

Key Issues-2012

Assuring the Viability of the US Aerospace and Defense Industrial Base

ISSUE: Continued stability of the U.S. aerospace and defense (A&D) industrial base is critical to our economy, national security, infrastructure, and future workforce. The A&D industry is facing one of its greatest challenges in history as Congress and the Administration deal with mounting national debt and the need to balance the federal budget. All federal agencies face significant budget reductions, with the Department of Defense (DoD) potentially bearing the biggest burden. While all areas must be examined to identify unnecessary spending that can be reduced or eliminated to help lower the federal budget deficit and national debt, we must make sure that the nation's future is not mortgaged to address today's crisis.

The aerospace and defense industry employs more than one million people. Annual sales are nearly \$331 billion and the industry supports more than two million middle-class jobs. Aerospace sales alone account for \$77.5 billion in exports, providing the economy with a foreign trade surplus of more than \$50 billion. Conservatively, U.S. aerospace sales account for three to five percent of our country's gross domestic product (GDP). The industry's workforce is highly skilled and leads our nation in global competitiveness, providing current and future opportunities for young people to have high-paying careers that will keep the industry strong for the future while advancing our national and economic security.

The A&D industrial base possesses unique capabilities and expertise required to address the unique and diverse missions required by both their civil and military customers. However, future U.S. space operational capabilities face industrial base challenges, both from reduced production capability and loss of supporting human expertise. The domino effect of reduced federal budgets will undoubtedly force some companies out of business and still others to significantly scale back, resulting in single-source suppliers, or perhaps no domestic supplier for items on the critical development path. If those capabilities are allowed to erode in this lean budget environment, this nation could become technologically bankrupt and unable to address future threats to our national security or economic stability when they arise.

RECOMMENDATIONS: The American Institute of Aeronautics and Astronautics recommends that:

- Congress appoint a non-partisan commission to identify specific aerospace capabilities where there is both a threat to the domestic industrial base capabilities and the capabilities are deemed critical to future national needs. The commission should also examine the impacts of the nation's export control regime and ITAR, and determine which components of these policies enhance our national security, and which provide no benefit, decrease security, and/or reduce our industrial capabilities or competitiveness. In addition, the commission should examine workforce capabilities including our ability to produce the intellectual talent of the next generation of engineers and researchers needed to insure our competitiveness, the role of our national visa policies in enhancing our workforce, and our ability to maintain the manufacturing labor necessary to produce these systems. This commission must also examine our acquisitions policies and the impact this has on our RDT&E programs and on the industrial base. This report should be completed in six months from the inception of the commission.
- Congress and the Administration carefully consider the impact of budget cuts on the continued viability of the aerospace and defense industrial base as well as their impact on U.S. national and economic security in their budget reduction deliberations.

Dealing with Counterfeit and Malicious Hardware

ISSUE: A global economy, industrial participation requirements, and program costs are just a few of the reasons that a significant amount of the equipment in our commercial and military aerospace and defense (A&D) products come from outside the U.S. From a U.S. national security perspective, a March General Accounting Office (GAO) report found that counterfeit parts have the potential to “seriously disrupt the Department of Defense supply chain, delay missions and affect the integrity of weapon systems.” On the commercial side, pressure to cut costs because of high fuel prices has pushed more MRO (Maintenance, Repair, and Overhaul) work offshore and forced repair shops to lower costs. As a result of lax regulation, limited oversight, and limited FAA resources, counterfeit and discarded parts are used during aircraft maintenance and modification. The FAA has estimated that some 520,000 counterfeit parts make their way into planes each year. With regard to electronic hardware, used in both military and commercial platforms as well as by their respective branches or companies, a 2010 report by the Department of Commerce (Bureau of Industry and Security) found serious flaws in the acquisition, verification and testing, and overall industry/government process for identifying and reporting counterfeit or malicious hardware. It also determined that 39% of the companies participating in the Department of Commerce (DoC) survey encountered counterfeit electronics, including DOD qualified components, during the four years under review.

