Naval Research Laboratory's ANDE-2 launched aboard Space Shuttle Endeavour

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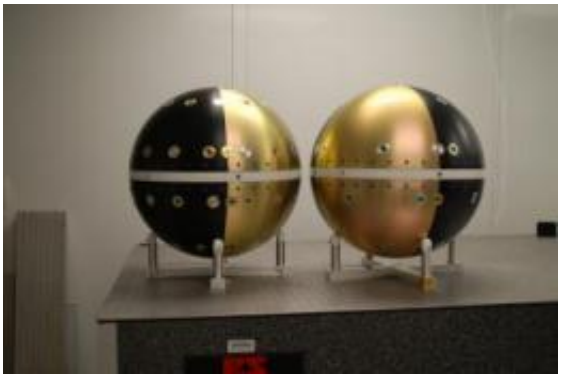

ANDE-2 consists of two spherical microsatellites, Pollux and Castor, that are both 19" in diameter but have different masses. ANDE-2 is a low-cost mission designed to study the atmosphere of the Earth from low-Earth orbit by monitoring total atmospheric density between 300 and 400 km altitude. Credit: NRL photo

The Naval Research Laboratory's (NRL's) satellite suite, the Atmospheric Neutral Density Experiment 2 (ANDE-2), launched aboard NASA's Space Shuttle Endeavour on July 15, 2009. The ANDE-2 satellite suite consists of two nearly perfectly spherical micro-satellites with instrumentation to perform two interrelated mission objectives. The first objective is to monitor the total atmospheric density along the orbit for improved orbit determination of resident space objects. The second is to provide a test object for both radar and optical U.S. Space Surveillance Network sensors.

ANDE-2 is a low-cost mission designed to study the atmosphere of the Earth from low-Earth orbit by monitoring total atmospheric density between 300 and 400 km altitude. ANDE-2 data will be used to improve methods for the precision orbit determination of space objects and to calibrate the Space Fence, a radar space surveillance system belonging to the Air Force 20th Space Control Squadron, a principal resource for tracking low-Earth orbiting space satellites.

Because of ANDE-2's particular design requirements, a new deployment technique was developed by the Air Force Space Test Program and tested with the ANDE Risk Reduction (ANDERR) flight in December 2006. The primary ANDERR mission objective, a test of the Shuttle deployment mechanism, was successful.

The ANDE project was conceived and developed at NRL, by Andrew Nicholas of NRL's Space Science Division. The mission consists of two microsatellites with the same size but different masses sent into orbit at the same time: the lighter satellite known as Pollux, and the heavier satellite, Castor. The Castor spacecraft carries active instruments: a miniature wind and temperature spectrometer (NRL/NASA GSFC) to measure atmospheric composition, cross-track winds, and neutral temperature; a Global Positioning Sensor (AFRL/University of Texas at Austin); a thermal monitoring system to monitor the temperature of the satellite (NRL); an electrostatic analyzer to monitor plasma density spacecraft charging (U.S. Air Force Academy).

Each satellite contains a small lightweight payload designed to determine the spin rate and orientation of the satellite from on-orbit measurements and from ground-based observations. The two microsatellites will slowly separate into lead-trail orbit to provide researchers an opportunity to study small-scale, spatial and temporal variations in drag associated with geomagnetic activity. Both the satellites will be fitted with and array of thirty retro reflectors, and will be observed by the U.S. Space

Surveillance Network and domestic and international satellite laser ranging sites. The variation in observed position will be used to determine in-track total density. Scientists will determine its position in relation to the passive satellite to compute total density and validate drag coefficient models. In addition, instrumentation on board Castor will measure density and composition.

A joint effort between the Space Science Division and the Naval Center for Space Technology to routinely process and analyze the ANDERR data has led to improved orbit determination and prediction using an atmospheric model correction method. The ANDE data provide a valuable tool for correcting deficiencies in atmospheric models and have led to advancements in miniature sensor technology. These advancements are pivotal for multi-point in-situ space weather sensing. The DoD Space Test Program will provide launch services for the ANDE-2 mission.

Source: Naval Research Laboratory (news : web)