

A stylized graphic of a rocket launch. A blue and red rocket is shown in profile, angled upwards from the bottom left towards the top right. The background is a gradient of blue and purple, with several white stars scattered across the upper portion. The rocket's trail is a bright orange and yellow gradient.

Commission on the Future of the United States Aerospace Industry

www.aerospacecommission.gov

Interim Report #3

June 26, 2002

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I. Introduction

The Commission on the Future of the United States Aerospace Industry was established by Section 1092 of the Floyd D. Spence National Defense Authorization Act for fiscal year (FY) 2001, Public Law 106-398. It was formed to study the future of the U.S. aerospace industry in the global economy, particularly in relationship to U.S. national security; and to assess the future importance of the domestic aerospace industry for the economic and national security of the United States.

This report is the third in a series of interim reports aimed at identifying issues the Commission believes are critical to the future of the U.S. aerospace industry and require immediate attention by the Administration and/or the Congress. The first report was issued on December 18, 2001, and focused on the need for the federal government to budget and fund aerospace activities as a sector. The second report was issued on March 20, 2002, and focused on the aerospace business environment, defense/dual-use exports and air transportation. The focus of this report is on space infrastructure, industrial base, and workforce issues. The Commission will issue a final report to the President and Congress in November 2002 (which will contain more sweeping recommendations in these and other areas).

A. Mission Statement

The Commission shall develop and recommend a series of public policy reforms that will permit the U.S. aerospace industry to create superior technology, excel in the global marketplace, profit from investments in human and financial capital, benefit from coordinated and integrated government decision-making, assure our national security, access modern infrastructure, and give the United States a capacity throughout the 21st Century to reach for the stars.

B. Congressional Mandate

The Commission was given a broad mandate to study:

- The adequacy of projected budgets of the federal departments and agencies for aerospace research and development and procurement;
- The adequacy of the current acquisition process of federal departments and agencies;
- The procedures for developing and fielding aerospace systems incorporating new technology in a timely fashion;
- The policies, procedures, and methods for the financing and payment of government contracts;
- Statutes and regulations governing international trade and the export of technology;
- Policies governing taxation, particularly with a view to assessing the impact of current tax laws and practices on the international competitiveness of the aerospace industry;
- Programs for the maintenance of the national space launch infrastructure; and
- Programs for the support of science and engineering education.

C. Commissioners

The Commission is composed of 12 members: six appointed by the President, two each by the House and Senate Majority Leaders, and one each by the House and Senate Minority Leaders. The Chairman is the Honorable Robert S. Walker, former Chairman, U.S. House of Representatives Committee on Science, and the Vice Chairman is the Honorable F. Whitten Peters, former Secretary of the Air Force.

The commissioners appointed by the White House are:

Dr. Buzz Aldrin
President, Starcraft Enterprises, Sharespace, Starbooster & Starcycler

Mr. Edward M. Bolen
President, General Aviation Manufacturers Association

The Honorable John W. Douglass
President, CEO and General Manager, Aerospace Industries Association

Dr. Neil de Grasse Tyson
Director, Hayden Planetarium

The Honorable Robert S. Walker
Chairman, Wexler & Walker Public Policy Associates

Ms. Heidi R. Wood
Executive Director, Morgan Stanley

The commissioners appointed by the Congress are:

Mr. R. Thomas Buffenbarger
President, International Association of Machinists & Aerospace Workers

The Honorable Tillie K. Fowler
Partner, Holland & Knight

The Honorable John J. Hamre
President & Chief Executive Officer, Center for Strategic & International Studies

The Honorable F. Whitten Peters
Partner, Williams & Connolly

The Honorable William Schneider
President, International Planning Services, Inc.

Mr. Robert J. Stevens
President and Chief Operating Officer, Lockheed Martin Corporation

II. Space Infrastructure

A. Establish Federal Spaceports

1. Issue

The National Aeronautics and Space Administration (NASA) and the United States Air Force (USAF) currently manage the space launch infrastructure at Kennedy Space Center (KSC) and Cape Canaveral Air Force Station (CCAFS). They do so according to their own distinct agency processes and procedures, even though both share the same infrastructure. A new paradigm to manage infrastructure is necessary to increase efficiency and reduce cost.

