



Forging Future Flight: Aeronautics Research at the NASA Langley Research Center (Aviation Safety Research – Atmospheric Environment Safety Technologies)

The NASA Langley Research Center (LaRC)

Located in Hampton, VA, LaRC was established as the nation's first civilian-led aeronautics research laboratory in 1917. NASA Langley serves as a world leader in "cutting edge" aeronautics research. Approximately \$180 million was invested in aeronautics research at LaRC



(2011). In 2010 NASA Langley contributed \$946.8 million to the Virginia economy while supporting 8,624 jobs in the state of Virginia. In the Hampton Roads area in 2010, Langley contributed \$886.7 million to the local economy while supporting 7,962 jobs.

Aeronautics Research Directorate (ARD)

The ARD at NASA LaRC manages projects that support four programs: (1) Integrated System Research Program, (2) Fundamental Aeronautics Program, (3) Aviation Safety Program, and (4) Airspace Systems Program. Research activities are performed under the specific projects described later. The NASA LaRC ARD facilitates external partnerships to complement the agency's aeronautics mission.



NASAfacts

Aviation Safety Program (AvSP)

Objectives of AvSP:

- Proactively identify, develop, and mature tools, methods, and technologies for improving overall aircraft safety of new and legacy vehicles operating in NextGen (AvSP goal).
- Provide knowledge, concepts, and methods to proactively manage increasing complexity in the design and operation of vehicles and the air transportation systems (System-Wide Safety and Assurance Technologies Project).
- Identify risks and provide knowledge needed to avoid, detect, mitigate, and recover from hazardous flight conditions, and to maintain vehicle airworthiness and health (Vehicle Systems Safety Technologies Project).
- Investigate sources of risk and provide technology needed to help ensure safe flight in and around atmospheric hazards (Atmospheric Environment Safety Technologies Project).

Atmospheric Environment Safety Technologies (AEST) Project (Aviation Safety Program)

This Glenn Research Center (GRC)-led project integrates work at LaRC, GRC, and Ames Research Center (ARC). The work at LaRC focuses on the improvement of remote sensing to assess atmospheric threats and provide guidance on how to avoid them altogether. In addition, research is being conducted on lightning strikes and their effects on composite materials used in a variety of aircraft structures.

Primary Goal: Investigate sources of risk and provide technology needed to help ensure safe flight in and around atmospheric hazards.

Technical Challenges:

- Develop engine and airframe icing characterization and simulation capability

- Develop Atmospheric Hazard Sensing and Mitigation (AHSM) technologies

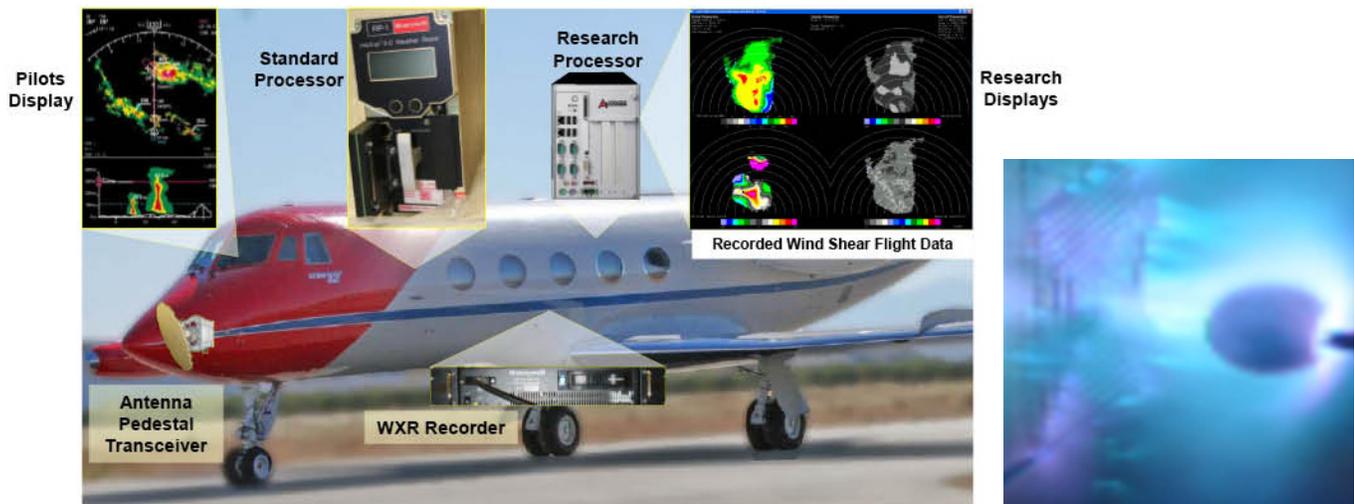
Research benefits include greater ability for aircraft to avoid hazards (such as icing, turbulence, and wake vortices); availability of hazard information to share with other aircraft and ground-based systems; and reduced vulnerability to lightning and other hazards.

Recent Research Accomplishments:

- In 2012, LaRC researchers conducted a field experiment (Passive Multi-Spectral Imaging for Hazard Detection – a Forward-Looking Interferometry (FLI) field test and data evaluation) to collect data to test interferometric imaging capability for real time observation of hazardous orographic turbulence. The recorded sensor data will be compared to predictions based on modeling and validated by available pilot reports. This experiment will assess the capability of interferometric imaging to provide real time observation of orographic turbulence hazard and provide data for detection research and model development.
- In 2012, LaRC researchers delivered an X-band weather radar data system (developed in cooperation with Honeywell) to NASA GRC to fly on a Gulfstream G2 aircraft as part of the High Ice Water Content (HIWC) flight campaign at Darwin, Australia. The radar system will perform all the normal functions of the ship's weather radar, providing standard information to the crew, while additional analysis is performed and data is provided by special displays for the scientists on the aircraft and in the ground support facility. The flight campaign will provide data to solve the problem of aircraft engine icing in HIWC conditions.

LaRC Facilities and Capabilities Used in Research:

High Intensity Radiation Fields (HIRF) Lab
Mobile Sensors Research Van



LaRC researchers are studying and evaluating new passive multi-spectral imaging technology for hazard detection.

A simulated lightning strike on an aircraft sensor.

National Aeronautics and Space Administration

Langley Research Center
100 NASA Road
Hampton, VA 23681
www.nasa.gov/centers/langley

www.nasa.gov

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