NASA Facts

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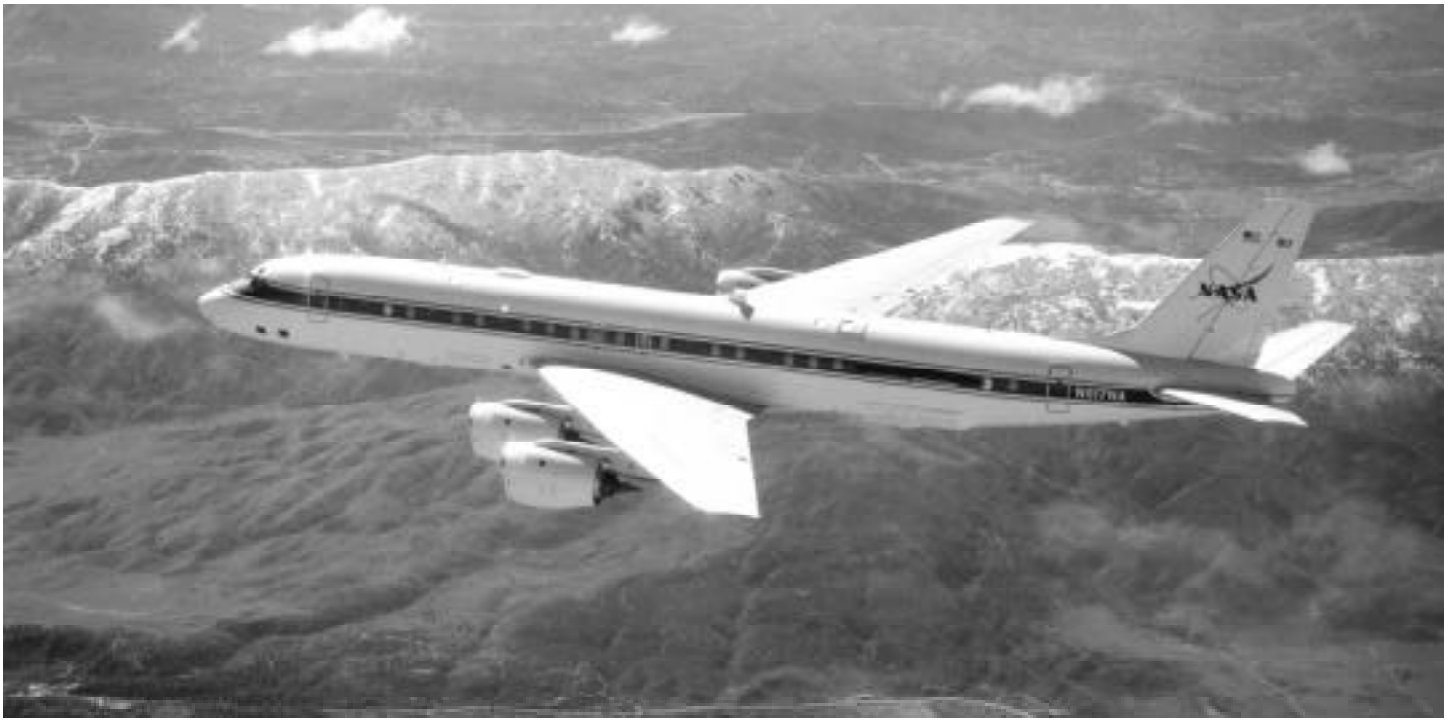
FS-2002-04-050-DFRC

NASA DC-8 Airborne Laboratory



NASA's Douglas DC-8 Flying Laboratory soars over Southern San Gabriel Mountains, Calif. NASA photo EC98-44428-2 by Carla Thomas.

NASA is using a McDonnell Douglas DC-8 aircraft as a flying science laboratory. The platform aircraft, based at NASA's Dryden Flight Research Center, Edwards, Calif., collects data for many experiments in support of scientific projects serving the world scientific community. Included in this community are NASA, federal, state, academic and foreign investigators.

Data gathered by the DC-8 at flight altitude and by remote sensing have been used for scientific studies in archaeology, ecology, geography, hydrology, meteorology, oceanography, volcanology, atmospheric chemistry, soil science and biology.