2. Background/Findings

Significant strides have been made in unifying KSC and CCAFS through the Joint Base Support Contract and a joint planning and customer service office to coordinate customer space launch needs. Merging KSC and CCAFS into one facility, then creating a quasi-federal entity (QFE) to manage it, might well improve efficiencies, reduce costs, and provide a simplified “single face” to the users of and suppliers supporting these two facilities. This would support both Government and commercial customers.

While the government could retain ownership of all land, the QFE could operate, maintain and upgrade the facility under the leadership of an executive director and Board of Directors comprised of the government owners of the facilities. The QFE should be allowed to operate more freely than traditional federal agencies through streamlined rules and regulations with respect to appropriations, real property and procurement. An appropriate model might be that of the Metropolitan Washington Airports Authority. The unified spaceport facility (KSC and CCAFS) would operate under a unified set of procedures rather than the two different sets of procedures (NASA and USAF) used today, incorporating the best practices of each. As tenants of a unified spaceport facility, NASA and the USAF could shed the direct responsibility for base operations in the expectation that this should result in more efficient operations and cost savings. Traditional government roles, such as range and airspace safety, could be left in the hands of NASA and the USAF, or transferred to other agencies, such as the Federal Aviation Administration (FAA).

Interim Report #3, Recommendation 1

NASA and the USAF should immediately begin a short-term study, to be completed prior to May 2003, to support the FY 2004 legislative process. The study should build on the recommendations of the February 2000 Interagency Working Group report “The Future Management and Use of the U.S. Space Launch Bases and Ranges.” It should investigate the feasibility of establishing a national spaceport structure at KSC and CCAFS under a single management system. The study should

identify the advantages of a common management for the national spaceport system, potential cost savings, and process improvements above and beyond the current level of cooperation. Recognizing that the USAF today provides a significant subsidy to other users of CCAFS and KSC, the study should also consider the economic feasibility of a quasi-federal corporation in light of the current economic climate for space launch in the event that the USAF subsidy was unavailable to support range operations. The study should include representatives from Edwards Air Force Base, the Dryden Flight Research Facility and other government agencies, as appropriate. The results of the study should be delivered to the Administration and the U.S. Congress.

B. Enhance Leasing Authority

1. Issue

Currently, NASA and the Department of Defense (DoD) have only a limited ability to lease real property and, in the few instances in which they can, the proceeds generally return to the U.S. Treasury. Thus, there are few incentives for NASA and DoD to lease their property. At the same time, NASA and DoD are having difficulty adequately maintaining their space operations infrastructure due to budget constraints and/or competing priority operations. NASA and DoD should have expanded leasing authority and retain the proceeds from these arrangements to reimburse the impacted organization for operations and maintenance costs.

2. Background/Findings

Real property is liberally defined as land (including undeveloped land), facilities, capabilities and other resources provided to NASA and DoD customers under an official lease agreement. Currently, lease proceeds/rents are deposited in the U.S. Treasury as miscellaneous receipts rather than returned to the agencies for costs attributable to the lease. This inhibits NASA and DoD from entering into long-term agreements with state and commercial entities that would result in substantial state and private investment.

In early calendar year 1999, NASA proposed enhanced leasing authority legislation for consideration in Congress. Subsequently, Senator Bob Graham (D-FL) introduced the “Commercial Space Partnership Act of 1999” in the U.S. Senate in March 2000. The Senate postponed action on the bill at the Office of Management and Budget’s request to allow the General Services Administration (GSA) one year to investigate similar legislation for all agencies. However, GSA’s umbrella legislation for all agencies was not approved that year.

Since KSC and CCAFS still saw great potential for this legislation, they redrafted legislation that was included in NASA’s proposed FY 2003 Authorization Act. KSC’s proposed legislation is supported by Senator Graham and Congressman Dave Weldon (R-FL) and is consistent with the original bill, with the following significant

exceptions. It deletes the reference to the lease of personal property, increases the term for which a lease could be executed from five to 75 years, and adds new language concerning the flexibility of lease proceeds usage.

Interim Report #3, Recommendation 2

Congress should approve an Enhanced Leasing Authority bill that allows NASA and DoD to lease real property at fair market value and retain lease proceeds to cover the total costs incurred in supporting the development and operation of the KSC and CCASF facilities. This legislation should grant the individual organizations the widest and most flexible interpretation and authority.

