

Industry Perspectives on the National Aeronautics Policy

Leadership Vision* Relevance* Facilities* Education & Training*Transition* Programs*

The United States' federal investment in aeronautics research is at a crossroad. Around the world, governments are taking aim at our aeronautics industry -- increasing their investment and making aeronautics R&D a top priority. Meanwhile the United States continues to de-emphasize aeronautic research. For example, while NASA continues to downsize and internalize its aeronautics program, implementation of the European Union's Vision 2020 is accelerating. This trend will have a serious impact on the nation's competitiveness, national security, and our position as the world's leader in aeronautics research. As a result, rather than leading the world in the development of next generation aviation products, services and infrastructure, the United States will take a backseat to the products created by other nations: products supported by policies, rules and incentives designed to disadvantage U.S. solutions.

The Aerospace Industries Association, our member companies and industry partners, strongly support language included in the FY2006 Science, State, Justice, Commerce, and Related Agencies Appropriations Act calling for a “. . . national aeronautics policy to guide the aeronautics programs of the Administration through 2020.” The national aeronautics policy must be consistent with the government's historic role, promote continued United States' leadership of civil and military aeronautics research, and substantially address the following:

- **Leadership** -- Emphasize the critical role of the federal government in civilian and defense aeronautics research to ensure the United States' economic and national security.
- **Vision** -- Provide a clear, compelling vision that will drive decisions and priorities for the future of domestic aeronautics research: a vision that, once set, will be adhered to for years to come and will avoid the dramatic reversals seen in recent years.
- **Relevance** -- Develop and implement a process whereby technology customers and United States' government stakeholders (DoD, DoC, FAA, industry, etc.) are consulted on the research roadmaps and are participants in federally funded research programs intended to deliver technologies suitable for civil and military aeronautics applications.
- **Facilities** -- Ensure that cost-effective, state-of-the-art national test facilities are available to meet future civil and defense aeronautics research needs.
- **Education & training** - Secure the future of America's workforce through emphasis on secondary and post-secondary education in engineering, mathematics and science disciplines that are critical to the aviation sector.
- **Transition** - Establish a framework to ensure that the technologies pursued and developed by the federal government will be of interest and able to be transitioned to domestic operators and manufacturers. This framework will spur greater private sector investment and provide tangible public return on government research dollars.
- **Programs** –
 - Ensure that the Next Generation Air Transportation System is supported by appropriately funded research in all relevant disciplines.
 - Provide aeronautics research with application to advanced fixed and rotary wing aircraft and propulsion concepts in subsonic, supersonic, and hypersonic fields, while ensuring a plan for timely and applicable transfer of these research results to industry and government stakeholders.

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Leadership Vision* Relevance* Facilities* Education & Training* Transition* Programs*

Leadership: Emphasize the critical role of the federal government in civilian and defense aeronautics research to ensure the United States' economic and national security.

Since the earliest days of powered flight, the United States has led the world in the research, development, and manufacture of propulsion, aircraft, and air traffic management systems. Our leadership in these sectors has greatly enhanced our positions in other economic areas. Not insignificantly, the American public has been the general beneficiary of America's aeronautics leadership. Nearly a century in the making, this lead position is now at risk from a decline in domestic public-sector investment and invigorated foreign investment in the aeronautic sciences. Surrender of our technological leadership in aeronautics would be a harbinger of our retreat from global competitive eminence, a retreat with potentially devastating near-term and long-term effects.

- NASA's Aeronautics Research Mission Directorate (ARMD) budget has seen consistent funding cuts over the last 13 years. From a funding level of \$1.54 billion in FY1994, cuts to the ARMD budget have resulted in a more than 50 percent reduction, with a proposed FY2007 budget submission of only \$724.4 million. This excessive decrease in funding and the dramatic change in NASA's research priorities endanger both the future of U.S. leadership in the global aviation industry and the benefits that accrue to the American taxpayer.
- NASA plays a critical role in the way Americans' view – and benefit from – our place in the world: from the perspective of the world leader in space exploration, science programs, and aeronautics research. These programs are far too important to be pitted against one another in annual funding battles to the detriment of our position of global leadership and our domestic economy.
- The impact of the aerospace industry on the domestic economy cannot be overstated. In 2005, the aerospace industry provided the largest trade surplus of any segment of the American economy – a trade surplus of \$39.8 billion and a 28 percent increase from 2004. In 2004, the industry employed 539,000 workers and had an annual payroll of \$31 billion. This investment provides widespread, positive, secondary and tertiary impacts on regional, state, and local economic health – a multidimensional and expansive public return on investment of taxpayer dollars. If we surrender U.S. leadership of aviation manufacturing, the adverse affects on trade, employment, high-technology industry, as well as local, regional, and national economies, will be dramatic.
- In times of war, the U.S. has always had the ability to manufacture the state-of-the-art weapons needed for victory. Sacrificing this technological supremacy in aviation will remove a valuable asset from the technological armamentarium of U.S. military might. We must continue to invest in critical R&D research to ensure continued U.S. military strength.

