and industry participants asserted that U.S. corporations are experiencing a loss of market share from openly marketed ITAR-free products and services. They further stated that the

[16] EADs and Alcatel are two companies that have profited by selling ITAR-free technology.

ITAR-free market may soon provide foreign countries with capabilities that match some of those of the United States, further placing U.S. companies at risk.

Commercial data providers also suggested that the U.S. Government has imposed on them significant legal restrictions as part of its oversight. CDPs are concerned that U.S. restrictions on the sale of commercial imagery are beginning to inhibit their growth and their competitiveness in foreign markets, especially as foreign imagery satellites improve and foreign reliance on U.S. systems diminishes.[17]

Recommendations on Government restrictions on space-related commerce

- The DDNI/Acquisition should assess the impact that current laws and regulations, including International Traffic in Arms Regulations (ITAR), are having on the space industrial base, and it should report recommended changes to Congress.
- NGA, as the action agency for commercial remote sensing data to the DOD and Intelligence Community, should help ensure that the rules governing how commercial remote sensing is regulated do not impede the ability of this commercial industry to compete in international markets.[18]

CONCLUSIONS

The good news is that the United States has an enduring space legacy. Many of the characteristics that made the aerospace industry great in the past still exist.

Some of the issues facing the aerospace industry have existed for many years; for example engaging and training personnel, stabilizing funding, ensuring open competitions that yield the best value to the Government, and minimizing agency duplication of efforts. In recent years, the industry has been forced to tackle new challenges such as jointly-funded programs with unclear authorities, significant numbers of retiring professionals, insufficient engineers/scientists graduating from colleges and universities, and failed programs that continue to plague current development efforts years after their termination.

The executive branch has a choice. It can keep doing things the way it is currently doing them, or it can respond to Congress with a plan that clearly prioritizes and outlines all user requirements against a timeline that shows how the proposed systems fit into a funding-constrained architecture. Such a step will help bring stability to the aerospace community, both Government and industry. Admittedly, not everyone will be happy, but everyone will understand the roadmap, where they fit in, and where they can best contribute.

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[17] Currently commercial companies are operating under a panchromatic resolution restriction of 0.5 m, meaning that companies cannot sell data of higher resolution to non-U.S. Government entities without approval. The National Oceanic and Atmospheric Administration's licensing office states that resolution restrictions are "subject to change based upon foreign availability and other considerations."

[18] NGA participates in the Advisory Committee on Commercial Remote Sensing (ACCRES), which provides information, advice, and recommendations to the Under Secretary of Commerce for Oceans and Atmosphere on matters relating to the U.S. satellite commercial remote sensing industry.

Fixing the issues that exist will not take a monumental effort like the "Manhattan Project," but it will take a paradigm shift. Both Government and industry will need to step away from their respective parochial interests. It will take great integrity for leaders to make decisions, not from where they sit in the hierarchy, but from a desire to do what is best for the nation. The Committee is ready to support such an effort.

APPENDICES

APPENDIX A: ROUNDTABLE PARTICIPANTS

Industry

Boeing
Digital Globe, Inc.
General Dynamics
Geo Eye
Lockheed Martin
Northrop Grumman
Raytheon Company

Other industry sources

Ball Aerospace and Technology Corporation
ITT Corporation
Orbital Sciences
Satellite Industry Associates

Executive branch

Director of National Intelligence
Under Secretary of Defense for Intelligence
Director, National Geospatial-Intelligence Agency
Director, National Reconnaissance Office
Deputy Director, National Geospatial-Intelligence Agency
Deputy Director of National Intelligence for Acquisition
Deputy Director of National Intelligence for Collections

APPENDIX B: QUESTIONS POSED TO ROUNDTABLE PARTICIPANTS

Questions for industry participants

1. What recommendations would your company make to the DNI as the best way ahead for our overhead architecture?
2. What key issues, if any, are being overlooked by the Intelligence Community with respect to the way ahead decision? Do you foresee any paths being considered that are technically or programmatically dangerous?
3. Recognizing the importance of technical employees entering and remaining in the aerospace industry for the success of any program, how would you invest our nation's resources to insure a healthy industrial base both now and in the future? How is your company ensuring it has access to sufficiently skilled technical employees?

Additional topics for executive branch participants

1. Best practices for managing system level requirements;
2. The role and importance of maintaining a stable research and development program which matures technologies in advance of initiating an acquisition;
3. The role of commercial imagery in the Intelligence Community and Department of Defense;
4. The need for improved contract and program management;
5. Interagency collaboration and the challenges associated with the acquisition of satellites and the acquisition of the tasking, collection, processing, and exploitation and dissemination systems; and
6. Challenges that are influenced by current policies or authorities.

MINORITY VIEWS

REPORT: "CHALLENGES AND RECOMMENDATIONS FOR UNITED STATES OVERHEAD ARCHITECTURE"

We cannot support this report in its current form. It is unfortunate that it fails so completely to represent the countless hours of time invested by Committee Members and staff, along with private sector and Executive Branch representatives to explore the shortfalls of satellite intelligence collection programs—America's "overhead architecture". These serious shortcomings are particularly disappointing given the continuous efforts of the Republican Majority of the Committee during the previous Congress to force the Administration to develop a comprehensive architecture plan and to address significant flaws in current programs.