C. Provide NASA Utility Privatization Authority

1. Issue

The electrical distribution infrastructure at KSC and CCAFS is 40 to 50 years old and frequently fails. There were 22 unscheduled outages last year alone. The current infrastructure is obsolete and many parts are no longer manufactured or available. The infrastructure should have been replaced 20 to 30 years ago but has not been upgraded due to lack of funding. Absent a new source of funding for upgrading the system, it is only a matter of time before a power failure delays a launch.

2. Background/Findings

Replacement of the electrical distribution infrastructure at KSC and CCAFS is long overdue but is now quite an expensive undertaking. There are 360 miles of primary and secondary electrical distribution lines. Some 170 miles of these lines are overhead/aerial and exposed to lightning strikes, which can propagate through the system causing extensive damage. It would cost \$500,000 per mile or \$85 million in total to relocate these lines underground in concrete-encased duct banks. An additional \$17.7 million would be required to repair power cables on KSC. Replacing the power distribution on CCAFS and KSC would cost approximately \$400 million. DoD and NASA budget priorities have precluded adequate maintenance and upgrade of the system. There is an urgent need for a new source of funding. In the commercial world, these upgrades would have been accomplished long ago (perhaps twice) through loans amortized over 30 years.

Congress enacted utility privatization legislation for DoD in 1994. The legislation authorized DoD to sell its utility systems, including electrical distribution and water and sewer to private companies. The USAF planned to sell its power and water utilities and had several bidders. If implemented, the companies would have owned, operated, and improved the systems, recovering the costs of operations and improvements from the CCAFS and KSC through monthly utility service charges. However, since CCAFS and KSC share the same electrical distribution system and NASA did not have the same legislative authorization, the USAF could not move forward with this plan until NASA received similar legislative authority, except at prohibitive expense to NASA.

Interim Report #3, Recommendation 3

Congress should grant NASA utility privatization authority. Privatization (whether to private, state or municipal utilities) holds great potential for NASA and DoD facilities (specifically KSC and CCAFS) to overcome the budget burdens associated with capital improvements to outdated infrastructure. This legislation should grant the individual organizations the widest and most flexible interpretation and authority. The legislation could also be a model for other government agencies.

III. Aerospace Industrial Base

A. Sustain Critical U.S. Industrial Base Capabilities

1. Issue

The aerospace industry has raised concerns regarding the lack of sustaining design and engineering for manned fighter aircraft (following completion of the Joint Strike Fighter in 2008) and for solid rocket boosters used in strategic missile systems and space launch systems.

The Commission recognizes the validity of industry's concerns and includes a more detailed description and assessment of these issues as appendices to this Interim Report. The Commission also recognizes that the past decade's dramatic shrinking and thinning of the overall aerospace industrial base and today's continuing challenging business environment leave a high probability that additional similar sub-sector problems exist or may arise in the future.

A broad assessment of the overall aerospace industrial base reveals the following:

<u>Negative Conditions/Trends</u>	<u>Positive Conditions/Trends</u>
- General reduction in the number and robustness of aerospace companies - U.S. civil transport aircraft market share declining - Overcapacity in launch industry - Space Shuttle future replacement clouded - Commercial/Military integration weak - Overcapacity in satellite industry - NASA, FAA research funding in decline - No U.S. regional jet production - U.S. export controls confining global access - World Trade Organization (WTO) position on tax issues unfavorable to U.S. manufacturers - Serious air traffic control challenges, airport saturation - Financially weak airlines struggling with post September 11, 2001 challenges - Foreign government sponsored competitors - NASA elimination of rotorcraft research funding	- Defense research, development, testing and evaluation increase helping - Unmanned aerial vehicle developments emerging - Overall general aviation aircraft sales are growing

The U.S. Government, particularly its national security organizations, must be alert to risks that arise from such an environment and be prepared to take action in order to avert serious damage to the aerospace industrial base. The establishment of this Commission shows that a degree of overall concern has been noted. The DoD does conduct ad hoc analyses of individual programs when particular concerns are raised, but performs no future-looking systematic assessment to identify potentially critical industrial base issues. In fact, DoD has recently asked the Congress to drop a requirement for annual reporting on the status of the U.S. defense industrial base.

