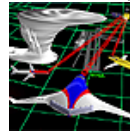


The 12-foot long X-43A hypersonic demonstrator is a scramjet-powered test. Powered by a supersonic combustion ramjet engine and at a speed of Mach-5, this technology could enable travel to any point on Earth in two-hours, if the ultra high-speed flight proves successful in September 2003 as planned.

THEMES (Aeronautics)



Aeronautics Technology

THEMES (Crosscutting Technologies)



Space Launch Initiative



Mission and Science Measurement Technology



Innovative Technology Transfer Partnerships

Note: The four Themes of the Aerospace Technology Enterprise are split across the two appropriations. Aeronautics Technology can be found here in the Science, Aeronautics, and Exploration appropriation.

AEROSPACE TECHNOLOGY

(AERONAUTICS)

PURPOSE

The *Aeronautics Technology* theme holds a unique role within NASA as the sole steward of the Agency's aeronautics investments. By developing and transferring technologies, NASA's investments in Aeronautics Technology play a key role in creating a safer, more secure, environmentally friendly and efficient air transportation system, increasing performance of military aircraft, and developing new platforms for science or commercial uses. This theme also enhances the Nation's security through its partnerships with Department of Defense (DOD) and Federal Aviation Administration (FAA). Research areas include advanced propulsion technologies, lightweight high-strength adaptable structures, adaptive controls, advanced vehicle designs, and new collaborative design and development tools. In collaboration with the FAA, research is conducted in air traffic management technologies for new automation tools and concepts of operations.

ENTERPRISE: Aerospace Technology

FY 2002 ACCOMPLISHMENTS

During FY 2002, the Aerospace Technology Enterprise made substantial progress in developing aeronautics technologies that, when implemented, will support a 21st Century air transportation system that is safer, more efficient, environmentally friendly, flexible, and able to meet the increasing demands of the Nation.

In cooperation with the FAA and industry, aviation safety research addresses accidents and incidents involving hazardous weather, controlled flight into terrain, human performance, and mechanical or software malfunctions. Data analysis of an air turbulence warning system demonstration indicated excellent performance with probability of detection of severe turbulence with at least 30 seconds lead time at 81%. Collaboration with industry enabled digital communications and graphical weather display technologies to be flight-tested and transferred a year earlier than originally planned for transport and general aviation aircraft. A self-paced, computer-based training aid was developed presenting student and professional pilots with information and tools to avoid ice, detect ice and minimize exposure. A simulation of aircraft dynamics under adverse conditions improves aircrew training for upset recovery and provides an advanced simulation capability for accident investigations.

Among the chemicals produced during the combustion of aircraft fuel, two have the most significant impacts on the environment. Nitrogen oxides (NO_x) degrade the local air quality by creating smog and impact global air quality by contributing to the loss of ozone. Carbon dioxide (CO₂) degrades global air quality by contributing to global warming. NASA is developing critical engine and airframe technologies that provide a significant reduction in emissions. Low NO_x (combustor sector) testing demonstrated 67% reduction below 1996 standards and increased confidence in meeting the 70% reduction goal. A ceramic thermal barrier coating process was developed to create a low conductivity thermal barrier coating to increase the temperature capability and efficiency of aircraft engine turbine blades and reduce CO₂ emissions.

Confining objectionable air transport noise within the airport boundary will benefit homes and businesses close to airports. Aircraft noise reduction concepts were evaluated. Technology development continued on the most promising concepts to reduce noise closer to the runway threshold.


In cooperation with the FAA, NASA is developing decision support tools to improve air traffic management by helping air traffic controllers, pilots, and aircraft operators use airspace more efficiently through reduced spacing, improved scheduling, collaboration with operators, and other techniques. The tools are matured through field-testing at airports, such as Dallas-Ft. Worth. Tools have been delivered to the FAA for implementation in their "Free Flight" concept. A simulation at "FutureFlight Central" provided data to analyze the efficiency of combining two decision support tools: the Surface Management System to control flow of traffic on taxiways and the Traffic Management Advisor to control air traffic arriving and departing airports. Combining the two tools shows promise in increasing capacity of airports through improved scheduling and departure runway balancing.

By developing new small aircraft technologies that could permit operations during any weather conditions at thousands of airports in the United States, the ability of the Nation's air system to transport goods, individuals, families, or groups of business associates could be greatly increased. The Small Aircraft Transportation System (SATS) partners, including NASA, the FAA and industry's National Consortium for Aviation Mobility, have established baselines for key documents, including: the systems engineering management plan, concepts of operations, functional architecture, and operational and technical requirements. These documents provide the framework for developing, evaluating, and demonstrating new operating capabilities.

THEME DISTRIBUTIONS

Budget Authority (\$ in millions)	FY 2002	FY 2003 President's Budget, As Amended	FY 2004 President's Budget
Aeronautics Technology	645.8	541.4	959.1
<u>Institutional Support</u>	<u>385.7</u>	<u>445.0</u>	<u>--</u>
Total	1,031.5	986.4	959.1

Note: For all formats, the FY 2002 column reflects the FY 2002 Congressional Operating Plan dated 9/30/02. The FY 2003 column reflects the FY 2003 Presidents Budget Submit (PBS) as Amended. FY2004 column is in full cost.

 Indicates budget numbers in Full Cost.

ENTERPRISE: Aerospace Technology

Aeronautics Technology

This theme plays a key role in creating a safer, more secure, environmentally friendly and efficient air transportation system, increasing performance of military aircraft, and developing new uses for science or commercial missions. This theme also enhances the Nation's security through its partnerships with the DOD and Federal Aviation Administration (FAA). Research areas include advanced propulsion technologies, lightweight high-strength adaptable structures, adaptive controls, advanced vehicle designs, and new collaborative design and development tools. In collaboration with the FAA, research is conducted in air traffic management technologies for new automation tools and concepts of operations. Highlights for FY 2004 include:

Overall budget

FY 2004 request is \$959 million, a \$10 million or 1.0 percent increase over FY 2003 President's Request (full cost).

- \$169 million for Aviation Safety and Security projects aimed at reducing accident and fatality rates.
- \$217 million for Airspace Systems projects to provide technologies that can dramatically increase the capacity and mobility of the nation's air transportation system.
- \$574 million for Vehicle Systems projects focused on development of breakthrough technologies for future aircrafts and air vehicles.

New Initiative – Aviation Security

Request includes \$20 million for this new initiative (\$195 million over five years).

- Addresses critical aviation security needs that NASA is uniquely qualified to provide.
- Develops technology for commercial aircraft and airspace protection, including development of damage-tolerant structures and autonomous and reconfigurable flight controls technology to prevent aircraft from being used as weapons and to protect against catastrophic loss of the aircraft in the event of damage from sabotage or explosives.

New Initiative – National Airspace System Transition Augmentation

Request includes \$27 million for this new initiative (\$100 million over five years).

- Enables technology, in cooperation with FAA, to transition to a next-generation National Airspace System that would increase the capacity, efficiency, and security of the system to meet the mobility and economic-growth needs of the Nation, reducing delays and increasing air transportation efficiency.

New Initiative – Quiet Aircraft Technology Acceleration

Request includes \$15 million for this new initiative (\$100 million over five years).

- Accelerate development and transfer of technologies that will reduce perceived noise in half by 2007 compared to the 1997 state-of-the-art.
- Fully implemented throughout the system, eliminates unacceptable noise outside the boundary of the airport.