



# Tropical Composition, Clouds and Climate Coupling Experiment (TC4) ER-2 High Altitude Research Aircraft



Flying high above the clouds, the ER-2 will reach 70,000 feet while sampling the air.

## 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.

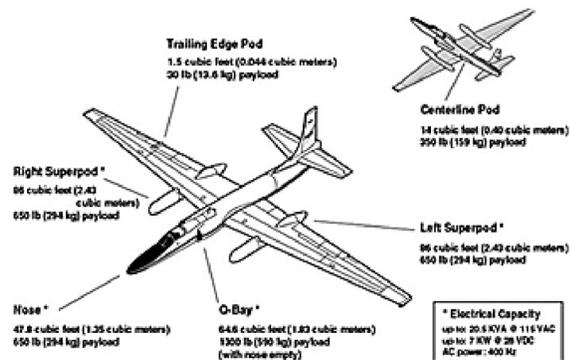
Flying high above the clouds will be the ER-2, a civilian version of the Air Force's U2-s reconnaissance aircraft that can reach and altitude of 70,000 feet, bordering the stratosphere.

## ER-2 Capabilities

The ER-2 is a versatile aircraft well-suited to perform multiple mission tasks. The ER-2 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 on a single mission. 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.



## TC4 ER-2 Aircraft Platform Instruments:

- AMPR - Advanced Microwave Precipitation Radiometer
- BBIR - Broad Band Infrared Radiometer
- CPL - Cloud Physics Lidar
- CRS – Cloud Radar System
- CoSSIR – Conical Scanning Sub-millimeter Wave Imaging Radiometer
- EDOP - ER-2 Doppler Radar
- MAS - Moderate Resolution Imager Spectroradiometer (MODIS) Airborne Simulator
- MTP - Microwave Temperature Profiler
- SSFR - Solar Spectral Flux Radiometer
- SHIS – Scanning High Resolution Interferometer Sounder

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