RECOMMENDATIONS: The U.S. government and industry need to work together to establish and implement a cohesive set of policies and procedures regarding counterfeit and malicious hardware. Recent reports by the Aerospace Industry Association (AIA), the DoC, and the GAO, provide several actionable recommendations that could be undertaken to address these issues. They include:

- Standardize the term “counterfeit” in support of the various stakeholders and their industries to remove ambiguity created by multiple agencies having multiple definitions of the activity.
- Study the feasibility of establishing/leveraging a centralized federal reporting mechanism for collecting information on suspected/confirmed counterfeit parts for use by industry and all federal agencies. This can also serve as a means to distribute industry best practices. Existing systems, such as Government-Industry Data Exchange Program (GIDEP) could be utilized if necessary funding and resources are maintained.
- Strongly encourage increased reporting and tracking of instances of counterfeit parts discovered by suppliers and OEM’s. Work with industry to address concerns over loss of confidence in products or companies reporting instances of counterfeits.
- Study the creation of an “Approved/Qualified Suppliers List” to help address the receiving of counterfeit or malicious parts by purchasing items only through approved vendors as recommended in Society for Automotive Engineers Standard AS5553.
- Improve and increase screening and testing methodologies to identify suspected counterfeits or malicious items. Leverage projects such as the Defense Advanced Research Projects Agency (DARPA) Integrity and Reliability of Integrated Circuits (IRIS) as part of industry standard practices.

Referenced Documents:

Counterfeit Parts: Increasing Awareness and Developing Countermeasures, March 2011, AIA
DEFENSE INDUSTRIAL BASE ASSESSMENT: COUNTERFEIT ELECTRONICS, JANUARY 2010, DoC
INTELLECTUAL PROPERTY – OBSERVATIONS ON EFFORTS TO QUANTIFY THE ECONOMIC EFFECTS OF COUNTERFEIT AND PIRATED GOODS, APRIL 2010, GAO (GAO-10-423)

Supporting an Evolving and Adaptive Cybersecurity Policy

ISSUE: *“Pentagon to Consider Cyberattacks Acts of War.”* With this statement came an entirely new perspective on the importance of cybersecurity. State-sponsored DDoS (Distributed Denial of Service) or Trojan horse attacks intended to infiltrate and retrieve data or passwords could now be addressed in the real world, on a state-to-state level, possibly with the use of conventional weapons. Attacks from individuals, loosely organized groups, and even state-sponsored organizations continue to probe for

vulnerabilities in U.S. networks. Whether it takes the form of “cybercrime,” accessing personal identification information (PII) for financial gain, or attacking networks and servers to access classified information or networks, the impact of allowing such vulnerabilities to go unchecked cannot be overstated. The U.S. Computer Emergency Response Team (US-CERT) reported that the number of attacks on critical U.S. government infrastructure rose from 5,503 in fiscal year 2006 to 41,776 in fiscal year 2010. This 650% increase highlights several issues related to U.S. cybersecurity. First is that the number of attacks has risen, and will continue to rise. Additionally, the need to continually update networks and software to address these attacks is going to require sufficient resources, both in terms of money and people. Constant vigilance must be paid to this area of U.S. policy as the level and sophistication of the threat continue to rise.

RECOMMENDATIONS: Past General Accounting Office (GAO) reports on shortcomings of U.S. cybersecurity policy contained recommendations that still have not been implemented. Additionally, the ever-changing game board presents new and different challenges that must be adapted to. Recent attacks on aerospace and defense companies, financial institutions, and the U.S. government show that there are sustained and persistent threats to critical U.S. infrastructure, jeopardizing their ability to perform as intended or needed. In light of this evolving situation, the cybersecurity policy of the United States must also adapt. Specifically:

- Congress and the Administration should immediately complete the implementation of recommendations contained in the February 2009 review of the government’s cybersecurity policies and infrastructure requested by the president. As of October 2010, only two of the twenty-four recommendations had been implemented.
- The Administration should fully engage and support international efforts to create an open but secure cyberspace platform in support of the global economy.
- Congress should pass HR 2096, the “Cybersecurity Enhancement Act of 2011,” to advance cybersecurity research, development, and technical standards.
- Congress should provide realistic and necessary resource levels to address issues with NextGen and cloud computing from the standpoint of U.S. government vulnerabilities.
- Congress should review National Institute of Standards and Technology (NIST) and Federal Energy Regulatory Commission (FERC) cybersecurity guidelines in support of “SmartGrid” for addressing all noted security deficiencies.
- Congress should create a prioritized national and federal cybersecurity research and development (R&D) agenda. Further, it should work with the White House Office of Science and Technology Policy (OSTP) to establish a national R&D plan related to cybersecurity.

