Fact Sheet

National Aeronautics and
Space Administration

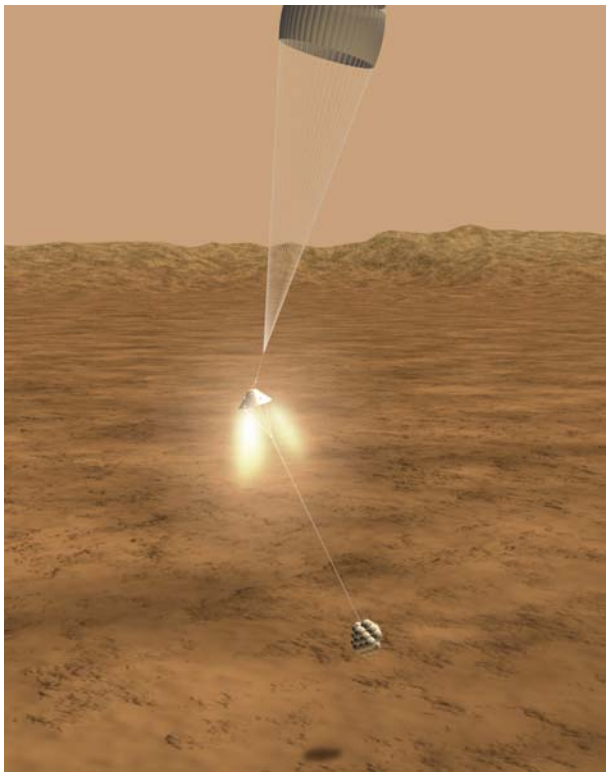
Langley Research Center
Hampton, Virginia 23681-2199

FS-2004-02-84-LaRC

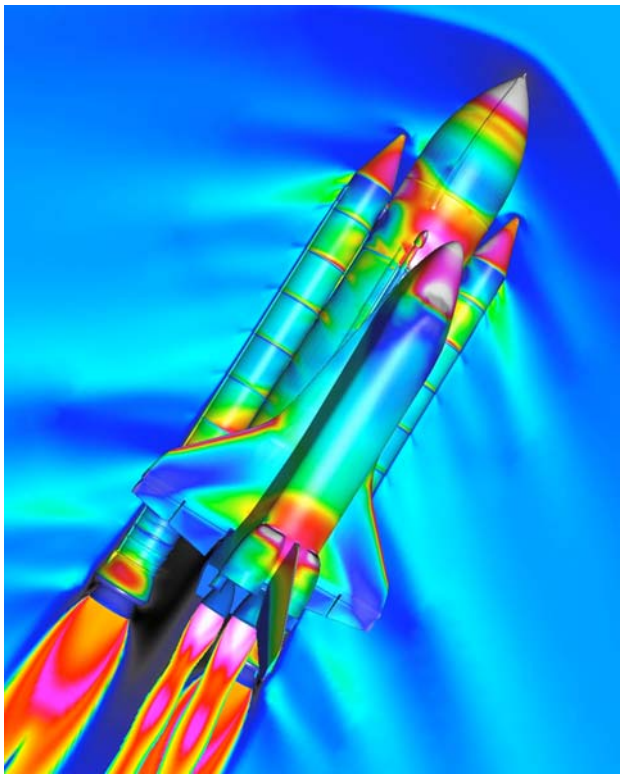
NASA Langley Research Center
Contributing to the Next 100 Years of Flight

Langley Research Center in Hampton, Virginia, is a vital component of NASA. In collaboration with other NASA Centers, Langley strives to understand and protect the Earth, explore the universe and search for life, and inspire the next generation of explorers. Since 1917 Langley has examined the challenges of flight and made air and spacecraft more responsive to the needs of our Nation.

With computer-enhanced wind tunnels and laboratories, research aircraft and spacecraft, and flight simulators, the highly qualified staff at Langley contributes to technological advances in aerospace systems concepts and analysis; aerodynamics, aerothermodynamics, and acoustics; structures and materials; airborne systems; atmospheric sciences; and systems engineering.



Artist concept of landing, entry, and descent of the Mars Rover 'Spirit'.



A computer-generated image of the space shuttle showing varying pressures in the airflow

Langley is making the national air transportation system safer, more secure and more efficient; contributing to the exploration of our universe; and increasing understanding of our home planet. We are partnering with parents and educators to inspire the next generation. Visit the NASA Langley web site at http://www.larc.nasa.gov/.