2. Background/Findings

Highlighted findings from an overall view of the U.S. aerospace industrial base include the following:

- Several economic and international trade issues are hampering the U.S. aerospace industry. The challenge of reforming U.S. export control policy has been raised by this Commission. The effect of recent WTO rulings on tax issues is to hurt U.S. companies while helping international competition. Furthermore, the impending expiration of research and development (R&D) tax credits will inhibit needed investment and innovation.
- Given the failure of a robust commercial space business to emerge, there is a worldwide overcapacity in space launch. The U.S. space launch industry is also facing severe pressures from international competitors, many of whom are sponsored by their governments and therefore do not face the full consequences of the marketplace.
- Even with DoD budgetary increases, the overall trend for consolidation and thinning of the aerospace industry will likely continue in the absence of government intervention. The government currently has not clearly stated its policy as to whether it favors or discourages further consolidation as the appropriate means to address overcapacity. As a result, the business community is less able to proceed efficiently in coordination with the national interest in strategic planning and development.
- The government's current mechanisms for addressing broad industrial base issues are weak and uncoordinated. Such mechanisms fail to match medium- and long-term future requirements with current policies affecting the size and structure of the aerospace industrial base. The current mechanisms do not address the significant barriers to entry for defense-related industries. These barriers make a free market model highly unreliable for industries seeking to reenter the defense market.
 - For example, the anticipated gap in engineering design and development for manned fighter aircraft and solid rocket boosters is not clearly being addressed by the DoD. If these gaps do occur, reconstituting the engineering expertise needed for successful system

development will be extremely problematic, time consuming, and at high risk of losing lessons from past experience.

- The budget increases proposed for the DoD by the Administration will clearly help support the defense sector. However, stability of these budgets will be required for improvements to be maintained over the long term.
- The long-term cooperative efforts between NASA and the DoD in rotorcraft research are in serious turmoil. As NASA faces internal budget pressures, it has sought to eliminate all of its rotorcraft R&D activity unilaterally. In the face of a growing European rotorcraft industry, the future competitive U.S. capabilities in both military and commercial rotorcraft technology development is in serious jeopardy.
- The past year's recession and the effects of the September 11, 2001 terrorist attacks have severely impacted the U.S. aerospace industry. Airline traffic is down, aircraft orders have dropped, and 2001 saw fewer space launches than any year since 1963. The supplier base has been especially hard hit with the repercussions of slowing orders from prime contractors. A significant portion of government spending in the air transportation sector is being refocused to massive security responses, reducing the funding available for innovation and system efficiency improvements.
- As stated in the Commission's Second Interim Report, the limitations to air traffic capacity growth is a major challenge facing the nation. The effects will be felt in the near term. Traffic recovery from September 2001 is already underway and will continue with an economic recovery and success in preventing future terrorist incidents. Already, however, on time performance is dropping as traffic increases, highlighting the fact that the air traffic control (ATC) system is very near its effective capacity. New runway construction is a process that typically takes well over a decade to complete. NASA and FAA budgets aimed at air transportation's growth have been decreasing for a number of years. The long lead-time for increasing aviation capacity calls for immediate Administration and Congressional attention to address this major national need.
- At this time of severe air transportation challenges, the senior leadership of the FAA is in transition. The FAA Administrator's term expires in August of this year, the Deputy Administrator has indicated his intent to retire in the same time period, and the leader of the proposed Performance Based Organization for managing air traffic operations remains unnamed.

In previous interim reports, the Commission has recommended a number of actions for the Administration and Congress that would directly improve the condition of the U.S. aerospace industrial base. It is important to consider industrial base issues in its full context, and worth reiterating several previous Commission recommendations:

- Congress should fully fund the President's DoD budget request.
- Congress and the President should ensure full funding of the FAA's operations budget and its Operational Evolution Plan.
- Congress should adopt the National Foreign Trade Council (NFTC) unitary proposal to replace the Foreign Sales Corporation (FSC)/Extra-territorial Exclusion Act of 2000 (ETI) with changes to U.S. tax laws that would ensure the future competitiveness of current users of the FSC/ETI regime in the global marketplace.
- The Administration should negotiate changes in the WTO rules that would remove the inequity in treatment of direct and indirect taxes that led to the European Union's challenge of the FSC/ETI tax regime, and put in place an equitable resolution that would ensure that U.S. business interests receive the same level of tax relief as European businesses enjoy from their government systems.
- In the near term, Congress should revise the U.S. tax code to make the research and experimentation (R&E) tax credit permanent, and increase the alternative credit rates to achieve parity with the savings provided by the regular credit. In the longer term, Congress should enact structural changes to the R&E credit, including changes in the baseline period, increases in the rates for the Alternative Incremental Research Credit and other improvements that enhance its effectiveness in stimulating private sector investment in new technologies.

