National Aeronautics and Space Administration

NASAfacts

ER-2 High Altitude Airborne Science Aircraft

EC98-44530-3

NASA is operating two Lockheed ER-2 Earth resources aircraft as flying laboratories in the Sub-Orbital Science Program under the agency's Science Mission Directorate. The aircraft, based at NASA's Dryden Flight Research Center, Edwards, Calif., collect information about our surroundings, including Earth resources, celestial observations, atmospheric chemistry and dynamics, and oceanic processes. The aircraft also are used for electronic sensor research and development, satellite calibration and satellite data validation.

Program History

In 1981, NASA acquired its first ER-2 aircraft. The agency obtained a second ER-2 in 1989. They replaced two Lockheed U-2 aircraft, which NASA had used to collect science data since 1971. The U-2s, and later the ER-2s, were based at NASA's Ames Research Center, Moffett Field, Calif., until 1997, when the ER-2 aircraft and their operations moved to NASA Dryden.

Since the airborne science program's inaugural flight on Aug. 31, 1971, NASA U-2s and ER-2s have flown more than 4,500 data missions and test flights in support of scientific research conducted by scientists from NASA, other federal agencies, states, universities and the private sector.

The ER-2 set a world altitude record for the class of aircraft with a takeoff weight between 12,000 and 16,000 kilograms on Nov. 19, 1998, when the aircraft reached 68,700 feet. Although the ER-2

routinely operates at 70,000 feet and above, this was the first time the aircraft's performance was documented and made public.

Atmospheric Experiments and Deployments

In 1991, NASA launched a comprehensive program to study the Earth as an environmental system. By using satellites and tools like the ER-2 to intensively study the Earth, NASA hopes to expand human understanding of how natural processes affect people and how people might be affecting the processes. Such studies may yield improved weather forecasts, tools for managing agriculture and forests, information for fisheries and local planners, and the ability to predict how the climate will change in the future.

NASA ER-2s have played an important role in Earth science research because of their ability to fly into the lower stratosphere at subsonic speeds, enabling direct stratospheric sampling as well as virtual satellite simulation missions. In another example of Earth science research enabled by its high-altitude capability, the ER-2 has been an invaluable tool for studying tropical cyclone (hurricane) development, tracking, intensification, and landfall impacts.

The ER-2s have supported atmospheric research investigating global warming and ozone depletion in the United States and around the globe. The aircraft systems have acquired extensive digital multispectral imagery for global climate change research and aerial photography. These imagery missions have tested prototype satellite imaging sensors and have acquired Earth resources data for research projects sponsored by NASA and other federal agencies. The NASA U-2s and ER-2s assist in developing satellite sensors by testing prototypes or by simulating proposed configurations with existing systems.

ER-2 Aircraft Capabilities

The ER-2 is a versatile aircraft well suited to perform multiple mission tasks. The aircraft operates at altitudes from 20,000 feet to well above 70,000 feet. Depending on aircraft weight, the ER-2 reaches an initial cruise altitude of 65,000 feet within 20 minutes. Typical cruise speed is 410 knots. The range for a normal eight-hour mission is 3,000 nautical miles, which yields seven hours of data collection at high altitude. The aircraft is capable of longer missions in excess of 10 hours and ranges in excess of 6,000 nautical miles. The ER-2 can carry a maximum payload of 2,600 pounds (1,179 kilograms) distributed in the equipment bay, nose area and wing pods.

The aircraft has four large pressurized experiment compartments and a high capacity AC/DC electrical system, permitting it to carry a variety of payloads. The modular design of the aircraft permits rapid installation or removal of payloads to meet changing mission requirements.

Typically operating at 65,000 feet (19.8 kilometers) altitude, the ER-2 acquires data above 95 percent of the Earth's atmosphere. At this altitude the aircraft provides a stable platform for Earth imagery, atmospheric research, and electronic sensor development. Because the ER-2 can fly so high, its sensors mimic sensors carried aboard orbiting satellites.

National Aeronautics and Space Administration

Dryden Flight Research Center
P.O. Box 273
Edwards, CA 93523-0273
Voice 661-276-3449 FAX 661-276-3566
pao@dfrc.nasa.gov