Industry Perspectives on the National Aeronautics Policy

Leadership Vision* Relevance* Facilities* Education & Training*Transition* Programs*

Vision: Provide a clear, compelling vision that will drive decisions and priorities for the future of domestic aeronautics research: a vision that, once set, will be adhered to for years to come and will avoid the dramatic reversals seen in recent years.

There is no better agency to set the vision for future aeronautics research than NASA and its Aeronautics Research Mission Directorate (ARMD). Now, decreased funding and a new research direction raise concern that the agency's vision no longer encompasses full scientific investigative research to the validation/demonstrator level. Yet from its inception, NASA's development of transferable technology resulted in products and production that boosted the domestic economy and benefited the American public. To maintain this critical visionary role, NASA must continue to support groundbreaking research that incorporates operational concept/validation/demonstrator levels. In the past, such vision has provided America its global competitive stature; continuation of this vision is imperative for America to retain and strengthen its global market position

- With X-planes validating the possible directions and benefits of new aeronautics capabilities, NASA has contributed to enormous economic growth in the civilian and defense industries – growth with advantageous consequences to America's economy and national security. Running the gamut from tilt-rotor aircraft and fly-by-wire systems to the recent X-43C and its scramjet engine, these research projects have captivated the imagination of not only the aviation and engineering communities, but also of the potential future aerospace workforce still in school.
- With limitless possibilities, NASA understandably must prioritize its research agenda. Yet the recent decision to focus ARMD research on fundamental aeronautics leaves many questions unanswered and has seriously damaging ramifications. Fundamental aeronautics research must be continued. However, it is essential that this research extend through the validation/demonstrator level for taxpayer return-on-investment and protection of our international leadership. If NASA foregoes pursuit of market-deployable aeronautics research, with its extensive domestic economic benefits, another federal agency or national organization must assume this leadership.
- To succeed, NASA's ARMD must have effective funding. Current budget estimates of approximately \$725 million per year do not meet those goals. Higher, sustainable funding levels are mandatory if NASA ARMD is to maintain its leadership in the aeronautics sciences. However, it is crucial that any additional funds be dedicated to program-specific aeronautics research; that the research substantively engage industry; and that the NASA-funded research encompasses the validation/demonstrator level. Also required is a more equitable balance between NASA's internal and NASA-funded external research.
- NASA must form partnerships not only with industry and universities, but with Congress. Through open communication with Congress, NASA assists lawmakers in identifying appropriate and reasonable funding levels in the context of budget constraints and needed aeronautics research.

Industry Perspectives on the National Aeronautics Policy

Leadership Vision* **Relevance*** Facilities* Education & Training* Transition* Programs*

Relevance: Develop and implement a process whereby technology customers and United States' government stakeholders (DoD, DoC, FAA, industry, etc.) are consulted on the research roadmaps and are participants in federally funded research programs intended to deliver technologies suitable for civil and military aeronautics applications.

There is a critical need for industry and stakeholder input at a level to influence the formation and implementation of a federal aeronautics research policy roadmap. This influence will ensure that federal research is relevant and benefits the U.S. taxpayer and U.S. global competitiveness. Relevant research that is eventually deployable to products and applications increases the American public's return-on-investment on several levels, such as job creation, increased tax revenue, new services and new technology application spin-offs – to cite just a few examples.