The report falls well short of being a succinct, balanced, or well thought out treatment of the problems plaguing the overhead architecture for a number of reasons. The Majority's "challenges and recommendations" contained in the report are biased by the methodology used during a series of round table discussions, and ultimately in presenting its findings. In short, the Majority failed to:

- capture participants' dissenting views;
- treat problems plaguing the Nation's overhead architecture comprehensively rather than in a haphazard, piecemeal fashion;
- address the classified systems and threats that drive many architectural decisions;
- address the importance of integrated ground systems for tasking, processing, exploitation and dissemination;
- discuss possible adverse aspects of using commercial space services;
- protect the candor of discussions with the Committee that were made on a "not for-attribution" basis;
- make a linkage between acquisition practices and maintenance of one of the Nation's most important treasures—our dedicated aerospace professionals.

The series of roundtable discussions provided an excellent forum for Members of the Committee to discuss and learn about these systems, but failed to reach conclusions to help repair policy shortcomings at the core of the Nation's overhead architecture problems.

When participants were invited to attend the roundtable discussions they were told that their comments would be made without individual attribution to ensure candor. Yet, the Majority has chosen to list the organizations that participated in the roundtable discussions. This betrays the trust the private sector (or for that matter, any individual) should have in a commitment from Congress, and it also appears to falsely suggest that the views of the participants are favored. It is critical that We maintain the trust of the

private sector and the American people, and keep our commitments,

On substance, the Majority has failed to address the views offered by the roundtable participants that do not agree with their views. The unknowing reader is misled to believe that the Majority's conclusions are the result of unanimous agreement. For example, participants' views differed on sole source contracting and open competitive contract bidding. Some of the private sector participants believed that a more reliable product results from awarding follow on work to current contractors via a firm fixed price contract, while smaller aerospace firms argued that they have difficulty gaining insight needed to compete with existing performers. These are clearly different views amongst industry participants. Failing to include dissenting views or disagreements among participants has resulted in a fundamentally flawed report.

The report also fails to adequately address the most important issues related to overhead architecture. The report does not address the need for a durable and coherent architecture that can last through changes in administration and congressional leadership. The report does not discuss classified threats or classified aspects of the overhead architecture, which are the most important issues facing us. Instead of developing ideas and actions required to correct the nation's architectural shortfalls, the Majority offers only platitudes and general observations.

The Majority also ignores one of the most fundamental and important aspects of developing an overhead architecture—the ground segment. Few of the industry participants came prepared to have any detailed discussions about how to improve tasking, processing, exploitation and dissemination of information derived from sensors in both air and space. Those systems are a vital element of our overhead assets. This is not principally a technology issue; it is a bureaucratic challenge. Developing an integrated ground capability requires leadership to cut through bureaucracy hindering its rapid improvement. This is an area where small dollar investment could yield tremendous improvements—which was completely unexplored by the Majority.

The report also fails to address critical issues related to use of commercial satellites, even though a series of Presidential decision directives encourages their use to the maximum extent possible. Commercial remote sensing has become an increasingly viable answer to a host of national security demands. Recent Administration decisions to acquire tiers of collection platforms that can operate within a comprehensive architecture require it to address how the U.S. will incorporate commercial remote sensing into its architecture and to perform a more robust cost analysis balancing commercial costs against the flexibility and capability gained through ad hoc collection tasking changes, while also continuing the research and development for next generation systems. The issues involved in these discussions are complex and important and the Majority report doesn't even mention them.

Lastly, while the report fails to address key deficiencies in government acquisition policies that have negatively impacted our ability to retain a stable, long-term, aerospace workforce. Government acquisition practices have forced layoffs and massive program

reassignments when a few, expensive, highly technical programs are started, stalled, killed and sometimes restarted. We may need to fix those practices and focus on more frequent and steady acquisitions with shorter life spans, The report treats acquisition issues only superficially.

The shortfalls above are some of the most glaring problems with this report, which cannot be called a comprehensive effort. There are times when minor revisions can result in a product that is useful and worthy of bipartisan support. The flaws in this draft were so substantial that it was not possible to improve the report in the time available. It is our view that the report is incomplete, insufficiently rigorous and fails to fully analyze the serious problems we face. Its recommendations are, in some cases, superficial or self-evident and in other cases questionable or not adequately supported. We therefore cannot recommend it as a guide for policymakers or decision making.

PETER HOEKSTRA.
TERRY EVERETT.
ELTON GALLEGLY.
HEATHER WILSON.
MAC THORNBERRY.
JOHN M. MCHUGH.
TODD TIAHRT.
MIKE ROGERS.
DARRELL ISSA.

ADDITIONAL VIEWS

I want to thank the Minority Members and staff for their contributions to this comprehensive report. It is unfortunate, however, that they have chosen to focus on partisanship rather than the important issues facing our space programs. The status of our overhead architecture and space workforce is simply too important to taint with partisan rancor; their actions are disappointing.

Although the roundtables generated discussions related to the integrated ground architecture, the majority of these discussions were classified. This unclassified report was therefore not the proper venue to address issues related to the ground architecture. Instead, this is an appropriate topic for further study in the 111th Congress.

Finally, I want to thank all staff who contributed toward this report including Robert Minehart, Staff Director for the Subcommittee on Technical and Tactical Intelligence, Don Campbell, Stacey Dixon, and Mark Young. In addition, I would also like to thank Frank Garcia of the Minority staff whose timely input, independent of the Minority Views, contributed substantially to this report.

C. A. DUTCH RUPPERSBERGER.