Recommendations

This Interim Report recommends the following additional actions be taken to address areas of concern during Congressional deliberations in the current budget cycle and Administration preparation for the FY 2004 budget.

Interim Report #3, Recommendation 4

The Secretary of Defense should task the Defense Science Board (DSB) to review and recommend overall DoD policy toward future industrial base consolidation including its policies toward mergers and acquisitions. In particular, as part of this review, the DSB should:

- Address the aerospace industry consolidation and workforce challenges resulting from today's diminishing number of system design programs.
- Assess approaches for aligning consolidation policies with procurement and budgeting policies.
- Consider specific measures on the health of defense contractors such as the magnitude and longevity of a contractor's production base and product development work.
- Assess the long-term sustainability of the nation's high performance aircraft and solid rocket booster design and development capabilities, including the potential of increasing/initiating high payoff technology development programs and/or continuing low rate production of strategic systems to bridge industry capabilities to a succeeding generation.

Interim Report #3, Recommendation 5

The Administration and Congress should direct NASA and the DoD to coordinate R&D efforts in areas of common need and provide the appropriate funding for joint programs. For example, funding for joint Army/NASA rotorcraft R&D efforts should be restored.

Interim Report #3, Recommendation 6

Congress should hold hearings to address:

- National challenges for future air traffic capacity needs cited in the Commission's Second Interim Report.
- Increases to NASA and FAA research and development funding needed to retain national leadership in aeronautics.

Interim Report #3, Recommendation 7

The Administration should ensure that a new FAA Administrator, Deputy Administrator and Chief Operating Officer of the new Performance Based Organization are recruited to fill important leadership vacancies without delay. Each should be given a mandate for substantial long-term ATC capacity growth.

B. Ensure DoD Program and Budget Stability

1. Issue

Because of overall DoD budget constraints in the past decade, DoD investments have been inadequate to fund planned programs. This funding shortfall has been exacerbated by the practice of decrementing the investment accounts to provide supplemental funding for increasing operations and support (O&S) costs, the costs of unforeseen contingency operations and unanticipated internal program changes. The resulting program funding instability is contributing to increased weapon system costs and delays in military modernization. The current Administration seeks to resolve this issue by providing a significantly increased DoD budget top line that can accommodate fully the O&S accounts, including unplanned contingencies, and by budgeting more realistically for individual programs.

2. Background/Findings

Protecting Investment Funding

Stable and predictable funding levels for DoD procurement and R&D accounts are essential for achieving effective management of programs and costs, as well as meeting requirements for military modernization. Stable and predictable funding levels, though, must be accompanied with achievable and realistic requirements and

mature technologies, the lack of which also contribute to a program's failure to meet established baselines.

Ensuring adequate funding for both O&S and investment requirements would ameliorate some of the funding stability concerns for individual programs, and would help ensure adequate funding to complete and maintain the desired modernization and transformation of U.S. Armed Forces.

Realistic Cost Estimates

The competition for scarce resources, coupled with a desire to satisfy more requirements by having more programs ongoing than may be affordable, creates incentives and pressures on the Services and industry to be overly optimistic when estimating future system costs. As programs mature, actual costs are difficult to accommodate within the planned top line, leading to cost increases, delays, restructuring, or cancellation. Overly aggressive schedules and requirements also have a significant impact on program execution and delivery.

Requiring more realistic cost and schedule estimates will help reduce the tendency to include too many ultimately unaffordable programs within the FYDP and preclude both contractor and DoD investment in programs that realistically will not be completed.

Financing Flexibility

The current financial system requires detailed estimates of program costs years in advance of execution, and then allows only very limited flexibility, once the budget is finalized, to address changes and emerging needs as the program progresses through execution.

Greater flexibility to adjust funding requirements among programs, and within programs, would allow DoD to meet higher priority requirements as they arise, and solve problems discovered in testing during production or to provide support following production.

