National Aeronautics and Space Administration

NASA**facts**

Forging Future Flight: Aeronautics Research at the NASA Langley Research Center

(Aviation Safety Research – Vehicle Systems 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.

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).

Vehicle Systems Safety Technologies (VSST) Project (Aviation Safety Program)

This LaRC-led project integrates work at Ames Research Center (ARC), Dryden Flight Research Center (DFRC), Glenn Research Center (GRC), and LaRC. The work at LaRC includes: (1) the development of advanced displays and improved decision support; (2) the development of robust interfaces to trajectory automation; (3) the development of an integrated information management system; (4) the development of pilot proficiency standards; (5) the development of sensor and diagnostic tools; (6) the development of ways and methods for maintaining propulsion health; (7) research into maintaining airframe and engine material and coating; (8) the development of vehicle dynamics modeling for multiple hazards; and (9) the development of guidance, control, and system technologies.

Primary Goal: Develop technologies to reduce accidents and incidents through enhanced vehicle design, structure, systems, and operating concepts.

Technical Challenges:

- Develop technologies that lead to improved crew decision making and response in complex situations
- Develop technologies that contribute to the maintenance of vehicle safety between major inspections
- Develop technologies that contribute to safe and effective aircraft control under hazardous conditions

Recent Research Accomplishments:

- Under the auspices of the Synthetic and Enhanced Flight Vision Systems (SEVS) program, a team led by LaRC and consisting of the FAA, Gulfstream, and Honeywell developed a complex flight test plan and system to enable rapid deployment of a Gulfstream G-450 to low visibility environs across the U.S.; a total of nine flights were conducted resulting in 38 flight hours of collected data. Eight evaluation pilots flew 107 approaches to 73 touchdowns; with 80 approaches using an Enhanced Flight Vision System (EFVS) and 27 using a Synthetic Vision System (SVS); visibility ranged from 600-2400 ft. These flights were the first ever using such vision systems.

LaRC Facilities and Capabilities Used in Research:

Air Traffic Operations Lab (ATOL)
Airborne Subscale Transport Aircraft Research (AirSTAR)
Cockpit Motion Facility (CMF) – including Research Flight Deck (RFD), Generic Flight Deck (GFD), and Integrated Flight Deck (IFD)
Simulation Cabs
Composite Structures Lab
Composites & Polymers Lab
Environmental Fatigue Lab
Full-Scale Advanced Systems Testbed
Intermediate Design Evaluation and Simulation (IDEAS) Lab
Light Alloy Lab
Materials Research Lab
Nondestructive Evaluation Sciences Lab
Materials Research Lab
Structures & Materials Lab
Systems and Airframe Failure Emulation, Testing, and Integration (SAFETI) Laboratory
Visual Imaging Simulator for Transport Aircraft Systems (VISTAS-III)

As part of the Synthetic and Enhanced Flight Vision Systems (SEVS) program, researchers at LaRC teamed with the Federal Aviation Administration (FAA), Gulfstream, and Honeywell to develop enhanced and synthetic flight vision systems to improve crew decision-making and response in complex situations.

LaRC researchers are using Airborne Subscale Transport Aircraft Research (AirSTAR) assets to conduct remotely piloted, subscale aircraft flight research critical to the development of advanced aircraft control systems, better aerodynamic models, and better pilot training simulators of transport aircraft at extreme flight conditions.

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

For more information about NASA LaRC aeronautics research, visit http://aero.larc.nasa.gov/