Missions

The DC-8 flies three primary types of missions: sensor development, satellite sensor verification and basic research studies of the Earth's surface and atmosphere.

Sensor Development

The DC-8, because it flies in the Earth's atmosphere, offers a comparatively inexpensive way to test and verify prototype Space Shuttle or satellite instruments.

Scientists use the DC-8 to develop ideas in instrument technology, test new instruments and make modifications based on the flight results. NASA and industry can save time and money because potential problems can be corrected before the instruments are launched into space. In this way, flight proven hardware can lead to a substantial savings in time and resources.

Satellite Sensor Verification

Once in orbit, satellite instruments may send back billions of bits of data every day. The DC-8 helps scientists answer questions about the accuracy of the data obtained and how to interpret it. For these missions the DC-8 flies under a satellite's path, using instruments to compile the same information the satellite collects. Through this process, algorithms used to interpret satellite data are evaluated and updated to reflect the results verified by the DC-8 instrumentation.

From July through September 1999, the DC-8 flew the same path as NASA's Tropical Rainfall Measuring Mission (TRMM) satellite, which was launched November 1997. This mission, KWAJEX, was based on the remote Pacific atoll Kwajalein, Republic of Marshall Islands. KWAJEX used a combination of surface and airborne-based measurements, including DC-8 measurements, to complement and verify detailed weather data collected by the satellite.

Basic Research Studies

In 1991, NASA launched a comprehensive program to study the earth as an environmental system. The DC-8's extended range, prolonged flight duration, large payload capability, and laboratory environment make it one of the premier research aircraft available for this Earth Science Enterprise. Combined with other aircraft, satellites, or ground stations, the DC-8 complements and extends the range of any instrument package, allowing scientists to successfully address today's planetary issues, including global warming and deforestation.

As part of a series of Arctic ozone experiments, the DC-8 flew in the polar regions to collect atmospheric information that may contribute to human understanding of ozone depletion. Teamed with NASA's ER-2 high altitude research aircraft,

NASA'S DC-8 Airborne Science laboratory banks right as it soars over the Dryden Flight Research Center complex on a low-level pass. NASA photo EC98-44444-18 by Jim Ross.

the DC-8 participated in the SAGE III Ozone Loss and Validation Experiment (SOLVE) in Kiruna, Sweden. SOLVE, which took place during the winter of 1999/2000, was the largest field campaign conducted to measure ozone amounts in the Arctic stratosphere.

The DC-8 participated in the 2001 Transport and Chemical Evolution over the Pacific (TRACE-P) mission. The study was one of a series of NASA's Global Tropospheric Experiment aircraft missions aimed at better understanding the human impacts on the chemistry of the global troposphere (the atmosphere from the earth's surface to an altitude of seven miles). The experiment began in the 1980s as a tropospheric chemistry experiment. Today it is providing a powerful new approach to understanding the profound changes human activity generates and the possible long-term effects these changes may have on the habitability of Earth.

Another basic research mission featured the Airborne Synthetic Aperture Radar. The radar, developed by NASA's Jet Propulsion Laboratory, Pasadena, Calif., more than a decade ago, is an all-weather imaging device that can penetrate clouds, forest canopies, thin sand and dry snow packs. During the Pacific Rim II mission in 2000, the radar gathered geographic data for coastal analysis and oceanography, forestry, geology, hydrology and archaeology.

Convection and Moisture Experiment (CAMEX) is a series of field research investigations with the goal of better understanding and predicting hurricanes. The fourth campaign, which took place the summer of 2001, studied hurricane development, tracking, intensification and landfall. The DC-8 and a NASA ER-2, also based at the Dryden Flight Research

Center, carried instruments that yielded information about hurricane structure, dynamics and motion.

