



Aeronautics Research Mission Directorate

Improving aviation safety and efficiency

The first “A” in “NASA” stands for “Aeronautics”—as in the “National Aeronautics and Space Administration.”

Aeronautics has been part of NASA for more than 50 years. Before that, the National Advisory Committee for Aeronautics conducted pioneering research that influenced the design of every U.S. aircraft. NASA integrated that knowledge and existing testing facilities when it was created in 1958.

The Aeronautics Research Mission Directorate, located at NASA Headquarters in Washington, oversees the agency’s aeronautics research, which is conducted primarily at four NASA centers:

- Ames Research Center
Moffett Field, Calif.
- Dryden Flight Research Center
Edwards, Calif.
- Glenn Research Center
Cleveland
- Langley Research Center
Hampton, Va.

RESEARCH GOALS

NASA’s aeronautics activities are organized into four research programs and one test facilities management program:

- Aeronautics Test Program
- Airspace Systems Program
- Aviation Safety Program
- Fundamental Aeronautics Program
- Integrated Systems Research Program

NASAfacts



A view from a NASA chase plane during a test flight of the blended wing body X-48B remote-piloted vehicle in April 2008. *Image credit: NASA Dryden/Lori Losey*



Researchers run a simulation of potential new air traffic management tools at NASA's Airspace Operations Lab. *Image credit: NASA Ames*

Each program emphasizes research through collaboration and partnerships, shared ideas and knowledge, and solutions that benefit the public.

NASA works to improve aviation safety and efficiency, and to make aircraft more environmentally responsible. Nearly every aircraft today includes a technology developed from research conducted by NASA or from tests done in a NASA facility.

As demands on the aviation transportation system grow, NASA's aeronautics research goals include improving airspace capacity, and reducing noise, emissions and fuel consumption.

AERONAUTICS PROGRAMS

Aeronautics Test Program

The Aeronautics Test Program ensures the availability and accessibility of an extensive suite of ground and flight testing facilities for aeronautics research including laboratories, wind tunnels, flight test beds and other aerospace assessment capabilities. NASA researchers, other government agencies, corporations and institutions use the program's facilities to test new solutions for everything from jet engine noise reduction to aircraft icing detection.

Airspace Systems Program

The Airspace Systems Program works to transform the national air transportation system to accommodate dramatic increases in capacity, efficiency and flexibility. Its research is critical to development of the Next Generation Air Transportation System, which will allow for safe and efficient travel through increasingly crowded skies.



Simulators play a large role in testing new aviation safety technologies, including this test of a synthetic vision system that creates a graphical representation of the environment outside the aircraft. *Image Credit: NASA*

Aviation Safety Program

The Aviation Safety Program focuses on developing cutting-edge technologies and capabilities to improve the safety of the Next Generation Air Transportation System. Its research activities address the particular challenge of increasing safety while also improving efficiency.

Fundamental Aeronautics Program

The Fundamental Aeronautics Program develops capabilities for addressing national challenges in air transportation including noise, emissions, fuel consumption, acceptable supersonic flight over land, mobility, and the ability to ascend and descend through planetary atmospheres. The capabilities will enable design solutions for performance and environmental challenges facing future air vehicles.

Integrated Systems Research Program

The Integrated Systems Research Program focuses on exploring, assessing and demonstrating concepts and technologies that are integrated at the system-level and then tested in a relevant environment. Its research is coordinated with the ongoing foundational research conducted in the other three aeronautics research programs, and with the efforts of other federal government agencies.

PARTNERSHIPS

NASA partners with others to enhance the state of U.S. aeronautics, including major U.S. aircraft and engine manufacturers, U.S. government agencies, universities, non-government organizations, and international partners where the research and cooperation is of mutual benefit to both nations.



Test engineer Mark D 'Aprile checks a small model of a supersonic jet concept designed by Gulfstream Aerospace and tested in a NASA wind tunnel. *Image credit: NASA Langley/Sean Smith*



NASA, with Boeing and the Air Force Research Laboratory, tests an advanced vehicle concept that could make future aircraft more environmentally responsible by reducing noise, emissions and fuel consumption. *Image credit: NASA*

The Aeronautics Research Mission Directorate uses a variety of processes to create formal and informal partnerships including: cooperative or reimbursable Space Act agreements, NASA research announcements or announcements of opportunity, technical working groups or technical interchange meetings.

These are just a few examples of the many partnerships currently underway:

Industry—working with NASA to:

- develop computer codes to help detect the accretion of ice on aircraft;
- develop small commercial efficient and quiet air transportation to be introduced during the time period 2030-2035; and
- test noise reduction techniques to someday allow supersonic vehicles to make transcontinental flights.

International Partners—working with NASA to:

- investigate causes of, and solutions to reduce, aircraft airframe noise;
- research in-flight aircraft icing and improve in-situ and remote sensing of the environment; and
- design, fabricate, test and validate foil gas bearings that could be used in oil-free turbomachinery.

Universities—working with NASA to:

- develop multi-scale tools for airspace modeling and design;
- develop smart sensor processing for automatic runway hazard detection; and
- design and test an integrated alerting and notification function for the future intelligent integrated flight deck.