NASA's New Vision

On January 14, 2004, President Bush committed the United States to a long-term human and robotic program to further explore the Moon and beyond. Langley is expected to play a role in fulfilling President Bush's new vision for the space program. The Center's priority is to continue research for the Space Shuttle's return to flight and the International Space Station by supporting systems analysis, systems engineering, and technology development.

Langley could also be involved in developing better structures and materials for the new Crew Exploration Vehicle (CEV) that will better protect astronauts against radiation. Langley could also lead atmospheric entry, descent, and landing research for new spacecraft.

Planetary Exploration

Recently the Center contributed to the successful landing of twin rovers for the Mars Exploration Rover (MER) mission. Langley researchers developed the entry, descent, and landing (EDL) flight dynamics simulation that modeled the lander's flight from cruise-stage separation to landing. The end-to-end EDL simulation included multibody analysis of the combined parachute-backshell-lander configuration. It incorporated an EDL aerodynamic database by Langley, which will be used for the post-flight trajectory reconstruction. In addition to the EDL simulation, Langley also made important contributions to the analysis and testing of the parachute system, and in the assembly, test, and launch operations of the flight hardware.

Shuttle Return to Flight

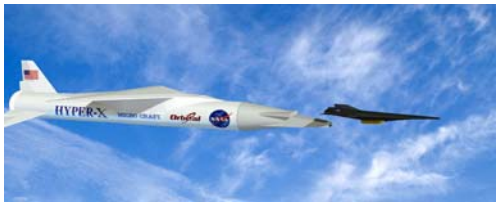
Langley is helping to safely return the Space Shuttle to flight. Langley is supporting tests of the redesigned bipod for the external tank. Areas of work also include developing sophisticated tools to quantify potential damage, improving the leading edge of the Orbiter wing, and on-orbit repair of the thermal protection system. These areas were identified by the Columbia Accident Investigation Board. Langley has demonstrated that advanced NDE technology can effectively be used to detect voids between the spray-on foam and the external tank surface.

NASA Engineering and Safety Center

In the wake of the Columbia tragedy, the NASA Engineering and Safety Center (NESC) was created to provide a comprehensive examination of selected NASA programs and projects. Based at Langley, the new center coordinates and conducts in-depth engineering and safety assessments. The new center will help NASA strengthen and expand the Agency's safety and mission assurance through collaboration of experts from a variety of engineering disciplines. For more information see http://www.nesc.nasa.gov/.

Flying at Mach 7

Langley is working with NASA Dryden Flight Research Center to demonstrate—in flight for the first time— promising new engine technologies for advanced space launch vehicles or airplanes that would fly many times the speed of sound. These "air-breathing" engines offer increased safety and more economical airplane-like operations. The unpiloted X-43A hypersonic research vehicle will be tested at Mach 7, or seven times the speed of sound.



The X-43 hypersonic research vehicle separates from the booster rocket in this artist's concept.

Better Flight Service for More People

The Advanced General Aviation Transportation Experiments (AGATE), an alliance of NASA, government agencies, industry, and universities, helped to revitalize the U.S. general aviation (GA) industry by creating an approach to design, manufacture, and certify safer, more affordable small aircraft. For example, the AGATE team developed computer gauges to replace dial gauges that reduce pilot workload. It also developed a standard that allows easy, cost effective replacement of avionics equipment.

Artist's concept of SATS.

The Small Aircraft Transportation System (SATS) is building on AGATE. SATS plans to increase air transportation access to smaller communities and improve the transportation of people, services and goods by effective use of over 5,000 small public airports. See the SATS web site at http://sats.larc.nasa.gov/.

Smoother Safer Flights

Researchers with the NASA Aviation Safety Program (AvSP) – a partnership with the Federal Aviation Administration (FAA), aircraft manufacturers, airlines, and the Department of Defense led by Langley – tested a new way to predict turbulence around thunderstorms. Atmospheric turbulence is not only hazardous; it also costs money and time because of rerouting and late arrivals. Turbulence is the leading cause of in-flight injuries to airline passengers and flight crews. Visit the AvSP web site at http://avsp.larc.nasa.gov/.