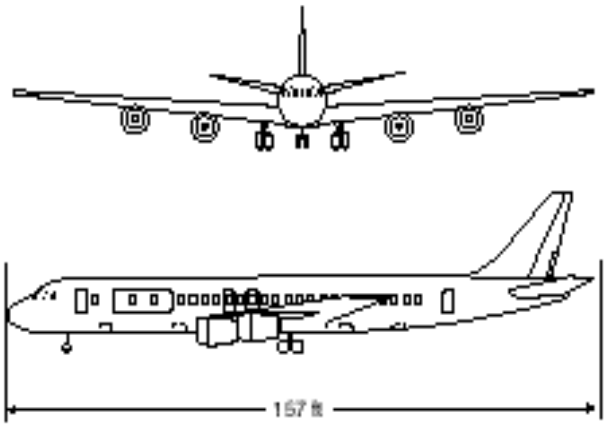
Deployment Locations

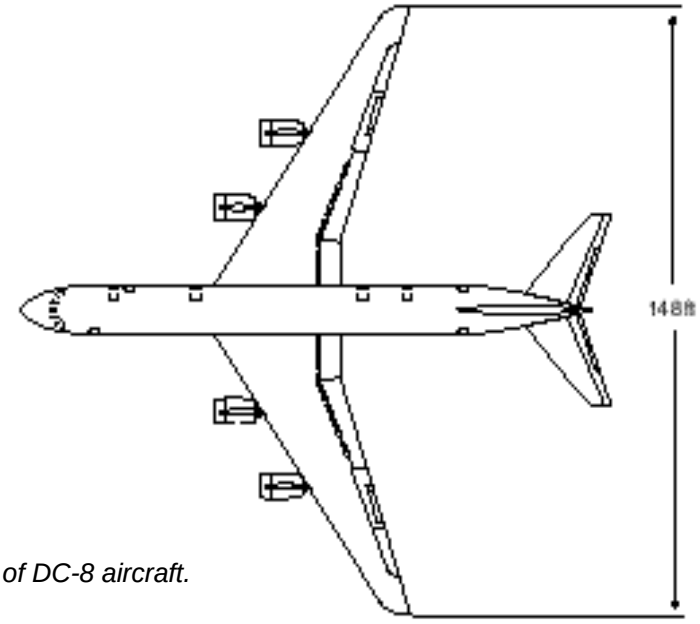
Anchorage, Alaska
Fairbanks, Alaska
Guam
Hickam AFB, Hawaii
Wake Island
Aviano, Italy
Okinawa, Japan
Yokota AB, Japan
Acapulco, Mexico
Windhoek, Namibia
Cebu, The Philippines
Stavanger, Norway
Recife, Brazil
Rio de Janeiro, Brazil
Edmonton, Canada
Punta Arenas, Chile
Christchurch, New Zealand
Kiruna, Sweden
Singapore
San Jose, Costa Rica
Stuttgart, Germany
Hong Kong
Keflavik, Iceland
Shannon, Ireland
Ascension Island
Darwin, Australia
Melbourne, Australia
Perth, Australia
Townsville, Australia
Brasilia, Brazil
Lajes, Azores
Prestwick, Scotland
Papeete, Tahiti
Madrid, Spain
Bangkok, Thailand
Johannesburg, South Africa
Marshall Islands
Nadi, Fiji

DC-8-72 Aircraft

The NASA DC-8-72 is a four-engine jet transport aircraft that has been highly modified to support the Agency's Airborne Science mission. The aircraft, acquired in 1985, is 157 feet long with a 148-foot wingspan. It can fly at altitudes from 1,000 to 42,000 feet for up to 12 hours, although most science missions average six to 10 hours. The aircraft has a range of 5,400 nautical miles. The DC-8 can carry 30,000 pounds of scientific instruments and equipment.

Among the aircraft's features are wing pylons (for aerosol sampling), a gyro-stabilized pointing and tracking mirror system, a dropsonde delivery tube, atmospheric chemistry sampling probes, and several reinforced ports that accept experiments pointing in virtually any direction. Experiment support facilities include weather radar, an integrated navigation management system, a satellite-based time code generator, a standalone Global Positioning System, and a weather satellite receiver system. Each experiment is supported by an information collection and transmission system providing navigation, aircraft conditions, and environmental data measured by facility sensors.





Three view drawing of DC-8 aircraft.