National Aeronautics and Space Administration

aeronautics research



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ABOUT THE IMAGE

The image on the front of this poster is the X-48B—a 21-foot wingspan, 500-pound, “blended wing body” (BWB) test vehicle. A series of remotely piloted flight tests of this vehicle began during the summer of 2007 at NASA’s Dryden Flight Research Center.

The wing of the BWB blends smoothly into a wide, flat, tailless fuselage. It provides additional lift with less drag than a traditional circular fuselage, therefore burning less fuel and producing less CO_2. Because the engines can be mounted on top of the aircraft, this configuration also provides the potential to significantly reduce noise signatures on the ground.

Such advanced aircraft concepts present potential solutions to the challenge of doubling or even tripling the capacity of our airspace without negatively impacting the environment.

Work on the BWB continues under the Subsonic Fixed Wing project of the Fundamental Aeronautics Program in NASA’s Aeronautics Research Mission Directorate.



ABOUT AERONAUTICS RESEARCH AT NASA

NASA’s Aeronautics Research Mission Directorate (ARMD) expands the boundaries of aeronautical knowledge for the benefit of our nation and the broad aeronautics community. We conduct cutting-edge research including:

- Foundational research across a number of core competencies that supports aeronautics and space exploration activities;
- Research in key areas related to the development of advanced aircraft technologies and systems, including those related to aircraft safety, environmental compatibility, and fuel efficiency; and
- Research that supports the Next Generation Air Transportation System (NextGen) in partnership with the Joint Planning and Development Office (JPDO).

ARMD’s research plans directly support the goal and objectives of the National Aeronautics Research & Development Policy that was established by Presidential Executive Order 13419 in December 2006.

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ABOUT AERONAUTICS RESEARCH PROGRAMS



Airspace Systems Program
Airspace Systems develops revolutionary concepts, capabilities, and technologies to enable significant increases in the capacity, efficiency, and flexibility of our National Airspace System. The program has aligned its portfolio of projects to directly address the Air Traffic Management (ATM) research needs of the NextGen.

NextGen–Airspace: Research on solutions for a safe, efficient, and high-capacity airspace system through improved traffic flow management, dynamic airspace configuration, aircraft separation assurance, and airspace super density operations.

NextGen–Airportal: Research to improve the capabilities of airportal resources (gates, taxiways, runways, and final approach airspace) through safe and efficient surface operations, coordinated arrival/departure operations, and airportal transition and integration management.



Fundamental Aeronautics Program
Fundamental Aeronautics conducts long-term, cutting-edge research in all flight regimes (from subsonic to hypersonic) to produce data, knowledge, and analysis and design tools for a broad range of air vehicles. The program supports NASA’s human and robotic exploration missions by advancing knowledge in aeronautical areas critical to entry, descent, and landing on other planets. Its projects support the goals of the NextGen and the JPDO by providing foundational research, prediction tools, and advanced technologies to assess and reduce noise and emission levels of current and future aircraft.

Subsonic Fixed Wing (Mach < 1.0): Research to develop concepts/technologies for dramatic improvements in noise, emissions, and performance characteristics of subsonic/transonic aircraft.

Subsonic Rotary Wing (Mach < 1.0): Research on the technical barriers that prevent rotorcraft from being used more widely in civil aviation, such as range, speed, payload capacity, fuel efficiency, and environmental acceptance.

Supersonics (Mach > 1.0): Research on overcoming the efficiency, environmental, and performance barriers to practical supersonic vehicles, and on supersonic deceleration challenges for planetary entry, descent, and landing.

Hypersonics (Mach > 5.0): Research on the fundamental methods, concepts, tools, and technologies needed for hypersonic flight through Earth’s atmosphere and atmospheres of other planets.



Aeronautics Test Program
For decades, the United States has relied on aeronautics test facilities at NASA—from wind tunnels to testbed aircraft—to explore the principles of flight. The ATP ensures strategic availability of these facilities, and the highly-trained and certified staff who support them, to meet ARMD, broader agency, and national testing needs. ATP works to have the right aeronautical test facilities in place at the right time by making utilization, operations, maintenance, and investment decisions for major wind tunnel/ground test facilities at NASA’s Ames Research Center, NASA’s Glenn Research Center, NASA’s Langley Research Center, and for the Western Aeronautical Test Range and support/testbed aircraft at NASA’s Dryden Flight Research Center.



Aviation Safety Program
Aviation Safety and its research projects help ensure the safety of the nation’s air transportation system as it transitions to meet the future needs of the NextGen. These needs include anticipated significant increases in air traffic, increased reliance on automation, increased diversity of air vehicles, and increased complexity in the overall system.

Integrated Vehicle Health Management: Research to advance the state of highly-integrated and complex flight-critical health management technologies and systems that will enable nearly continuous onboard situational awareness of the vehicle health state for use by the flight crew, ground crew, and maintenance depot.

Integrated Intelligent Flight Deck: Research on flight deck-related concepts and technologies that ensure crew workload and situational awareness are both safely optimized and adapted to the future operational environment as envisioned by NextGen.

Integrated Resilient Aircraft Control: Research to advance the state of aircraft flight control to provide onboard control resilience to ensure safe flight in adverse conditions that could otherwise lead to a loss-of-control type accident.

Aircraft Aging and Durability: Research on advanced diagnostic/prognostic capabilities for detecting and mitigating aging-related hazards in order to decrease the susceptibility of aircraft and onboard systems to premature deterioration, thus greatly improving vehicle safety.

ABOUT CAREERS IN AERONAUTICS RESEARCH

People who work in aeronautics research are often called aerospace engineers. And we need more of you!

Aerospace engineers have a strong background in mathematics and physics. They work on every aspect of crewed or non-crewed vehicles that fly—either on Earth or into space.

Characteristics of a good aerospace engineer include:

- Good grasp of engineering science fundamentals
- Good understanding of the design and manufacturing process
- Basic understanding of the social/economic/political context in which engineering is practiced
- Good communication skills
- Ability to think both critically and creatively, independently and cooperatively
- Ability and the self-confidence to adapt to rapid/major change—flexibility
- Curiosity and a life-long desire to learn
- Understanding of the importance of team work.

Samples of types of aerospace engineering degrees include:

- Aerodynamics
- Flight Dynamics and Control
- Aerospace Propulsion
- Aerospace Structures
- Aerospace Design

Engineers are often big fans of flying. As aviation enthusiasts, aerospace engineers are excited about using technology to transform flight for today’s society, and for pushing the boundaries of flight to other planets. They love exploring concepts and then often seeing them built into something real.

Visit the Education pages at the ARMD Web site:

http://www.aeronautics.nasa.gov/education.htm

NASA AERONAUTICS SCHOLARSHIP PROGRAM

NASA is committed to supporting a future workforce that helps us continue to reach our goals in science and exploration.

In 2008, ARMD started the new Aeronautics Scholarship Program for graduate and undergraduate students. The program expects to annually award 20, two-year scholarships plus summer internships to undergraduate students; and five, two- to three-year scholarships plus summer internships to graduate students.

Apply online at:

http://www.asee.org/fellowships/nasaasp/

NASA CENTERS TO CONTACT ABOUT AERONAUTICS RESEARCH

NASA Ames Research Center
http://www.nasa.gov/centers/ames

NASA Dryden Flight Research Center
http://www.nasa.gov/centers/dryden

NASA Glenn Research Center
http://www.nasa.gov/centers/glenn

NASA Langley Research Center
http://www.nasa.gov/centers/langley

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