Health Management for Aircraft

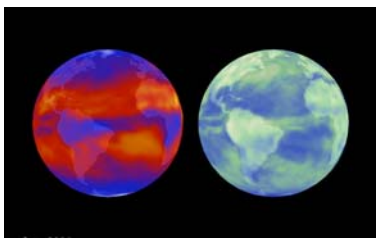
Aircraft accidents caused by equipment failure may some day be prevented with the Aircraft Condition Analysis and Management System (ACAMS), being developed at Langley with an industry partner. This system would read data from sensors throughout an aircraft. Detection of a malfunction or degrading performance would trigger an alert. During a flight simulation, the ACAMS technology prototype successfully identified landing gear brake faults that were intentionally set. In addition, it predicted how a small crack in an airframe structure would grow if no corrective action was taken.

Nozzle on Aircraft Noise

The Quiet Aircraft Technology (QAT) Program is addressing the difficult problem of reducing noise from flying aircraft. Noise generated from wing slats and flaps and landing gear–airframe noise–as well as engine noise is being examined. To quiet engine noise, noise-absorbing engine inlets, and "chevron" engine nozzle exit concepts were successfully flight-tested. Researchers are examining ways that aircraft fly around airports to determine flight paths that have the least noise impact on surrounding communities.

Better Understanding of Clouds

Programs like the Clouds and the Earth's Radiant Energy System (CERES) include a number of Langley instruments currently in orbit. CERES is providing a better understanding of the role of clouds and the energy cycle in global climate change. Understanding clouds, where they occur and their characteristics, is thought to be one of the keys to understanding on-going natural and human-induced climate change.



CERES Instruments measuring heat loss from Earth (left) and heat reflected back into space (right).

Understanding Our Atmosphere

Center scientists joined more than 350 researchers from around the world in 2003 to measure ozone and other atmospheric gases in the Arctic for the SOLVE II (SAGE III Ozone Loss and Validation Experiment). SOLVE II used aircraft, large and small balloons, ground-based instruments, and satellites. This study follows an earlier study in which record ozone losses of 70 percent were observed at higher altitudes above the Arctic Circle. The ozone layer prevents the Sun's harmful ultraviolet radiation from reaching the Earth's surface.

Technology Transfer

Langley is known for unparalleled technology transfer to both aerospace and non-aerospace businesses. These spin-off technologies have enormous benefit to the public and the local and national economy. Learn more about technology transfer at http://tech-transfer.larc.nasa.gov/.

Monitoring Fetal Heartbeats

Aerospace technology originally created to better understand airflow over a wing was developed to monitor fetal heartbeats. The easy-to-use portable device allows expectant mothers, who live in remote areas or have difficulty in visiting a doctor's office, to send a heart-monitoring signal over a telephone line to their doctor.

Langley History

The Center was awarded Collier Trophies for:

- 1929 - Development of a low drag engine cowling.
- 1947 - Determining the physical laws affecting supersonic flight, shared by John Stack of Langley and Lawrence Bell and Chuck Yeager.
- 1951 - Development and use of the slotted-throat wind tunnel for transonic speed research, shared by John Stack and associates.
- 1954 - Development of the Whitcomb area rule to reduce the increase in wing drag associated with transonic flight, to Richard Whitcomb.

During World War II, Langley was instrumental in drag cleanup studies that improved the performance of military aircraft.

The Langley staff made crucial contributions to the Mercury, Gemini, Lunar Orbiter, Apollo, Viking, Space Shuttle, and Space Station programs.

Significant technologies for today's aircraft was developed at Langley in programs such as NASA Aircraft Energy Efficiency (ACEE) Program, NASA Advanced Subsonic Technology Program, and the High-Speed Research Program.

Five sites at Langley are designated as National Historic Landmarks.

- Langley Variable Density Tunnel
- Langley Full-Scale Tunnel
- Langley 8-Foot High-Speed Tunnel
- Lunar Landing Research Facility
- Rendezvous and Docking Simulator

The American Institute of Aeronautics and Astronautics (AIAA) named Langley a Historic Aerospace Site. Visit the NASA History Office web page at: http://history.nasa.gov/.

Significant Agency Milestones

- 1915 - National Advisory Committee for Aeronautics (NACA) formed.
- 1917 - Langley Memorial Aeronautical Laboratory founded.
- 1948 - Name changed to Langley Aeronautical Laboratory.
- 1958 - National Aeronautics and Space Administration (NASA) formed; Langley Aeronautical Laboratory renamed NASA Langley Research Center.

For more information, contact:

Office of External Affairs
NASA Langley Research Center
Hampton, Va. 23681-2199
(757) 864-6124