Multiyear Budgeting

While a weapon system's design and development program typically requires many years, often from five to ten, resources are requested and appropriated on an annual basis. Thus, while contracts span multiple years, program managers and contractors face annual uncertainty over the timely availability of adequate funding to do the next increment of work. As long as high priority programs are performing, Congress and DoD should recognize that funding reductions impact performance and should avoid funding perturbations resulting from undistributed cuts, disbursement lags, and other adjustments not related to program performance or funding requirements. Multiyear contracts for production offer a means of providing defense

companies with stable revenue and cash flow, lowering unit costs due to economies of scale and supporting a more stable workforce.

Recommendations

Based on the need to adequately fund and manage investment in modernization and transformation, the Commission recommends that the Administration/DoD and Congress:

Interim Report #3, Recommendation 8

Establish and maintain a stable top line for DoD investment in the FYDP.

- a. Establish and maintain an adequate long-term investment (procurement and R&D) budget in the FY 2004-2009 FYDP.
- b. Establish and maintain an adequate O&S budget in the FY 2004-2009 FYDP.
- c. Protect continuity of long-term investment funding by seeking to limit downward adjustments across the FYDP for other than economic reasons (i.e., inflation) and/or by limiting reprogramming into O&S or other accounts in year of execution.

Interim Report #3, Recommendation 9

Fully fund programs within the FYDP.

- a. Industry should submit realistic cost and schedule information in all bid proposals.
- b. DoD should provide sufficient funds in the FYDP based on realistic schedule and performance goals, using independent cost estimates as decided by the Milestone Decision Authority.
- c. DoD and industry should jointly manage programs to ensure visibility and review all requirements changes during program execution. If approved, funding will be adjusted for any such requirements.

Interim Report #3, Recommendation 10

Increase DoD's financial flexibility.

- a. Support the Administration's proposal to provide authority for program managers to move funds from procurement to R&D within a program.
- b. Double reprogramming thresholds to \$20 million for procurement and operations and maintenance and \$8 million for R&D.

Interim Report #3, Recommendation 11

Support multiyear, full-phase funding for both development and production programs.

- a. Procurement Programs: Expand the use of multiyear procurement contracting and funding using existing criteria and by working to achieve the Secretary of

Defense's (SECDEF) desired goals for multiyear contracts. SECDEF selected pilot programs with spiral development acquisition and multiyear funding will include mechanisms to allow the insertion of technology enhancements without invalidating the advantages (cost savings and program stability) of multiyear contracting.

- b. Development Programs: Develop baselines for selected development programs based on realistic cost, schedule and performance goals; establish and protect "milestone-to-milestone" budgets in the FYDP to provide full-phase funding from initiation to production, as long as acquisition program baseline goals are met. Enact legislation to provide "milestone" Congressional authorizations for the duration of each selected development program, and appropriate funds annually as required for each program so long as each program meets its baseline goals.

IV. 21st Century Aerospace Workforce

A. Develop and Maintain a 21st Century Workforce

1. Issue

The future of the U.S. aerospace industry depends on the ability of the industry to attract, develop and retain a properly skilled professional, scientific, engineering and production workforce. Contractions in the industry due to mergers and consolidations and a downturn in the economy have produced large layoffs and few opportunities for new jobs. The U.S. aerospace industry is also dependent upon the U.S. educational system to develop high quality graduates in math and science. Declining national scores in math and science highlight the deficiencies of the educational system to effectively motivate and teach these skills. The impending retirement of the aging aerospace workforce, the fact that young people are not choosing engineering as a career field, and a lack of qualified, skilled workers will result in a shortage of aerospace workers in the next decade.

2. Background/Findings

With the end of the cold war, the rise of global competition, industry consolidation, and growth in other sectors of the economy – particularly in the computer sciences – the U.S. aerospace industry has lost its premier status as the employer of choice for many types of professional, scientific, engineering, production and maintenance workers. At the same time, the average age in the workforce on the defense side of aerospace is over 50 years old. In the next six years, nearly half of the workforce is eligible to retire, leaving a gaping hole in skills and experience. According to retired USAF General Thomas Moorman, “The work force is the biggest issue facing the industry today. We are not attracting and retaining the best and the brightest.”

