Written Testimony Provided By

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To

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As the Executive Director of the NASA Aeronautics Support Team (NAST) located in Hampton, Virginia, I appreciate the opportunity to testify before the House Commerce, Justice, Science and Related Agencies Appropriations Subcommittee today regarding the National Aeronautics and Space Administration's (NASA) Aeronautics research enterprise. I am also currently the Governor's Chairman for the Virginia Aerospace Advisory Council.

We, like everyone else here today, await the details of the FY10 NASA budget with baited breath. Hopeful due to the change in Administrations that may signal a new direction for NASA Aeronautics research, yet at the same time, conditioned to expect the worst. The subcommittee knows the gory details – year after year, the program is rebaselined lower and lower on the out years and proposed for massive cuts from the previous year.

We first however want to thank the Subcommittee and full Committee for both the $53.5 million above the request for NASA's FY09 Aeronautics program budget contained in the Omnibus bill targeted at Next Generation air traffic control and "Green Aviation", and the $150 million in the American Recovery and Reinvestment Act for research, development, and demonstration to improve aviation safety and Next Generation air traffic control. In taking these actions, the Congress has at least put the Aeronautics program on a firm budget footing for FY09 and FY10 which will enable the acceleration of very badly needed research in the critical areas of more efficient aircraft, modernized ATC and aviation safety.

We have engaged the new Administration hoping that a fresh perspective will reverse the negative budget trends for NASA Aeronautics. But it is more than reversing budget trends, there is a larger picture that we implore Congress to consider. While the Exploration and Human Space Flight side of NASA have been given a grand vision and goals to develop the hardware necessary to reach the moon then Mars, and Space and Earth Sciences have their Decadal Surveys that drive NASA mission planning well into the future, where is the grand vision for NASA Aeronautics?

There is a desperate need for a major challenge, with concrete deliverables and timelines, rather than the ad hoc annual "fundamental" research that drifts here and there as the winds blow. If there is a mission, the budget resources might logically follow, and we challenge you and the

Administration to challenge the NASA workforces at Langley, Glenn, Ames and Dryden to accomplish a grand vision on behalf of the American people and the future of our aviation industry. We believe that one grand vision could be the development of a radical new next generation subsonic aircraft that is "green" by its totally new design and which will use 75% less fuel and emit a fraction of harmful greenhouse gasses, and we have developed a white paper on the concept.

In order to realize such a grand "green aircraft" vision the Administration and Congress must abandon the shortsighted and nonsensical decision in recent years to restrict NASA's Aeronautics research program to working on only "basic" or "fundamental" research. The program has been restricted to undertaking studies on materials and designs, modeling using computers and wind tunnel testing – not actually aggressively pushing design limits and flight testing advanced aircraft concepts. Langley's major test aircraft, a Boeing 757, was mothballed due to budget constraints over two years ago. How can you flight test technologies with no airplanes?

The emphasis of the entire program must shift back to actually doing things relevant to the US aircraft manufacturing base and providing the critical initial stages of R&D to prove new technologies so that they are ready for handoff to industry for development into actual commercial aircraft. The unfortunate fact is that budget cuts in the past decade to a degree pushed NASA to make this unfortunate change which has lessened the overall value of the current Aeronautics research efforts. NASA should be directed to re-direct a large portion of its aeronautics research and development budget to activities that achieve a higher level of technology readiness.

We at NAST have written a White Paper that can be found on our website (http://www.nastus.org/)– titled "The Future of NASA". This paper calls for a drastic shift at NASA to return back to innovative research that focuses on programs that are vital and important to the current needs of our country and includes details on proposed innovative research projects such as the Green Aviation Initiative..

