NASAfacts

ELaNa 20 Mission

Overview

NASA will enable the launch of 10 small research satellites, or CubeSats, developed by 9 universities and a NASA center. These CubeSats, selected through the CubeSat Launch Initiative (CSLI), are flying as the 20th Educational Launch of Nanosatellite (ELaNa) mission. Over the past three years, more than 250 students have been involved in the design, development and construction of the CubeSats. The ELaNa 20 mission complement will be launched on Virgin Orbit's LauncherOne rocket by an air-launched booster system from the Virgin Orbit 747-00 carrier in Mojave, California. This Virgin Orbit launch was obtained by NASA's Venture Class Launch Services (VCLS), which provides dedicated launch capabilities for smaller payloads. These VCLS launches of CubeSats can tolerate a higher level of risk than larger missions and will demonstrate, and help mitigate risks associated with, the use of small launch vehicles providing dedicated access to space for future small spacecraft and missions.

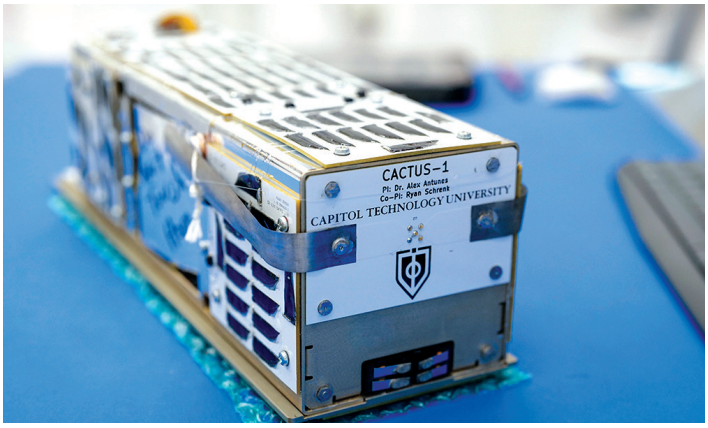
CubeSats are playing an increasingly larger role in exploration, technology demonstrations, scientific research and educational investigations at NASA. These miniature satellites provide a low-cost platform for NASA missions, including planetary space exploration; Earth observation; fundamental Earth 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 affordable 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 nonprofit organizations. Managed by NASA's Launch Services Program at the agency'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 provide spaceflight education through the preparation (licensing, integration and testing) of payloads flown in space. Since its inception in 2010, the initiative has selected more than 194 CubeSats and launched 107 CubeSat missions 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 in response to CSLI announcements. NASA announced another **call for proposals** on Oct. 5, 2020.

Virgin Orbit teammates complete a dry run of the payload encapsulation process ahead of the company's Launch Demo 2 mission. August 2020. Credit: Virgin Orbit/Greg Robinson.

CubeSat Deployment

The 10 CubeSats of the ELaNa 20 mission will deploy into space from their dispensers atop Virgin Orbit's LauncherOne rocket.



CACTUS-1

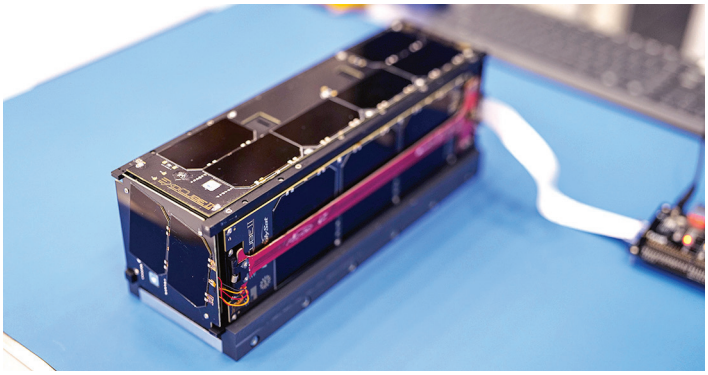
Capitol Technology University, Laurel, Maryland

CACTUS-1 is a tabbed 3U CubeSat involving two technology demonstrations built entirely by undergraduate students. The primary payload, TrapSat, uses aerogel to capture and profile micrometeorites and microdebris to collect data for cleanup of low-Earth orbit (LEO), and is the first CubeSat-based orbital debris detector to be flown in LEO. The secondary payload demonstrates commanding via internet as an innovative cost-saving communications and command subsystem for gathering scientific data.

CAPE-3

University of Louisiana Lafayette, Louisiana

CAPE-3 is the third cube satellite in the CAPE Series. The primary purpose of this educational mission is to allow grade school classrooms to access the Smartphone CubeSat Classroom and run interactive experiments through an experimental smartphone ground-station grid. The secondary mission of the satellite is to perform scientific experiments involving radiation detection through triboluminescent crystals and take pictures of Earth using an active attitude control system.

