National Aeronautics and Space Administration

October 2011

CubeSat ELaNa III Launch on NPP Mission

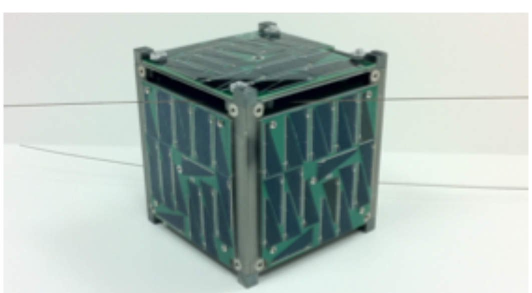
OVERVIEW

NASA will launch small research satellites, or CubeSats, for four universities. This will be the third installment of the Educational Launch of Nanosatellite (ELaNa) missions. The CubeSats are manifested as auxiliary payloads on the Delta II launch vehicle for NASA's NPOESS Preparatory Project (NPP) mission, planned for liftoff on October 27. NASA's Launch Services Program at the Kennedy Space Center in Florida manages the ELaNa project.

These miniature satellites were chosen from a prioritized queue established through a short-listing process from universities that responded to two public announcements to NASA's CubeSat Launch Initiative in 2010. Another launch initiative call will close on November 14, 2011.

AubieSat-1

A CubeSat created by Auburn University, designated AubieSat-1, is the first of several missions with the goal of achieving formation-flying CubeSats for collecting space weather data. Its mission is to measure fluctuations in Earth's magnetic field in low-Earth orbit using magnetometers. This mission will allow students at Auburn to get hands-on experience and to provide a knowledge base for future missions.



The ELaNa I mission manifested three CubeSats on NASA's Glory Mission. They failed to reach orbit because of a failure in the Taurus XL rocket. ELaNa II proposed to manifest two CubeSats on the ORS Enabler mission, which was postponed. These CubeSats have been re-manifested on later launches.

Basic CubeSat Facts:

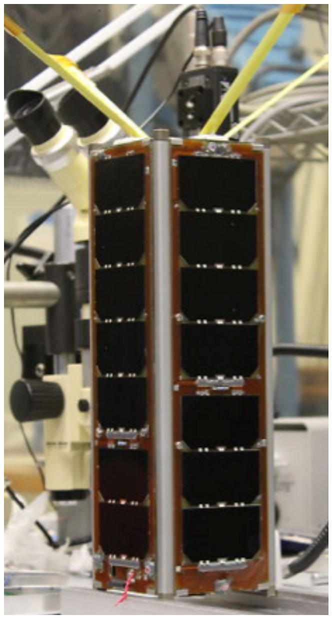
- Built to standard dimensions (Units or "U") of 10 × 10 × 11 cm—about 4 in
- Can be 1 U, 2 U, 3 U, or 6 U in size
- Weigh about $1\frac{1}{3}$ kg (3 lb) per U
- Deployed from standard Poly Picosatellite Orbital Deployer (P-POD)

CubeSat Deployment

For the NPP mission, there will be three Poly Picosatellite Orbital Deployers (P-PODs) aboard the Delta II rocket that will ferry NPP into space. Each P-POD is capable of deploying up to three CubeSats. Five CubeSat projects were selected for this mission, as some are larger than the minimum size. Kennedy adapted the P-POD, which was designed and manufactured by the California Polytechnic State University (Cal Poly) in partnership with Stanford University, to integrate into the Delta II launch vehicle. This P-POD design has flown previously on Department of Defense and commercial launches and on Orbital Sciences' Taurus XL for NASA. Cal Poly integrates the CubeSats with the P-POD and provides the entire assembly to the launch vehicle integrator.

As the Delta II rocket reaches an altitude of about 217 mi (350 km), the NPP spacecraft will be deployed. The CubeSats will separate from their P-PODs 10 seconds after NPP has completed its separation. The launch vehicle will provide indications that the P-POD doors have opened and the CubeSats have been released. After 45 minutes in orbit, the CubeSat transmitters will turn on. University ground stations will listen for their beacons, determine the nanosatellites' functionality, and announce operational status. CubeSat mission durations and orbital lives will vary but are anticipated to last at least 90 days.

