

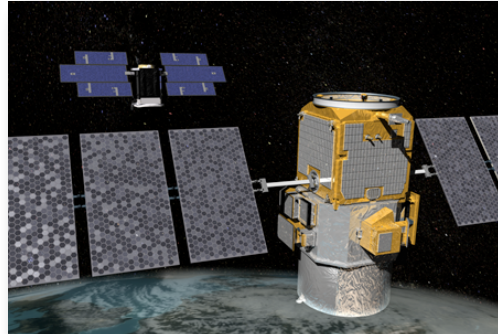


The CALIPSO-CloudSat Validation Experiment (CC-VEx)

The CALIPSO-CloudSat Validation Experiment (CC-VEx) was conducted between July 24 and August 14, 2006 and was designed to provide coincident observations of cloud and aerosol (small particles) layers needed to support calibration and validation studies for two new satellite missions: CALIPSO and CloudSat. These missions provide valuable new information on vertical structure and properties of aerosols and clouds needed to improve our understanding of climate, weather, and air quality. They were launched together on a Delta II launch vehicle on April 28, 2006 and placed in formation with three other earth observing satellites into what is commonly known as the “A-Train” satellite constellation. CALIPSO is a joint mission between NASA and the French space agency, CNES, and its payload consists of an innovative two-wavelength polarization-sensitive lidar, an infrared imaging radiometer, and a wide field-of-view camera. CloudSat is a partnership between NASA, the Canadian space agency, and the United States Air Force, and its payload consists of a state-of-the-art cloud profiling radar operating at 94 GHz.

For initial validation studies, both CALIPSO and CloudSat needed measurements of layers of clouds and aerosols over a range of altitudes and thicknesses with varying composition to compare with the satellite observations. To meet these requirements, three aircraft were used during CC-VEx: the NASA ER-2, the Weather Modification, Inc LearJet, and the NASA B-200 King Air aircraft. The ER-2 payload included a lidar, radar, and imaging spectrometer with instrument characteristics similar to CALIPSO and CloudSat. The Learjet carried a suite of cloud particle measurements, and the King Air supported a newer lidar design. Flights were designed to fly over different cloud and aerosol features at specific locations timed for coincident satellite overpasses. Base operations for the ER-2 and the LearJet were located at Warner Robbins Air Force Base in Georgia and hosted by the 78th Air Base Wing and the 116th Air Command Wing. Two B-200 flights were conducted from NASA Langley and another from Warner Robbins.

During CC-VEx, 12 comparison flights were conducted by the ER-2, including four at night. The Learjet made seven flights, and the B-200 King Air made three flights. All planned mission objectives were successfully obtained with measurements of thick and thin cirrus, mid-layer clouds, precipitating clouds, clouds with ice, water, and mixed phases, and aerosols (including scenes with thin cirrus) along the satellite track. Early satellite validation studies using CC-VEx observations led to improvements in the quality of CALIPSO and CloudSat data products released in late 2006.



CloudSat and CALIPSO pairing set a new standard in terms of precision placement of Earth-orbiting satellites. Both satellites looked at the same clouds in the atmosphere. As clouds change and transform in the sky, the instruments passing overhead needed to be close in order to take measurements simultaneously.



B-200 aircraft



ER-2 aircraft