NASA Facts

National Aeronautics and
Space Administration

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NASA's Aviation Safety Accomplishments

Airborne Wind Shear Sensors Technology Provides Advance Warning: A 10-year collaboration among NASA, FAA and industry has developed, demonstrated and implemented the technology for effectively conquering the wind shear aviation hazard. On November 30, 1994, Continental Airlines Flight 1637 became the first commercial flight with an airborne detection system capable of providing pilots up to 90 seconds of advance warning of wind shear activity to prevent future wind shear accidents.

Aging Aircraft Studies Help Ensure Structural Soundness: Aircraft aging is a safety concern throughout all classes of aircraft. NASA, in conjunction with the FAA, Sandia Laboratory and the University of Idaho, is developing nondestructive evaluation methods, metal fatigue analyses and structural modeling to help operators ensure that older aircraft are as structurally sound as new ones. NASA is also developing new airframe manufacturing techniques which will add strength to composite materials and monitor the "health" and safety of aircraft structures.

Stall/Spin Improvements Slash Accident Rate for General Aviation: NASA's 10-year program to improve the control of aircraft stall and spin characteristics of general aviation aircraft has produced knowledge and techniques which allow development of spin-resistant designs. New aircraft designs are incorporating these technologies to reduce the occurrences of maneuvering accidents which have accounted for a significant portion of past pilot-related accidents. This technology could reduce total general aviation accidents by nearly 20 percent. At the same time, because of these advances, the complex process of aircraft certification has been vastly simplified and the related costs have been drastically reduced.

Propulsion Control System Provides Emergency Maneuverability: NASA has demonstrated the viability of an advanced propulsion control system recently successfully flight-tested on an MD-11 transport aircraft. This system is designed to prevent future accidents such as the one in Sioux City, Iowa, where the aircraft control system was damaged and the pilot did a heroic job of controlling and crash-landing the airplane by manual operation of the engine controls. This technology is now available for appropriate application by the major aircraft manufacturers.

Human Factors Training Saves Hundreds of Lives: NASA has developed many of the key human factors concepts underlying cockpit resource management and has played a pivotal role in coordinating the efforts of industry and the military to develop effective training programs. A senior United Air Lines executive has credited NASA's Cockpit Resource Management program with saving "hundreds of lives" in "two in-flight emergencies . . . Flight 811 out of Honolulu that lost the cargo door, and Flight 232 at Sioux City that suffered an uncontained failure of the #2 engine. The teamwork exhibited by both . . . flight crews was directly attributable to the training they received as a result of the efforts of many [NASA personnel]. [NASA] does indeed contribute to aviation safety."

Icing Hazards Are Being Reduced: Research is being conducted to develop analytical and experimental icing simulation tools to support aircraft design and certification, and to develop advanced ice-protection concepts to improve aircraft productivity, operational capability, and safety. NASA conducts tests for all major U.S helicopter and airplane manufacturers to determine typical icing buildup patterns on rotors and wings.

New Air Traffic Control Tools Improves Air Transportation System: Just as information technology has entered the cockpit, it is becoming vitally important to air traffic controllers who must deal with an increasingly complex air traffic management situation. NASA has been working with the FAA to design and implement safe automation tools for use in air traffic management. These tools, now being tested at the new Denver International and the Dallas-Fort Worth airports, will increase air traffic precision and ensure safety under crowded conditions. In conjunction with these efforts, NASA is also developing computational models to predict vortex hazard in order to enable proper sequencing, scheduling and controlling of aircraft on final approach.

General Aviation Safety Improvements To Reduce Fatalities by 90 Percent: Several ongoing NASA efforts (including the Advanced General Aviation Transport Experiments (AGATE), the General Aviation Propulsion Program (GAP) and the Advanced Aircraft Transportation Technologies (AAT'T) Program) will combine to reduce the fatality rate for general aviation accidents by as much as 90 percent within the next 15 years. These programs are improving such critical safety factors as weather situational awareness, crash worthiness, engine reliability, systems and displays, maneuvering control and traffic control management.

Helicopter Controls, Sensors and Displays Permit Safer Advanced Maneuvers: Military Nap-of-the-Earth flight represents one of the most demanding low-altitude, near-terrain flight operations, wherein the pilot flies below tree-top levels for concealment. NASA is working with the rotorcraft industry, avionics manufacturers, FAA, and the Army to develop forward-pointed sensors, both passive (cameras, infrared) and active (radar, lidar), to produce three-dimensional terrain/obstacle maps ahead of the aircraft to increase the pilot's awareness of the situation and to reduce accidents resulting from controlled flight into terrain.

Safety from Lightning and Stray Electromagnetic Radiation: Current NASA research is developing techniques for assessing the effects of high-intensity radiated fields around ground-based transmitters and lightning on the digital electronics aboard aircraft. Once developed, these techniques will provide tools that can be applied to safety certification of aircraft systems installed on today's aircraft.

Aviation Safety Reporting System (ASRS) Provides Critical Safety Insights: NASA manages and operates the FAA-funded ASRS system. It is America's aviation safety reporting system. This enormous data base and the resulting research are critical to identifying and solving safety problems. Reports are confidential, yet critical, to timely problem identification. In addition to this program, NASA and FAA are working with airlines to develop systems to use flight data recorder information for safety research in a program titled Aviation Performance Monitoring System.

New Situational Awareness Methods Will Help Reduce Accidents: In the Aviation Performance Measuring System (APMS) program, FAA and NASA have joined forces to develop methodologies and tools for converting flight-recorded data on aircraft operational characteristics and practices into a form valuable to the commercial airline flight crews, the airlines and FAA. This new system will be a key factor in a timely, accurate feedback process of "situational awareness" essential for managing and improving the safety of the aviation system. In October 1995, the first U.S. air carrier joined with NASA to collaborate on the development of the suite of APMS tools and for operational testing of the system. Responding to a growing recognition of the potential value of this system, the most recent major airline participant joined the program in December 1996.

Aviation Safety in Automation Facilitates Future Air Traffic Control System: Automation technology holds the key to allowing a pilot to handle more complex and varied responsibilities, more safely and easily. In fact, new automated cockpit displays are critical to implementing the future air traffic system known as “Free Flight.” A NASA team of experts, in disciplines as varied as psychology and software engineering, is currently developing methods to ensure that aviation automation technology development has the foundation it needs for safe implementation.

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