Lessening the Impact of Export Controls on the Domestic Aerospace Industry

ISSUE: Academics and industry have long struggled with U.S. export-control regimes, which are divided among three agencies: the Department of Commerce licenses export and re-export “dual-use” commercial items (items and technologies those that have civilian and military applications) under the Export Administration Act (EAA) and described in several lists including the Commerce Control/ Critical Commodities List (CCL); the State Department administers technologies and services deemed to be military items under the Arms Export Control Act (AECA), its International Traffic in Arms Regulations (ITAR) and the ITAR’s United States Munitions List (USML) including satellite systems; and the Department of the Treasury’s Office of Foreign Assets Control (OFAC) administers and enforces economic and trade sanctions. The exercise of controls by various agencies, with different agendas, imposes costs. Overlapping jurisdictions creates some confusion as to where specific items fall, even to administrators in the agencies. The problem of multiple forums is made worse by long license processing times. There is significant paperwork and time involved in submitting and processing license applications. In addition, sanctions can apply to specific companies as well as specific countries, and proliferating subsidiaries often make effective administration, and timely compliance, difficult. The complexity leaves many unsure as to what is covered and how to proceed. Efforts to change the laws have stalled due to anxieties over the theft and use of technologies used in missile, satellite, weapons of mass

destruction, and other important systems.

It is widely recognized that the current implementation of export regulations, including those applicable to actual exports as well as knowledge transfers, imposes high costs on firms, universities, and other organizations, often without a perceived commensurate benefit to the national security. Some argue the regulations restrict trade in information and goods tied to technologies that have already been replicated or surpassed by entities outside of the U.S. that are not subject to the regulations. The result is an ongoing erosion of American competitiveness in the global economy through both a diminished industrial base and stifled innovation. These unintended and avoidable consequences impact the nation's long-term national security capabilities and its current and future prosperity. Potential industry partners overseas avoid collaborations that could become enmeshed in the U.S. regulatory snare. Further, U.S. companies are competing globally with foreign manufacturers that specifically market "ITAR-free" systems and components, and often lose market share needlessly for comparable products.

RECOMMENDATIONS: AIAA recommends that the following actions be taken:

- To mitigate adverse effects while preserving intended national security benefits, Congress should overhaul and amend the export control regime. Its strictest provisions should be applied only to the most sensitive technologies which are not already readily available from countries that freely export the resulting capabilities. With such an approach many aerospace subsystems and components could be exempted from ITAR controls, and limitations imposed by the EAR reduced.
- While the ongoing presidentially-directed review may provide some marginal relief from export laws and regulation that hamper international trade and scientific cooperation, Congress should direct that the Administration perform a further review of capabilities, technologies, and production/manufacturing capacities to identify which domestic components and capabilities do not provide a significant national security advantage compared to equivalent available foreign components or capabilities.
- Congress should direct the Departments of State, Commerce, and Treasury to increase staff levels, and fund technical systems, to streamline approval processes to assure improved and speedier processing of license and agreement subject to export control regimens. Consideration should be had to funding ombudsmen activities to support applicant efforts to comply with controls and compete where appropriate in the technology export marketplace.

Sharing Stewardship of the Federal Aeronautics RDT&E Infrastructure

ISSUE: The federal aeronautics research, development, test & evaluation (RDT&E) infrastructure (addressed as part of the December 2007 *National Plan for Aeronautics Research and Development and Related Infrastructure* supporting the December 2006 *National Aeronautics Research and Development Policy*) is aging, operation and support costs are increasing, and Service Life Extension Program (SLEP) and Improvement and Modernization (I&M) investments have remained level or are declining. In addition, test programs are incentivized to utilize less effective and less capable facilities in the interest of reducing test costs, resulting in more capable ground and flight test facilities being underutilized and falling into a state of ever-decreasing readiness and repair.

