ELaNa XVII International Space Station CubeSat Deployment

April 2017

NASAfacts

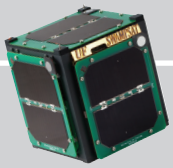
OVERVIEW

NASA will enable the deployment of three small research satellites, or CubeSats, developed by two universities and one NASA Center. These CubeSat missions were selected through the CubeSat Launch Initiative (CSLI) as part of the seventeenth installment of the Educational Launch of Nanosatellites (ELaNa) missions. The ELaNa XVII mission will embark on Orbital ATK's seventh contracted commercial resupply services mission for NASA to the International Space Station, guided to space by an Atlas V rocket scheduled to lift off on April 18 from Cape Canaveral Air Force Station, Florida, at 11:11 a.m. EDT. Over the past three years, more than 100 students have been involved in the design, development and construction of these CubeSats that will be deployed from the space station via the commercially-developed NanoRacks CubeSat deployer system.

CubeSats are playing an increasingly larger role in exploration, technology demonstrations, scientific research and education at NASA. These miniature satellites provide a low-cost platform for NASA missions, including planetary space exploration; Earth observation; fundamental Earth and space science; and technology demonstrations such as cutting-edge laser communications, energy storage, in-space propulsion and autonomous movement capabilities. They also provide educators an inexpensive means to engage students in all phases of satellite development, operation and exploitation through real-world, hands-on research and development experience on NASA-funded ride-share launch opportunities.

CSLI enables the launch of CubeSat projects designed, built and operated by students, teachers and faculty, as well as, NASA Centers and programs, and non-profit organizations. Managed by the Launch Services Program at NASA's Kennedy Space Center in Florida, ELaNa missions provide a deployment opportunity or ride-share launch to space for CubeSats selected through CSLI. ELaNa mission managers and their teams engage schools and colleges across the United States, providing spaceflight education through the preparation of payloads (licensing, integration and testing) flown in space. Since its inception in 2010, the initiative has selected more than 150 CubeSats and launched 46 CubeSats primarily developed by educational and government institutions around the United States. These miniature satellites were prioritized and selected through a formal NASA review of proposals submitted to CSLI announcements. NASA will announce another call for proposals in early August 2017.

Basic CubeSat Facts:



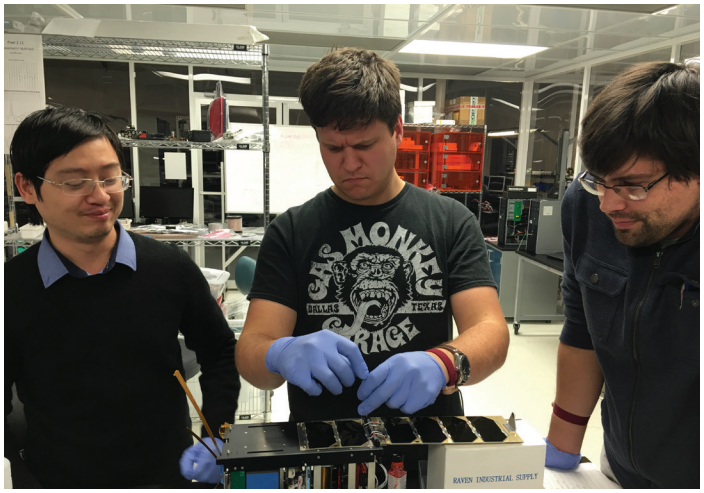
- Built to standard dimensions of 1 unit (1U) which is equal to 10x10x10 cm
- Can be 1U, 2U, 3U or 6U in size
- Weigh less than 3 lbs (1.33 kg) per U – 6U may be up to 6.3 lbs (14 kg)

CUBESAT DEPLOYMENT

In preparation for deployment, the CubeSats are placed inside the NanoRacks CubeSat Deployer, or NRCSD. The NRCSD is a stackable, modular, ground-loaded launch dispenser built by NanoRacks LLC in Webster, Texas, and each deployer accommodates up to 6.5U of CubeSat volume. Astronauts aboard the space station stack the NRCSDs into an eight-dispenser configuration, which are then mounted on the Japanese Experiment Module airlock slide table and moved outside of the station. The robotic arm captures the table and positions the facility toward Earth. Upon the approval to proceed from NASA and the Japan Aerospace Exploration Agency (JAXA), the NRCSDs are commanded one-by-one. The dispenser doors open and the large internal spring releases, deploying the CubeSats into an orbit similar to the space station, around 400 km above Earth. After 30 minutes in orbit, the internal timers on the CubeSats allow their onboard computers to activate and begin transmitting. The CubeSat teams utilize ground stations to listen for beacons to determine their small satellite's functionality and operational status. CubeSat missions are anticipated to last at least 120 days, although durations sometimes vary. Upon mission completion, the CubeSats begin a final fall through Earth's atmosphere, where tremendous heat caused by friction causes them to disintegrate.