Maintaining and developing the required quality workforce is compounded by a K-12 education system that is woefully inadequate in math and science teaching and learning. A recent national commission report describes math and science teaching at the K-12 level as “nothing short of a national disgrace.”¹ It is also noted that “34% of public school math teachers and nearly 40% of science teachers lack an academic major or minor in these fields, and that a serious shortage of K-12 teachers exists in science and math.”²

The aerospace industry plays a major role in the health of the U.S. economy and in maintaining the strength of our nation’s security. It provides jobs for hundreds of thousands of workers in aerospace and related industries. The industry is constantly developing sophisticated technologies that have widespread application in increasing

¹ “Before It’s Too Late”. A Report to the Nation from The National Commission on Mathematics and Science Teaching for the 21st Century, September 2000.

² “Road Map for National Security: Imperative for Change”, February 2001.

the nation's productivity and in protecting our country from its enemies. The development of new technologies has also spurred the creation of other industries that have greatly contributed to our economy.

None of the great benefits that have been derived from the aerospace industry would have been possible without the availability of a highly skilled and dedicated workforce. Despite its importance, however, the aerospace workforce is dramatically declining. From a peak employment in December 1989 to March 2002, over 600,000 aerospace workers have lost their jobs. The impact of the recent use of commercial aircraft in attacks on the U.S. by terrorists and the current downturn in the business have led to a further unplanned loss of aerospace jobs. Aerospace industry representatives have noted that the total announced layoffs since the September 11, 2001 terrorist attacks exceed 60,000 workers across the industry.

Recommendations

Given the necessity of the U.S. aerospace industry for economic and national security, the Commission makes these recommendations for stemming these losses with an overall objective of stabilizing and growing the U.S. aerospace workforce.

Interim Report #3, Recommendation 12

Interagency Workforce Task Force: The aerospace industry's workforce provides the skills, knowledge, and technical capabilities necessary to keep the U.S. in the leadership of production, sales, and marketing for the 21st century aerospace industry. To ensure leadership throughout the 21st century the Commission recommends that the Administration:

- a. Through Executive Order, create an interagency Workforce Task Force to coordinate programs and initiatives composed of the Departments of Labor, Commerce, Education, and other agencies as appropriate to respond to industry workforce and training needs.
- b. As part of the Workforce Task Force, establish an Industry-Based Aerospace Capability Network to develop public/private partnerships in which all key stakeholders – business, labor, government, and community groups – coordinate agency resources, the development of skill standards and certification programs, and provide information on occupations and job availability in order to foster the growth of the American aerospace economy and workforce.

Interim Report #3, Recommendation 13

Aerospace Industry Promotion (AIP): The Commission recommends that the Administration develop a national program to attract public attention to the importance and opportunities within the aerospace industry. This program should target high schools, community colleges and universities with engineering schools and be coordinated through the Aerospace Capability Network. Programs such as the

National Aerospace Initiative or the Automotive Youth Educational Systems could be models for promotion in the aerospace industry.

Interim Report #3, Recommendation 14

Tax credits for apprenticeship and training: The Commission recommends that the Administration and Congress consider targeted tax credits for employers who invest in the skills and training of the workforce for employees enrolled in registered apprenticeship programs and other short-term occupational training programs that meet the needs identified by industry.

Interim Report #3, Recommendation 15

Make long-term investments in education and training to keep America's highly skilled workforce "pipeline" filled. The Administration and Congress should:

- a. Support recommendations of the National Commission on Mathematics and Science Teaching for the 21st Century on improving K-12 mathematics and science education.
- b. Create programs, including scholarships and internships, to encourage more young people to study and work in the mathematics, science, and engineering fields.
- c. Make investments in vocational education to develop a workforce with the skills needed by industry.
- d. Expand the use of registered apprenticeships for skilled and technical occupations.

Interim Report #3, Recommendation 16

U.S. Aerospace Workforce Stabilization: Since the tragedy of September 11, 2001, the current erosion of U.S. aerospace employment has accelerated. U.S. policy towards domestic aerospace employment must reaffirm the goal of stabilizing and increasing the number of good and decent jobs in the industry. The Administration and the Congress should consider the impact on U.S. aerospace employment of domestic and international policies.