This has generated "a perfect storm" for federal facility owners and managers, who are continually being directed to do more with less – a dynamic further exacerbated by the fact that the National Aeronautics and Space Administration (NASA) and Department of Defense (DoD) individually own and have stewardship over the sub-elements of the federal aeronautics RDT&E infrastructure within their respective purviews. As a result, infrastructure investments are largely driven by owning Department or Agency priorities and needs, and not the greater national need. [An example of this is NASA's decision to close the National Full-Scale Aerodynamic Complex (NFAC) at its Ames Research Center in the early 2000's, despite a clear need for its sustainment to support the test needs of the DoD rotorcraft community.] A new management approach is needed that provides for shared stewardship of a facility or group of facilities by multiple federal departments and agencies (such as those facilities needed to support hypersonic ground and flight

testing) so SLEP and I&M investments can be made by owning and non-owning parties having a vested interest in their sustainment.

RECOMMENDATIONS: DoD and NASA should jointly

- Investigate the potential for shared stewardship of the federal aeronautics RDT&E infrastructure, including joint responsibility for the facilities and equipment, workforce, tools and technologies, modeling and simulation capabilities, and operations and sustainment – using the hypersonics area as a pilot program to “beta test” the concept;
- Identify any modifications needed to existing laws governing facility ownership, financing, and operation to allow for shared department and agency sustainment and modernization investment in federal RDT&E facilities to address the real-world challenges of facility ownership; and
- Develop a methodology capable of providing an evaluation and assessment of critical facilities and test capabilities that are in the collective best interest of a preeminent aerospace nation, rather than a department- or agency-centric view based on current ownership or stewardship.

Developing a Robust Next Generation Air Transportation System

ISSUE: To remain relevant, sustain high-tech industrial sectors, improve economic viability, and employ new airborne systems, the United States must modernize the National Air Transportation System. Much of the current system operates under policies and technologies created more than 60 years ago, which does not account for new air platforms, system use capabilities, and modern technologies which can greatly enhance and improve efficiencies and the effectiveness of the current system. The current global recession has reduced current demand for air travel and cargo shipment. However, as economies improve and air system use increases, the current system is not capable of keeping up with demand, and we will witness an increase in unnecessary delays. We need to create a system that can accommodate emerging technologies such as unmanned aerial systems safely and seamlessly, and that can integrate new technologies and upgraded systems to improve the overall management of our airborne civil, commercial, and national security assets.

In 2001, Congress saw the need to modernize the National Air Transportation System. Section 1092 of PL 106-398, the National Defense Authorization Act for FY2001, required the creation of a commission to examine the future of the U.S. aerospace industry. The focus of this study was to assess the U.S. aerospace industry in an ever more competitive global economy, particularly in the areas of U.S. national security and the sustainability of the industry. The commission, chaired by former Congressman Robert “Bob” Walker, provided several recommendations to sustain and enhance the viability of the nation’s aerospace endeavors. The commission concluded that “superior mobility afforded by air transportation is a huge national asset and competitive advantage for the United States. Because of the tremendous benefits derived from a highly mobile citizenry and rapid cargo transport, the United States must make consistent and significant improvements to our nation’s air transportation system a top priority.”

In January 2001, the European Union released their European Aeronautics: A Vision for 2020 report. This vision provided a blueprint for Europe to become the driving force and market for aerospace leadership. The highest priority in this plan consisted of an integrated next generation air transportation system that consisted of state-of-the-art positioning and guidance and navigation control technologies to allow for a complete modernization of their system. By leading in the implementation of these technologies and policies, the Europeans look to develop an industrial advantage over the U.S., other industrialized nations, and emerging nations, forcing others to adapt technologies and systems developed and manufactured within the EU. If the Vision 2020 is successful, it has the potential to force U.S. industries and even the federal government to conform to European policies and standards, and to decrease the competitiveness of several high-tech U.S. companies that employ a highly skilled and high salaried workforce.

RECOMMENDATIONS: Congress should fund and accelerate the transformation of the National Air Transportation System. Specifically, Congress and the Administration should:

- Implement the FAA reauthorization act recently passed by Congress, utilizing the resources, policies, and direction provided to accelerate air traffic modernization and fully fund FAA's capital and R&D accounts.
- Require the FAA to streamline the airport and runway development process to enable the introduction of new aerospace systems.
- Fund and support the coordination and acceleration of R&D, policies, and rulemaking necessary to enable NAS and UAS operators to plan and acquire systems to operate safely in the NAS.