Regarding a proposed Green Aviation Initiative that we support and that NASA itself is working on internally, it is desperately needed for several reasons. The US aviation industry faces a potentially huge problem in the not so distant future – the pressure from governments (foreign and domestic) to address the issue of emissions from aircraft engines and their outsized impact on the environment. Aviation currently accounts for about 10 percent of greenhouse gas emissions from transportation in the U.S. Aircraft have complex effects on climate through contrail formation and by emitting water vapor into the dry stratosphere. These high altitude emissions have a far greater global warming impact than if the emissions were released at ground-level. Lest anyone think this is just an academic problem, in December 2007, a coalition of environmental groups, states and regional governments filed petitions with the U.S. Environmental Protection Agency urging the agency to address the effects of vast amounts of global warming pollution from the world's aircraft fleet. The petitions are the first step in a process that requires the EPA to evaluate the current impacts of aircraft emissions, seek public comment and develop rules to reduce aircraft emissions or explain why it will not act.

Additional effort and funding is needed in the relevant areas of NASA aeronautics research such as engine design and combustion, contrail formation and mitigation, lightweight structures and materials, alternative fuels and advanced fuselage concepts. NASA should also reinvigorate past research into alternative energy sources for aviation propulsion such as batteries and fuel cells with the goal to demonstrate powered flight. Additional research into the Blended Wing-Body aircraft flight tested in 2007 should occur. Such technologies are forward looking and would be employed on a next generation of commercial aircraft, not existing planes.

There are a number of technologies that, when combined, can lead to a new generation of transport aircraft that will use 75% less fuel for transporting people and goods. In order to eliminate the impact of climate change of depositing water vapor in the stratosphere, these aircraft will be required to operate below about 27,000 feet altitude. This operating restriction could have the effect of significantly reducing ride quality and will require additional new technologies. The major elements of the technology base for these new aircraft are in the traditional areas of aviation research, aerodynamics, structures and materials, propulsion, and avionics and exist currently in NASA's Subsonic Aircraft Research Program.

A program of research is proposed that will bring the above described technology base up to a technology readiness level (TRL) of at least 6. This program we propose would start at $50M per year and grow to $300M in four years. The program will be conducted by the NASA aeronautical research centers with close involvement of key universities and the US aircraft industry. It will expand many current programs and investigations, and allow the research to be done on a larger scale to gain better fidelity to real design challenges for a full scale system. Although a five-year budget is proposed, many of the program elements will require more than five years to reach TRL 6.

This research on developing an actual flying prototype "green" aircraft must also be supported simultaneously with research to accelerate the deployment of a Next Generation Air Traffic Control System. The requirements to provide efficient ground and in-flight aircraft operations to minimize fuel burn combined with the super-density traffic that will result from operations restricted to below 27,000 feet place new requirements on the airspace management system. This will also require development of airborne conflict detection and resolution systems. It is estimated that successful implementation of such a system could reduce fuel burn up to 15% and enable the implementation of operation below 27,000 feet. Specific technologies to be developed include 4-D trajectory based operations, highly automated ground systems, reduced in-flight separation, dynamic resource allocation, and integrated, a diagnostic approach to safety, real-time weather prediction incorporated into 4-D trajectory calculation and updating.

A five-year program of research is proposed that will result in demonstration of the system in a relevant operational environment, enabling the achievement of TRL 6. The program would be initially funded at $50M and grow to $100M per year in four years This flight demonstration program would be conducted in collaboration with package delivery fleet operators, and would involve equipping and operating a significant number of aircraft for a year-long demonstration.

Lastly, since the end of the Cold War NASA's aeronautics budget has been on the decline and resources have not been applied to properly maintain and upgrade NASA's test facilities; thus

the facilities have fallen in to a poor state of disrepair. Three years ago NASA initiated the Aeronautics Test Program to start addressing these issues. Although this program has been successful in addressing smaller maintenance issues, the resources available in this program will not sustain the facilities in the long term (no projects in the FY09 budget above $5M). NASA has just completed a year long assessment of the physical condition of its major facilities and it is clear that additional resources are needed to properly maintain and upgrade these facilities. It is estimated that $50M a year is an appropriate level of maintenance and upgrade funding for NASA's major facilities; but if new significant test capabilities are required in the future special requests for resources will be needed.