V. Summary

To support development of its findings and recommendations, the Commission has conducted three public meetings – on November 27, 2001, February 12, 2002, and May 14, 2002 – and has three more public meetings scheduled for this year – August 22, September 17, and October 23. The public is encouraged to attend these meetings, as well as to provide inputs directly to the Commission via its website at: www.aerospacecommission.gov or to Mr. Paul F. Piscopo, Staff Director, Commission on the Future of the U.S. Aerospace Industry, Crystal Gateway 1, Suite 940, 1235 Jefferson Davis Highway, Arlington, Virginia 22202, via phone (703-602-1515), fax (703-602-1532), or e-mail (aerospace.commission@osd.pentagon.mil).

Appendix A: U.S. Solid Rocket Motor Technology and Production Capability

1. Issue

The United States solid propellant production programs for strategic missiles will end in 2008 with no follow-on development or production anticipated before 2015. Current trends indicate that civil and commercial markets beyond 2008 will not sustain the production base for solid rocket motors. The loss of the solid rocket motor industrial base would impede, if not prevent, the development and production of the next generation of U.S. strategic missiles.

2. Background

Our strategic, tactical and missile defense weapons depend on solid rocket motors for propulsion systems. Currently, the U.S. Navy is procuring Trident II D-5 Fleet Ballistic Missiles (FBM) and the U.S. Air Force is beginning a life extension program for 500 Minuteman III Intercontinental Ballistic Missiles (ICBM). Rocket motor production for these programs will end in 2008, and missile deployment is planned through 2020. For the first time in 50 years, no new strategic missile solid propulsion development or production program is on the horizon.

The defense industry is no longer the dominant solid rocket motor customer. In 1984 the \$2.5 billion solid rocket motor market was two-thirds defense related and one-third commercial space related. By 1999, the market dropped to \$1.2 billion: commercial space became the dominant customer with two-thirds of the market while defense made up only one-third of the market. Space launch customers using solid rocket motors include the NASA Space Shuttle, Air Force Titan IV and commercial Delta and Atlas vehicles. However, these customers plan to transition to liquid propulsion systems for their next generation vehicles. Potential reductions in strategic missiles will further dampen demand for solid rocket propulsion.

Future U.S. strategic missile development and production capability is now threatened. Inadequate solid propulsion markets could erode the U.S. ability to develop solid rocket boosters to meet future demands. Critical engineering design skills could be lost. Already the workforce is in decline: experienced engineers are retiring, and young talent is not entering the labor force. If there is ever a requirement for more advanced capabilities in strategic missiles, then we must continue to pursue related research and development. If we ever need to increase production of solid rocket motors in the future, then we must retain our production capability.

Appendix B: Design Capability for Advanced, High-Performance Aircraft

1. Issue

Based on current plans, by the end of the current decade, the United States will not be designing and developing a new advanced, high-performance aircraft. There will be no new fighter on the drawing boards to follow the Joint Strike Fighter. As a result, the U.S is at risk of losing its broad combat fighter aircraft design capability.

2. Background

There is concern over the declining design capability for advanced, high-performance aircraft in the U.S. aerospace industry. Over the past 50 years, the number of military manned aircraft design programs per decade has dropped 96% (1950s – 46 programs; 1960s – 16; 1970s – 12; 1980s – 7; 1990s – 6; 2000s – 2 [the Joint Strike Fighter (JSF), a manned aircraft, and the Uninhabited Combat Air Vehicle (UCAV), an as yet unproven concept]). This translates into a huge drop in the number of programs a technician, engineer, or manager will work on during a 40-year career. According to the RAND Corporation, declining experience levels have contributed to the problems observed in many recent military aircraft development programs. While experienced employees are retiring (54% are over 45 years of age, and 33% are eligible for retirement in 5 years), there are few, if any, high-tech aircraft programs on the horizon that would allow companies to attract and develop young talent, as well as maintain expertise throughout the workforce.

The JSF System Design and Development SDD will end in 2012. The UCAV program will complete its major design work by 2010. From that point forward, DoD plans leave a combat fighter aircraft design gap of 10 to 20 years, seriously impacting the capability of the U.S. to retain critical skills. Except for the possibility of a Long Range Strike Aircraft (B-2 replacement) or a possible National Aerospace Initiative hypersonic aircraft, there are no new military aircraft programs of any kind under consideration until 2024.