University Nanosat Program

The University Nanosat Program (UNP) seeks to encourage U.S. university students to competitively design, build, launch and track a small-satellite or nanosat. It remains the only program in the federal government open and dedicated exclusively to U.S.-university participation in spacecraft development. UNP is run out of the Air Force Research Laboratory's Space Vehicles Directorate located at Kirtland Air Force Base, N.M., with funding support from the Air Force Office of Scientific Research and the American Institute of Aeronautics and Astronautics.

The objective of the UNP is to train the next generation of space professionals by providing a rigorous two-year concept to flight-ready spacecraft competition, and to enable small-satellite research and development, integration and flight test. Approximately 4,000 undergraduate and graduate students from 27 universities have participated since the program's establishment in 1999 as well as thousands of K-12 students. Nanosats weigh little when compared to most operational satellites yet can have several experiments onboard, which makes them an excellent choice for student activity.

FASTRAC launching from Kodiak, Alaska in November 2010

All participating universities are expected to propose, design and fabricate a flight-quality satellite. The program consists of a series of workshops and reviews throughout the two-year process, culminating in a competition to downselect to a winning spacecraft. That spacecraft is then sponsored by AFRL to the Space Experiment Review Board in order to procure a flight through the Space Test Program.

As part of the competition, the UNP engineers host a series of two-day satellite fabrication classes for participants. The students are given hands-on work in a variety of skills needed to build, assemble and integrate a spacecraft. The UNP also hosts two high-altitude balloon workshops where the students have the opportunity to test their nanosat components in a space-like environment.

As UNP is ongoing, there are currently five overlapping projects, in addition to the prior completed round.

Nanosat-2, called Three-Corner Sat, was developed by the University of Colorado at Boulder, New Mexico State University and Arizona State University. It was launched in December 2004 on the Boeing Delta IV Heavy Demo rocket.

The Nanosat-3 project began in 2003, when 13 universities were chosen to compete. During the next two years, all the projects worked to develop a final Engineering Design Unit, which were then judged. The panel selected the University of Texas at Austin's Formation Autonomous Spacecraft with Thruster, Relative-Navigation, Attitude and Crosslink or FASTRAC.

Current as of September 2011

FASTRAC demonstrated autonomous, high-precision, real-time relative-navigation using innovative GPS technologies and was launched in November 2010.

Eleven universities were chosen from the submitted proposals for Nanosat-4 in March 2005, and Cornell University's CUSat was selected in March 2007 with a delivery date of February 2009. The CUSat mission will demonstrate an end-to-end on-orbit inspection mission using a unique Carrier Phase Differential GPS technique for relative-navigation and attitude determination. CUSat is manifested to launch in June 2012 on SpaceX's Falcon-9.

The Nanosat-5 competition began in January 2007 with 11 universities being selected from 26 proposal submissions. The University of Colorado at Boulder's Drag and Atmospheric Neutral Density Experiment or DANDE was selected to continue on toward launch. The DANDE mission will be to measure the density, composition and winds between 200 km to 350 km altitude as they investigate the transient affects of atmospheric drag on orbiting objects. DANDE is manifested for a March 2012 launch.

Eleven schools were selected for the Nanosat-6 competition that concluded in January of 2011. Michigan Technological University's Oculus-ASR spacecraft was selected to continue on for flight. Oculus-ASR is designed to provide characterization and calibration for optical ground facility. Oculus-ASR is scheduled to be flight-ready by December 2012. In addition to the Oculus-ASR satellite, the second place Violet spacecraft built by Cornell University was selected to be sponsored by AFRL. Violet is a test bed for algorithms and topologies for Control Moment Gyroscopes (a component used for spacecraft attitude control). Beside the two satellites selected by the University Nanosat Program, two of the NS-6 schools were selected for launch in 2012 on the NASA ElaNa CubeSat initiative.

For additional information, visit
www.vs.afrl.af.mil/UNP/

Satellite Fabrication Class

FASTRAC during integration at AFRL

FASTRAC integrated to STP-S26 platform

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