- **Global Competitiveness:** Unless the federal policy and research roadmap support federally funded research of technologies at a level leading to industry development of marketable product applications, we will continue to lose leadership to other nations in this critical arena. We must not cede our position, particularly now when faced with Europe's program of aggressive public investment in applied aeronautics research.
- **Industry Involvement:** Aeronautics stakeholders should have permanent standing in an institutionalized process for their continuous, substantive involvement in directing, monitoring and evaluating national aeronautics policy planning and implementation.
- **Oversight:** To ensure that funding is appropriate to industry-approved strategic and tactical roadmap goals, regular government-stakeholder meetings to evaluate progress, goals, and means should be sponsored by each federal agency that funds aeronautics research. Additionally, establishment of coordinated congressional oversight spanning all agencies' aeronautics research (or other government-wide oversight) would promote industry-agency collaboration on research needs and long-term goals.
- **Partnership:** A new government-industry partnership paradigm is needed to institute a mechanism that identifies and promotes federally funded research pursuing technology with transferable product applications and public benefit. Additionally, given the European community's accelerated, publicly funded product-oriented aeronautics research, there is an urgent need for federal focus on transferable research within shorter-term time constraints for the U.S. to maintain its leadership in this vitally important arena.
- **Investment:** The American public, our national competitive standing, and industry are adversely affected by dramatic redirection of research priorities. A national policy and a national research roadmap would minimize dramatic redirecting of aeronautics research and would provide industry with confidence regarding future federal research priorities, confidence that is necessary for future business investment determinations.

Industry Perspectives on the National Aeronautics Policy

Leadership Vision* Relevance* Facilities* Education & Training* Transition* Programs*

Facilities: Ensure that cost-effective, state-of-the-art national test facilities are available to meet future civil and defense aeronautics research needs.

The Aeronautics Test Program (ATP) is key to maintaining our global competitive advantage and ensuring practical applications that benefit the American public. A secure ATP will protect the strategic availability of the minimum critical suite of wind tunnels and ground test facilities necessary to meet national requirements. Federal funding of ATP at \$26 million in FY2006, with an increase to \$55 million requested in the President's FY 2007 budget, still represents an overall 18 percent decrease in NASA Aeronautics Research Technology funding and fails to reflect the importance of federal research facilities for American competitiveness.

- Stable, sufficient funding of ATP will help enhance the strategic and business management of the aeronautics wind tunnels/ground test facilities at Ames Research Center, Glenn Research Center, Langley Research Center, and the Dryden Flight Research Center.
- To maintain these valuable resources, the ATP will be instrumental in assisting NASA's establishment of a process for developing proposed budget content and size, as well as identifying associated issues. For example, national integration/coordination of NASA facilities would prompt an impact assessment of proposed program content on the overall Directorate mission, plans, and budget. This process would also promote consistent oversight of proposed program policies while assessing the efficacy of program management and conduct;
- A secure ATP will amplify the Directorate's ability to effectively apply Agency/Directorate investment mechanisms to strategic facility needs including, but not limited to, strategic investment accounts, working capital funds, and programmatic resources. This would help align NASA's representation to external customers and communities regarding strategic and operational facility issues, and permit innovative arrangements with external constituencies regarding facility ownership, operation, and utilization.
- ATP should provide a mechanism to evaluate and revise pricing and facility-access policies and regulations commensurate with new cost-structure studies' findings. NASA facilities need to become cost effective on a pricing basis that more accurately reflects cost-of-use and is consistent across all NASA facilities.
- The ATP will motivate discussions with NASA and non-NASA users to not only enhance facility utilization, but also to coordinate facility divestment (including investigation of reimbursable policies) to make better use of NASA test facilities.

Industry Perspectives on the National Aeronautics Policy

Leadership Vision* Relevance* Facilities* Education & Training*Transition* Programs*

Education and Training: Secure the future of America's workforce through emphasis on secondary and post-secondary education in engineering, mathematics and science disciplines that are critical to the aviation sector.

“[Job] losses, coupled with pending retirements, represent a devastating loss of skill, experience, and intellectual capital to the industry,” stated the final report of the President's Commission on the Future of the U.S. Aerospace Industry. With nearly 30 percent of the aerospace workforce eligible for retirement in 2008, the aging U.S. workforce in the defense and aerospace industries may cost us valuable ground in maintaining our global competitive position. Congress, industry, labor, academia and other stakeholders need to assist U.S. industry to identify and develop needed skills at all levels, ensuring existence of a workforce to support our current and future technological and national security interests. Congress and federal agencies must ensure that unnecessary regulation does not impede job and economic growth.

At present, the U.S. educational system is not providing enough students with the needed math and science skills to fill the critical positions being vacated by retiring workers. Fewer American students are pursuing undergraduate or graduate degrees in science and engineering disciplines.

As employers, the aerospace and defense businesses' cyclical nature often influences new graduates to pursue careers in more secure sectors.