Strengthening the National Commitment to Aerospace Research and Development

ISSUE: The U.S. Government must continue to invest in the nation's future by supporting aerospace research and development (R&D). R&D is the lifeblood of a healthy nation. Technological advances that we enjoy today took years to achieve and required major investment in R&D. Historically, the aerospace and defense (A&D) sector has relied heavily on the U.S. government to fund basic research and to mature resulting technology to a level where industry could commercialize it. With current intense fiscal pressure, R&D is at very great risk. This comes at a time when U.S. competitiveness and aerospace technological leadership is also at risk.

America's commitment to space research is in doubt. With the Space Shuttle's retirement, and commercial space vehicles becoming available to explore space, the U.S. is not well positioned with the technology advances needed to fully exploit new opportunities. This is a consequence of reductions to R&D funding in areas such as life and physical sciences research that bear on the long-term habitability of space by humans, and the means for more sophisticated application of robotics.

Reduction in research and development not only threatens future competitiveness, but also negatively impacts the A&D workforce. Without new R&D projects through which this nation's incredible expertise can be passed on to a new generation, it will be difficult and increasingly costly for the U.S. to remain competitive with other emerging space powers.

Worldwide demand for energy is increasing costs and driving new regulations to mitigate environmental impact. The nation must invest in fundamental research in combustion and develop a long-term propulsion technology vision to enable energy efficient, fuel-flexible, and environmentally friendly systems. We must also encourage R&D of alternative fuels through direct funding and tax incentives.

Historically aeronautical advances have been achieved through R&D funded by the Department of Defense (DoD) for military applications and by NASA for civilian applications. Fully or semi-autonomous operation of civil, commercial, and military aircraft can significantly reduce the cost of passenger and cargo flights, enhance overall safety, and increase public accessibility for flying. Intelligent system technologies are the critical piece for enabling autonomous operation of aircraft in the National Aerospace System. The government needs to take the lead in investing in technology development to reduce the risk of infusing such technologies into future commercial flight vehicles. A decline in U.S. government funding of R&D for military and precompetitive commercial aerospace technologies will cause technology gaps with serious military and economic competitiveness implications.

Hypersonic systems can enable game-changing capabilities vital to U.S. national security and aerospace leadership. Currently relevant R&D falls within the realm of the DoD, but shrinking budgets threaten critical projects. Hypersonic air-breathing, reusable launch vehicles could provide means for routine, low-cost access to space. Applicable, preparatory technology development and demonstration should reside at NASA, but presently no substantial efforts in this discipline are planned.

RECOMMENDATIONS: Congress should:

- Provide adequate resources for NASA to pursue the highest priority technologies in the space technology development roadmaps. The National Research Council report regarding these roadmaps provides clear investment prioritization guidelines.
- Review the national strategy for deployment of aerospace technology development funding through the various federal agencies (DoD, NASA, and others) to assure future national security needs and competitiveness goals are achieved.
- Sustain support at NASA for cutting-edge aeronautics research that is outside of the commercial R&D risk envelope. The existing aeronautics technology plan provides clear guidance for R&D investment prioritization.

Facilitating Assured, Cost-Effective Human Access to Space

ISSUE: With the retirement of the Space Shuttle, the U.S. has no current means to launch people into Earth orbit, leaving only the Soyuz as means for U.S. crew members to access the International Space Station (ISS). Costs for U.S. astronauts to use the Soyuz have risen substantially, and the recent launch failure of a Progress cargo vehicle resulted in temporary grounding of the Soyuz. NASA is putting some resources into commercial development of a number of launch vehicle/spacecraft concepts that would be capable of carrying crews to Earth orbit (the CCDev program). Also, Congress has authorized, and NASA is now beginning development of, a Space Launch System (SLS). The SLS, in combination with the Orion Multi-Purpose Crew Vehicle (MPCV), would also enable human access to Earth orbit while creating the means to launch crews beyond Earth orbit. The financial resources made available to the CCDev and the SLS/MPCV programs will determine the feasible timeframe for their success. Means for the U.S. to independently control placement of its citizens into space is at stake, including for continued utilization of the ISS, for expanded human activities in Earth orbit, and for revival of human space exploration. The future cost and safety of access to space as well as the applicable U.S. technological leadership are also at stake.

