FactSheet

National Aeronautics and
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Langley Research Center
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ARIES: NASA's 'Flying Lab' Takes Wing

NASA's Boeing 757-200 aircraft is equipped to conduct a range of research flight tests.

Research Focuses On Safer Skies, Improved Efficiency

A Boeing 757-200 aircraft obtained by NASA in 1994 is now serving as a "flying laboratory" for aeronautical research. The aircraft is being modified extensively for a broad range of flight research programs in the next 20 years to benefit the U.S. aviation industry and commercial airline customers. Called ARIES, or Airborne Research Integrated Experiments System, the aircraft is being used to conduct research to increase aircraft safety, operating efficiency and compatibility with future air traffic control systems. It is a vital research tool in support of the agency's Aviation Safety and Aviation Systems capacity programs.

The 757 is continuing work begun by the NASA 737-100 in state-of-the-art technologies such as electronic cockpit displays, flight management systems and flight safety devices. The 737, the first off Boeing's production line in 1967, was decommissioned in 1997.

Current and projected research needs greatly exceeded the capabilities of the 737. The 757 is a more modern airplane that utilizes electronic systems to a much greater extent in this growing electronic age. The 757 will better support research and development of the aeronautical subsystems for the airlines and the airframe and systems

manufacturers.

Already the airplane has been used for several research programs, including:

• Flight tests using Global Positioning System (GPS) satellite data to perform automated landings of the airplane.

• The study of jet-engine contrails to determine their effects on the atmosphere.

• Testing of a system to improve the safety and efficiency of aircraft during landing, taxiing and takeoff by giving pilots a computerized map showing airport ground operations.

Future research will focus on technologies to improve air safety and efficiency, including:

• Evaluation of a system that would provide pilots with better weather information.

• Testing of an airborne system that allows closely-spaced approaches to landings that will increase airport capacity.

• Development of an error-proof flight deck.

• Runway friction research.

The 757 features a Flight Deck Research Station on the left, or captain's, side of the cockpit.

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• Four research documentation video cameras are on the 757, three in the cockpit, one on the tail. Eight video recorders support the cameras, flight displays, and other data collection.

• Twelve test pallets/research work stations are in the baseline layout. Others are added depending on research needs.

• The 757 is 155'3" long, and 44'6" high at its tallest point, the tail. It measures 124'10" wingtip to wingtip.

• The aircraft originally seated 201 passengers. Its design range is 4,550 miles. Maximum fuel capacity is 11,526 gallons.

The NASA 757 was located after an extensive survey of the jet airliner market. It was the second 757 built, and the first one produced that was sold to an airline. The first 757 is owned by Boeing. The airplane now at Langley had been used by Boeing for Federal Aviation Administration certification of the 757 class of jet airliners.

The second-generation, digitally-equipped transport, designated N501EA, was obtained from the Eastern Airline bankruptcy estate. Langley took possession of the $24-million aircraft March 23, 1994, at McCarran International Airport in Las Vegas, Nev.

The 757, maintained and flown by NASA's Langley Research Center in Hampton, Va., is an integral part of the Transport Research Facilities (TRF). The TRF is a set of tools used in a simulation-to-flight concept. This concept incorporates common software, hardware, and processes for both ground-based flight simulators and the 757, providing government and industry with an efficient way to develop and test new technology concepts to enhance the capacity, safety, and operational needs of the ever-changing national airspace system.

Facilities used in the simulation-to-flight concept are:

• The 757, which features a Flight Deck Research Station (FDRS), a pilot station on the left side of the cockpit. The 757 also contains the Transport Research System (TRS), a set of mechanical and electronic components that augment normal airplane systems to support experiments and tests and the Flight Deck Research Station.

• The Research System Integration Laboratory (RSIL), a special-purpose laboratory that will be used for the integration and preflight validation of key hardware and software systems required for simulation and/or flight test.

• The Cockpit Motion Facility (CMF), a multiple-cab fixed- and motion-based flight simulation laboratory.

• The Integration Flight Deck (IFD), a simulator cab that will be housed in the Cockpit Motion Facility. It closely resembles the flight deck design and operating function of the 757 flight deck when the Flight Deck Research Station is installed.

• The Research Flight Deck (RFD), a simulator cab that will be housed in the Cockpit Motion Facility. The RFD, designed as an advanced subsonic transport, will be used for full-crew-workload and full-aircraft-systems integration development and tests by the research community.

For more information, contact the NASA Langley Office of Public Affairs at (757) 864-6124. Visit the web site at http://www.larc.nasa.gov/