SAFETY AND MISSION ASSURANCE

Each CubeSat developer has verified that their satellite is compliant with the NRCSD requirements. Each ELaNa CubeSat complies with U.S. and NASA orbital debris mitigation standard practices.



CXBN-2 Integration Team in the Morehead State University Spacecraft Integration and Assembly Facility. Credit: Morehead State University

CXBN-2

Cosmic **X**-Ray **B**ackground **N**anoSat-2

Morehead State University and partners **– Morehead, Ky.**

The Cosmic X-Ray Background NanoSat-2 (CXBN-2) CubeSat Mission developed by Morehead State University and its partners the Keldysh Institute (Moscow, Russia), the Maysville Community and Technical College (Morehead, KY) and KYSpace LLC (Lexington, KY) will increase the precision of measurements of the Cosmic X-Ray Background in the 30-50 keV range to a precision of <5 percent, thereby constraining models that attempt to explain the relative contribution of proposed sources lending insight into the underlying physics of the early universe. The mission addresses a fundamental science question that is central to our understanding of the structure, origin, and evolution of the universe, by potentially lending insight into high-energy background radiation and the evolution of primordial galaxies.

CSUNSat-1

California **S**tate **U**niversity **N**orthridge **Sat**ellite

California State University Northridge, Calif.

Jet Propulsion Laboratory – Pasedena, Calif.

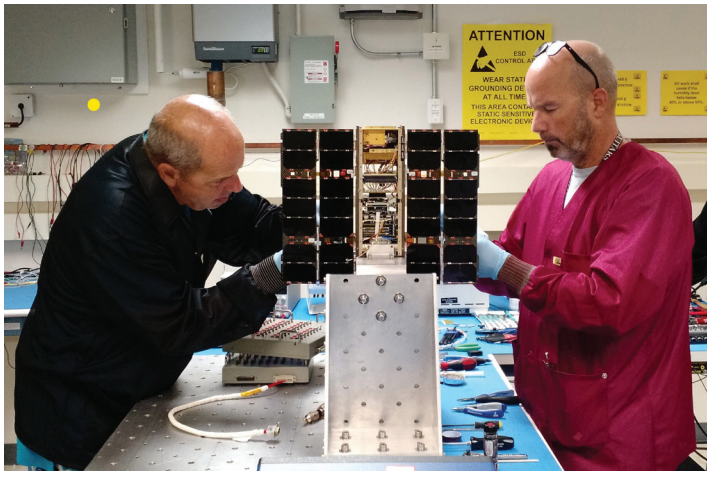
The primary mission of CSUNSat1 is to test an innovative low-temperature-capable energy storage system in space, raising its TRL level to 7 from 4 to 5. The success of this energy storage system will enable future missions, especially those in deep space to do more science while requiring less energy, mass and volume. This CubeSat was designed, built, programmed, and tested by a team of over 70 engineering and computer science students at CSUN. The primary source of funding for CSUNSat1 is NASA's Small Spacecraft Technology Partnership program.

CSUNSat CubeSat Testing at California State University. Credit: California State University Northridge

IceCube

NASA Goddard Space Flight Center – Greenbelt, Md.

IceCube's mission is to demonstrate the technology of a submillimeter-wave radiometer for future cloud ice sensing. This technology will enable cloud ice measurements to be taken in the intermediate altitudes (5 km – 15 km), where no measurements currently exist. It will perform first-of-a-kind measurements of ice particles embedded within clouds. These measurements will advance atmospheric monitoring technology and also fill in critical gaps in understanding how cloud ice affects the weather and how cloud formations process atmospheric radiation.



IceCube solar panels deployed. Credit: NASA

To contact the ELaNa XVII Launch Public Affairs Office, call 202-358-1100

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

For more information about the ELaNa XVII CubeSats, visit:

CXBN-2: www.moreheadstate.edu/College-of-Science/Earth-and-Space-Sciences/Space-Science-Center/Space-Missions/CXBN-2

CSUNSat1: www.csun.edu/cubesat

National Aeronautics and Space Administration

Headquarters
300 E Street, SW
Washington, DC 20546
www.nasa.gov/centers/hq

www.nasa.gov

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