U.S. Government Agencies—working with NASA to:

- pursue complementary goals in aviation and space transportation safety, airspace system efficiency, environmental compatibility and international leadership and others;
- transform the U.S. air transportation system into the Next Generation Air Transportation System by the year 2025; and
- conduct research that enables revolutionary capabilities in rotorcraft.

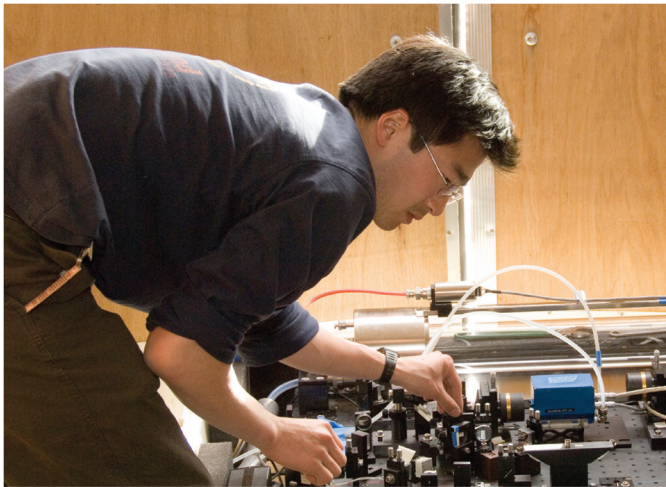
NATIONAL AERONAUTICS RESEARCH AND DEVELOPMENT POLICY

In December 2006, the president of the United States established the first National Aeronautics Research and Development Policy to advance U.S. technological leadership in aeronautics. The goal is to create a vibrant, dynamic research and development community that includes government, industry and academia.

NASA contributed to the development of the policy, its follow-on Research and Development Plan in 2007 and the Research and Development Plan Technical Appendix in 2008. NASA's aeronautics research goals are fully aligned with these guiding documents and their key principles: focus on cutting-edge research with broad benefits, share research results as widely as possible, coordinate the management of U.S. aeronautics infrastructure across federal departments and agencies, and establish strong partnerships.

FUTURE WORKFORCE

NASA's Aeronautics Research Mission Directorate seeks to engage and inspire students of all ages through edu-



Harvard graduate student Ben Lee tunes the optics on a quantum-cascade-laser methane isotope sensor used for alternative jet fuel testing. *Image credit: NASA Dryden/Tom Tschida*

educational materials, design competitions for high school and college students, exhibits, and more. In particular, NASA provides programs to create a future workforce by helping students pursue careers in aeronautics- and aerospace-related fields.

Aeronautics Scholarship Program

This new program awards scholarships to highly motivated undergraduate and graduate students who are pursuing careers in aeronautics and related fields.

Undergraduates in their second year of study can earn up to \$15,000 per year for two years, and graduate students can earn up to \$35,000 per year for three years. Money can be used for tuition, room and board, and other school-related expenses. Students also can apply for optional summer internships at NASA research centers to earn an additional \$10,000 in stipends. All applicants must be U.S. citizens.

Twenty undergraduate and five graduate scholarships are awarded each academic year.

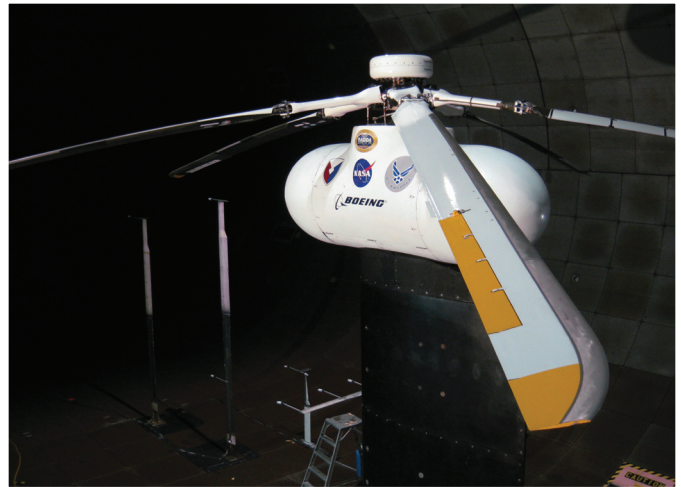
For more information about NASA's aeronautics research activities, establishing a partnership or applying for a scholarship, visit www.aeronautics.nasa.gov.

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Tests in a NASA wind tunnel of this SMART rotor hub confirm the ability of advanced helicopter-blade active control strategies to reduce vibrations and noise. *Image Credit: NASA*

BY THE NUMBERS

- Annual budget, NASA: \$18.7 billion*
- Annual budget, NASA Aeronautics: \$507 million*

- Workforce, NASA: 18,798 full-time civil service employees**
- Workforce, NASA Aeronautics: approximately 1,395 full-time civil service employees**

- NASA Research Announcement Awards, NASA Aeronautics: 377**
- International Partnerships, NASA Aeronautics**: 15 (countries represented include Australia, Canada, France, Germany, Japan, Korea, Spain, United Kingdom)

* Fiscal year 2010, U.S. dollars.

** As of October 2009.