Tropical Composition, Clouds and Climate Coupling Experiment (TC4)

DC-8 High Altitude Research Aircraft

NASAfacts

The DC-8 jet aircraft will measure the air at lower altitudes flowing into the tropical storms.

Overview

NASA embarks on the Tropical Composition, Cloud and Climate Coupling (TC4) mission this summer to study the hard-to-reach heights of the Tropical Tropopause Layer (TTL), where vast fields of icy cirrus clouds form. Cirrus clouds play a major role in determining how much solar energy is trapped in Earth's atmosphere. The TTL is the transitional layer between the troposphere and the stratosphere (about 9 - 11 miles above Earth), and is where airborne materials can penetrate the stratosphere and significantly change its chemistry. Knowing that water is the most powerful greenhouse gas in the atmosphere, mission scientists are interested in the changes in the water vapor at these high altitudes and its effect on the Earth's climate and atmospheric chemistry.

The mission, which will run from July through August, 2007, will be based in San Jose, Costa Rica, where there are warm waters, heavy rainfall, and high temperatures during the summer months. NASA will operate three aircraft equipped with scientific instruments, a DC-8, an ER-2 and a WB-57.

NASA will use its McDonnell Douglas DC-8 aircraft as a flying science laboratory to collect data at flight altitude and by remote sensing. Based at the University of North Dakota, Grand Fork, North Dakota, the aircraft also will be used for electronic sensor research and development, satellite calibration and satellite data validation. The DC-8 jet aircraft will measure the air at lower altitudes flowing into the storms systems.

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.

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-mounted pylons (for aerosol sampling), a gyro-stabilized pointing and tracking mirror system, a dropsonde delivery tube, atmospheric chemistry sampling probes, and several reinforced ports for conducting experiments in virtually any direction. Experiment support facilities include weather radar, an integrated navigation management system, a satellite-based time code generator, a stand-alone 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.

TC4 DC-8 Aircraft Platform Instruments:

- 2D - S – two dimension Stereo
- APR-2 - Airborne Precipitation Radar
- BBIR - Broad Band Infrared Radiometer
- CAFS - Composition of Carbon Dioxide - Actinic Flux Spectroradiometers
- CIMS - Chemical Ionization Mass Spectrometer
- CPI - Cloud Particle Imager
- CVI - Counterflow Virtual Impactor
- DACOM - Differential Absorption CO Measurement
- DIAL - Differential Absorption Lidar
- DLH - Diode Laser Hygrometer
- Dropsondes - Balloon
- FastOz - fast response ozone measurements
- LARGE - Langley Aerosol Research Group Experiment
- LASE - Lidar Atmospheric Sensing Experiment
- MMS - Meteorological Measurement System
- PALMS - Particle analysis by laser mass spectrometry
- PIP - Precipitation Imaging Probe
- RICE - Rosemount Icing Detector
- SAGA - Soluble Acidic Gases and Aerosols
- SID-2 - Cloud Probe
- SSFR - Solar Spectral Flux Radiometer
- TD-LIF - Thermal Dissociation and Laser Induced Fluorescence
- WAS – whole air sampler

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For further information on the DC-8 and a more complete instrument list, please visit our website at: http://www.espo.nasa.gov/tc4/

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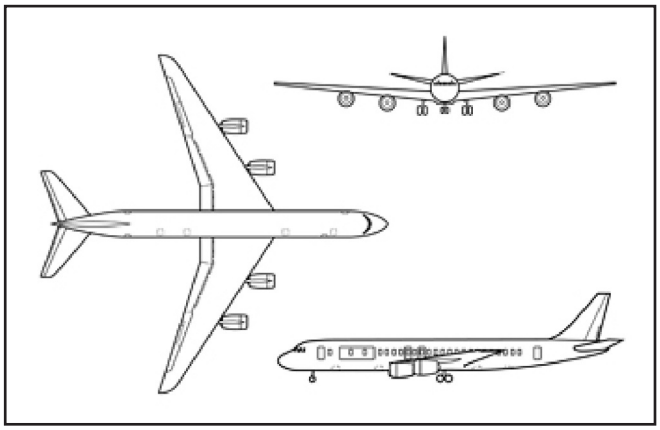

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