Background on the value of the NASA Aeronautics Program

Since the inception of the National Advisory Committee for Aeronautics in 1917 (NASA's predecessor Agency) NACA/NASA has invested heavily in world class, national test facilities (such as wind tunnels, structural test facilities, simulators, and flight test facilities) and has developed a technical staff of scientists, engineers, and technicians who are second to none in the world. NASA has become the national 911 for aviation problems, and is the only federal agency with the in-house expertise, experimental test facilities, computational tools, and far-term research focus required to provide long-term solutions to future civil and military aviation problems.

Military Value & Impact: NASA aeronautics research facilities have been utilized by the military since the dawn of military aviation, and every aviation asset currently in the inventory was designed with the help of NASA's experts. NASA conducted wind tunnel tests for DOD or their contractors on the F-14, F-15, F-16, F-18, F-22, JSF, B-1, B-2, C-141, C-5, and the C-17, as well as several classified systems, just to mention a few. Not only have NASA researchers made US military vehicles technologically superior, they have helped determine the capabilities of our enemies. In the 1970s and 1980s NASA did an enormous amount of testing and analysis of foreign warplanes for the defense and intelligence communities. NASA has a long history of cooperative research on military technical problems in aerodynamics, materials, structures, propulsion, propulsion integration, and stealth technologies. The Army has their own engineers assigned full-time at Langley and Ames to work with their NASA counterparts on rotorcraft and V/STOL vehicle technologies. Because there are fewer military airframe/engine manufacturers in the US these days, those that remain must be very careful in how they invest their R&D dollars. However, while these industry players cannot afford new cutting edge test facilities themselves, they still have an ongoing requirement for such facilities if they want to participate in future aircraft development efforts. Because of the stagnation in innovation at NASA aeronautics test facilities, currently, some US defense contractors are doing testing in European wind tunnels.

US Market Share in Aviation: America's aeronautics and aviation industries are at a critical crossroads. They face serious global competition and demanding economic circumstances. The path to recovery hinges on their ability to maintain their historical superiority in offering aeronautical vehicles, technologies, and systems that introduce cost-effective, yet dramatic innovation. Twenty-five years ago, the U.S. had over 90% of the world market for commercial

aircraft sales. Ten years ago the U.S. share of that market had dropped to about 70%. Today our market share is hovering around 50%. The Europeans have publicly announced – with a vision and investment strategy of over $20 billion to match – *a goal of dominating commercial aviation sales by 2020.* The plan calls for coordinating the research and manufacture of European-produced aerospace products among EU member states. The US trade surplus generated by aerospace foreign trade in 2003 totaled $28 billion, but that number continues to shrink annually.

Importance to the Nation's Economy: Aviation generates more than $1 trillion of economic activity in the United States every year. The aerospace industry is a powerful force within the U.S. economy and one of the nation's most competitive sectors in the global marketplace. It contributes over 15 percent to our Gross Domestic Product and supports over 15 million high quality American jobs. Each year more than 600 million passengers rely on U.S. commercial air transportation and over 150 million people are transported on general aviation aircraft. Over 40 percent of the value of U.S. freight is transported by air. These aviation capabilities have enabled e-commerce to flourish with overnight mail and parcel delivery, and just-in-time manufacturing.

The system is not, however, perfect, with an aging air traffic management system that is struggling to keep up with demand and that has built-in inefficiencies due to delays and airport use restrictions. We cannot ignore the need to build additional efficiencies into the system because air traffic is predicted to nearly double in the next decade and triple in 20 years. A safe, effective, and efficient national transportation system with ample capacity to match the increasing demand is essential for the U.S. economy to continue to grow. The national airway system is the only component of our transportation system (air, rail, highway, and sea) that has any hope of expanding to meet the needs of a growing U.S. economy (the US had added only 6% in highway capacity in the last 20 years). The coming transportation crisis could bring an end to U.S. economic expansion and will be a quality of life issue for all Americans.