To secure the requisite national aerospace workforce, a coordinated and broad-based national plan to promote career opportunities within the industry is needed to secure the required workforce. This plan would:

- Identify aerospace workforce needs, accommodate the increasing demand for aeronautical researchers and engineers, and help ensure that the demand is largely met by U.S. science and engineering education graduates.
- Help develop and maintain a strong partnership among industry, academia (community, technical, four-year, graduate, and post-graduate colleges), local communities, and the public workforce investment system.
- Oversee and monitor continuously enhanced-skills training curricula in response to in-demand occupations within aerospace.
- Systematically improve the quality and capacity of education, training those who provide skills and expanding programs to meet demand.
- Promote a positive image of the aerospace and national security industries to retain and recruit new workers.
- Help develop and maintain a workforce pipeline through recruitment and retention activities that connect people, training, and occupations to meet demand.

Industry Perspectives on the National Aeronautics Policy

Leadership Vision* Relevance* Facilities* Education & Training*Transition* Programs*

Transition: Establish a framework to ensure that the technologies pursued and developed by the federal government will be of interest and transitionable to domestic operators and manufacturers. This framework will spur greater private sector investment and provide tangible public return on government research dollars.

Government-funded research must be of value and transitionable to aerospace products and applications to ensure taxpayer return on investment (ROI) and to support our global competitiveness and technological leadership. The recent decision by NASA's Aeronautics Research Mission Directorate (ARMD) to focus on fundamental aeronautics is understandable and to an extent valid. But fundamental aeronautics research must extend to a level where industry can tolerate the investment risk of developing product applications. The demonstrator or validation level is well within the fundamental investigative science continuum.

- Industry and government must concur on development of a federal research roadmap that ensures taxpayers' return-on-investment from federal research funds and promotes American industry investment that enhances our global competitive status. If federally funded aeronautical research with potential transferability to product applications is no longer within NASA's purview, another federal agency or national organization needs to assume the role to retain America's lead of the aeronautics technology vanguard.
- Demonstrator or validation programs are critical to fundamental research. Typically, these programs are required to assess a technology's or system's capability: an assessment that cannot be conducted by computational means or other experimental methods. Technology demonstrator or validation models are far removed from marketable applications that require many years of direct corporate investment to convert demonstrator models to viable, marketable operational products and applications.
- Establishment of an industry stakeholder group to periodically review the implementation of the federal research roadmap would allow government and industry to re-evaluate, as necessary, the strategic and tactical goals of federally funded research, ensuring its relevance.
- Close monitoring of adherence to the federal research roadmap would serve as a vital counterbalance to the European Union's strategic research scheme that focuses on market/product applications from government funded research and expedites transitional research's time and cost.

Industry Perspectives on the National Aeronautics Policy

Leadership Vision* Relevance* Facilities* Education & Training* Transition* Programs*

Programs: Ensure that the Next Generation Air Transportation System is supported by appropriately funded research in all relevant disciplines.

Provide aeronautics research with application to advanced fixed and rotary wing aircraft and propulsion concepts in subsonic, supersonic, and hypersonic fields, while ensuring a plan for timely and applicable transfer of these research results to industry and government stakeholders.

To attain the technology capabilities necessary for the Next Generation Air Transportation System, sufficient, timely and dependable federal funding is necessary for federal and industry research programs directed to areas such as navigation, communication, and surveillance. Always important, such funding is now critical as we risk losing our global aeronautics leadership to other governments that are increasing their research investments, making applied aeronautics R&D one of their highest priorities. Not only is our market placement at risk, but taxpayers' return on investment of federal funds is severely diminished if transferable technology is not emphasized: needed capacity enhancements will not be implemented, and the diverse economic benefits from new services and products derived from expedited technology transfer are lost.

If NASA relinquishes its role in pursuing transferable technology through the demonstrator level, we must designate another federal agency or organization to direct this vitally important investigative area.

Research that supports development of the Next Generation Air Transportation System must be pursued expeditiously, or future constraints on aviation will cut a broad path through our economy, affecting a multitude of sectors with devastating results.

Dedicated pursuit of aeronautics research leading to transferable technology should be demonstrated by public funding/support/activities to advance a long-term strategic roadmap of industry and government research endeavors. The process should include industry assistance in developing a research roadmap and in ensuring timely transition of this technology to additional applications research.

Several recent studies provide valuable compendia of aeronautics research strategic objectives and programs necessary for future capacity, safety, efficiency and environmental impact of aeronautics, studies such as:

Responding to the Call: Aviation Plan for American Leadership
National Institute of Aerospace, April 2005

Final Report of the Commission on the Future of the United States Aerospace Industry: Anyone, Anything, Anywhere, Anytime
Commission on the Future of the United States Aerospace Industry, November 2002

Decadal Survey of Civil Aeronautic: Foundation for the Future
National Academies, publication this year