RECOMMENDATIONS: The following actions by the U.S. government are strongly encouraged:

- Make development of a sustainable means for transport of humans to/from Earth orbit a high priority.
- Consider safety, cost effectiveness, and early capability readiness as primary metrics for down-selecting vehicle development options.
- Consider both primary and secondary implementations to minimize the risk that future access to Earth orbit by U.S. citizens could be inhibited for an extended period due to a primary system fault or accident.
- Lead the development of the means for U.S. crews to access destinations beyond Earth orbit.
- Base the development plan on a schedule consistent with a realizable budgetary authority.
- Include incremental capability milestones that can serve an evolving set of human exploration objectives beyond Earth orbit.
- Leverage government system investments to date for initial capabilities.
- Factor in possible benefits of commercially conceived and demonstrated system elements for subsequent human deep-space access capability development decisions.

Recruiting, Retaining, and Developing a World-Class Aerospace Workforce

ISSUE: Without a strong aerospace workforce, the United States will lose the resulting economic and national security benefits. Incentives are needed for industry to invest in domestic aerospace workforce development, and for U.S. students to choose an engineering career. Barriers to employing talented

foreign nationals must also be removed.

RECOMMENDATIONS: To remain globally competitive, the U.S. must adopt policies to increase our talent base in science, technology, engineering, and mathematics (STEM), must educate, engage, and retain STEM professionals using means consistent with generational changes in technologies and markets, and must provide incentives for investment in research and development that helps to attract appropriate talent.

- Congress should strongly support NASA's new proposed graduate student research fellowship program, and increase funding for this program over the next several years. Among other purposes, these fellowships are needed to encourage students to pursue careers in key engineering specialty areas important to our country's future in aerospace.
- Congress should pass legislation to make the R&D tax credit permanent, providing stability to corporate fiscal policies, and thereby extending a critical technology and engineering research environment that attracts the best and brightest into the technology and engineering fields.
- The Administration and Congress should increase program funding for space science and aeronautics research. The U.S. cannot maintain its lead in these important fields without investments in new projects, generating the next big scientific and technological breakthroughs upon which future generations of innovations can be based.
- The Administration and Congress should invest in aerospace research infrastructure and increase R&D funding to universities, as good research opportunities attract talented students into graduate STEM studies. R&D dollars provide a fourfold return by supporting graduate students, generating knowledge, creating innovation opportunities for small businesses around universities, and building the next generation of talented engineers.
- The Administration and Congress should increase the number of H1 visas available to highly skilled foreigners, thus allowing foreign students who were trained at U.S. universities to remain in and contribute to our national engineering endeavors.
- Congress should provide incentives for aerospace and defense contractors to hire former military personnel with operational experience, thus incorporating important operational perspectives that can increase the effectiveness of the design and development of future military systems.
- The Administration and Congress should encourage the adoption of best practices across the military for transitioning discharged military personnel into the aerospace and defense workforce, thereby retaining their extensive aerospace expertise gained while serving our country.

Increasing Emphasis and Funding for Technology and Engineering in STEM

ISSUE: Science, Technology, Engineering, and Mathematics (STEM) education in our nation's classrooms provides the critical foundation needed for our future national security and economic competitiveness. Inadequate emphasis and funding has been provided to the critical technology and engineering (T&E) components of STEM, thus eroding this foundation. This nation has been supporting science and math education for decades, yet enrollments and graduation rates in engineering have not been increasing. Increased emphasis and funding must be directed to the T&E components of STEM if the nation is to fully reap the intended benefits of STEM education.

RECOMMENDATION: To remain globally competitive, the U.S. must increase its emphasis and funding on the technology and engineering components of STEM education. Several policies and actions would make significant progress on this objective.

- The Administration and Congress should endorse and fund a program to bring engineering professionals into middle school and junior high school classrooms to engage students in technology- and engineering-oriented activities. Research demonstrates this age group is where STEM performance and interest begins to wane.

- Congress should provide additional funds to support teacher training programs in technology and engineering areas. For every teacher trained, hundreds of students each year can be given better engineering- and technology-related learning opportunities.
- The federal government should support university programs that partner NASA, DOT, DOD, and NOAA with academia to provide hands-on training experiences at the college and university level.
- Congress should direct the National Research Council to create a roadmap for increasing public awareness regarding the benefits of space exploration and for using space exploration to inspire students to pursue careers in STEM fields.