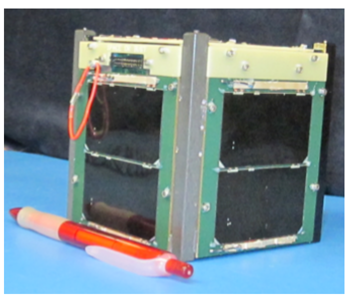
RAX



This CubeSat created by the University of Michigan in conjunction with SRI International is designated Radio Aurora and Ionosphere Experiment, or RAX. Its mission is to use a ground-to-space bistatic coherent-scatter radar system to analyze the distribution of naturally occurring ionosphere irregularities. RAX will provide insight on how those irregularities degrade the performance of communication and navigation satellites.

Explorer-1 [Prime] (Unit 2)

This CubeSat was created by Montana State University and is designated Explorer-1 [Prime], or E1P, to honor the launch and discoveries of the Explorer-1 mission that detected the Van Allen radiation belts more than 50 years ago. This satellite carries the same instrument as the E1P CubeSat that failed to reach orbit on the Glory mission: a miniature Geiger tube to measure intensity and variability of electrons in the Van Allen belts.



For More Information

For additional information about NASA's CubeSat Launch Initiative program, visit *http://go.nasa.gov/CubeSat_initiative*

For additional information about the CubeSats, visit:

AubieSat-1: *http://space.auburn.edu/*

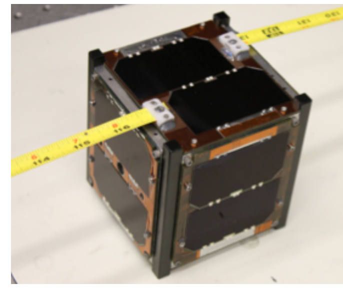
DICE: *http://www.sdl.usu.edu/programs/dice*

Explorer-1 [Prime]:
http://www.ssel.montana.edu/explorer-1_prime/

M-Cubed/COVE: *http://umcubed.org/*

RAX: *http://rax.engin.umich.edu/*

M-Cubed/COVE



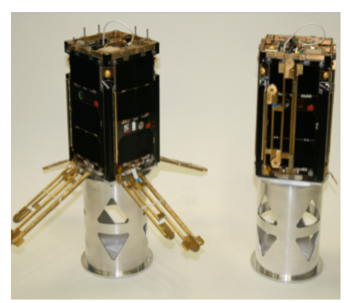
This CubeSat created by the University of Michigan is designated the Michigan Multipurpose Mini-satellite, or M-Cubed. M-Cubed's mission is to obtain mid-resolution color imagery of Earth's surface and to carry the JPL/Caltech-developed CubeSat On-board processing Validation Experiment (COVE). COVE will prove an image processing algorithm designed for the Multiangle Spectro-Polarimetric Imager (MSPI) instrument utilizing the first in-space application of a new radiation-hardened FPGA processor. COVE will advance technology required for real-time, high-data-rate instrument processing relevant to future Earth science.

Safety and Mission Assurance

Each CubeSat developer verified that its satellite complied with the P-POD requirements and provided for mission assurance. NASA conducted mission integration and safety verifications for the CubeSats to ensure that their presence and deployment would not add further risk to the primary mission. NASA jointly conducted a mission readiness review with each CubeSat developer.

DICE

This two-satellite CubeSat payload created by Utah State University is designated Dynamic Ionosphere CubeSat Experiment, or DICE. DICE will study Storm Enhanced Density (SED) bulge and plume features that occur frequently in the U.S. in the late afternoon during magnetic disturbances. Each of the two identical satellites is one and one-half unit (1½ U) in size and will launch together to remove spatial and temporal ambiguities in the observation of the plasma density and electric fields in the ionosphere. DICE will enable better understanding of ionospheric variability during solar storms, which has a dramatic effect on radio frequency systems.



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