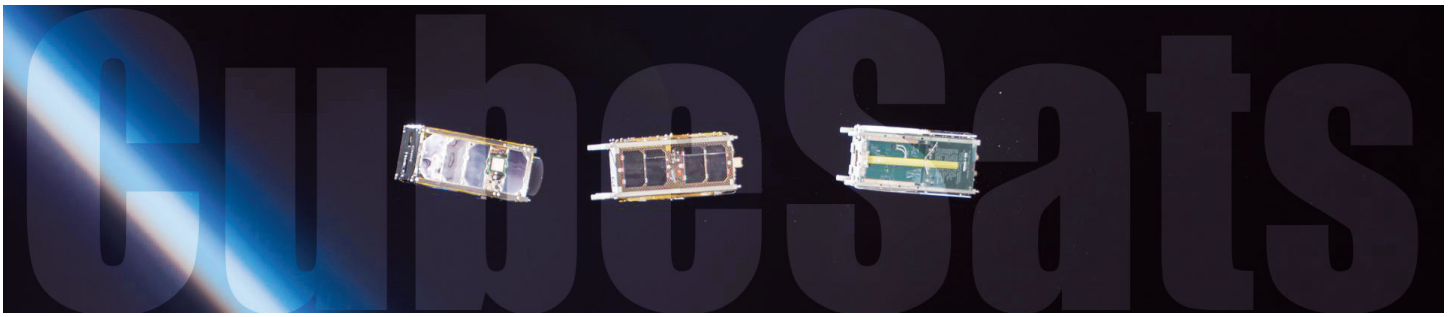


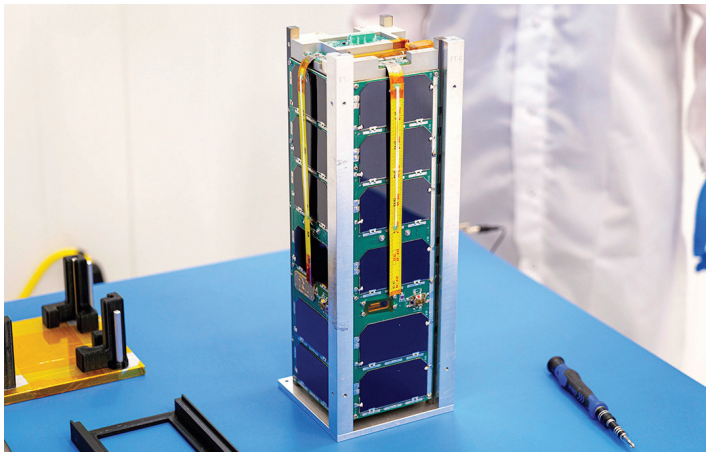
ExoCube-2

California Polytechnic State University, San Luis Obispo, California

ExoCube is a scientific investigation mission to study space weather by measuring the density of hydrogen, oxygen, helium and nitrogen in the upper atmosphere. The measurements will be used to characterize climatology and help improve empirical and climatological atmospheric models.

Virgin Orbit's mobile payload trailer pulls up next to the carrier aircraft Cosmic Girl to integrate the encapsulated payload assembly, carrying several NASA-sponsored small satellites for the company's Launch Demo 2 mission. November 30, 2020. Credit: Virgin Orbit/Greg Robinson.

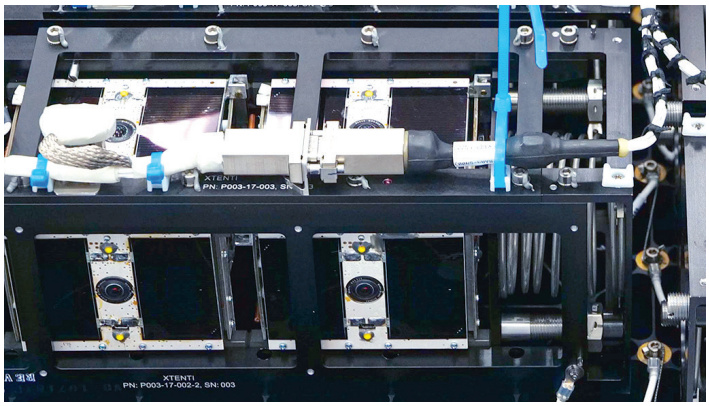




MiTEE

University of Michigan, Ann Arbor, Michigan

MiTEE, funded by NASA's Undergraduate Student Instrument Project, is a technology demonstration mission to prove the electrodynamic (ED) tether concept in space. The objective is to better understand ED tether propulsion technology so we can develop a technology capable of unlocking the potential of picosats and femtosats. Miniature ED tethers could allow large numbers of these satellites to function like a coordinated, controllable fleet. These capabilities could fundamentally transform the monitoring of natural disasters, space weather, and the broader space environment by enabling a new class of space mission.



PICs

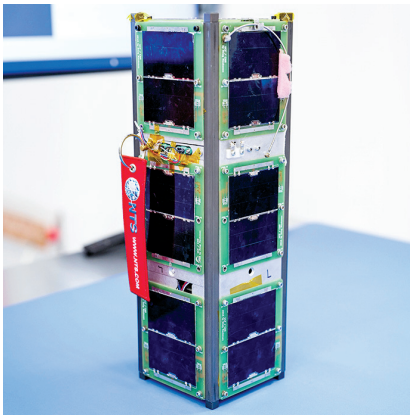
Brigham Young University, Provo, Utah

PICs is a technology demonstration of a spacecraft capable of performing inspection, maintenance and assembly on another spacecraft. This demonstration consists of two 1U CubeSats that will demonstrate ultrafast booting and power-up operation of system electronics and the low risk inspection of the exterior of another spacecraft by a passive, flyaway probe. The two flight systems deployed simultaneously will enable the collection of image data from each other and the launch vehicle. PICS is funded by NASA's Undergraduate Student Instrument Project.

PolarCube

University of Colorado at Boulder, Boulder, Colorado

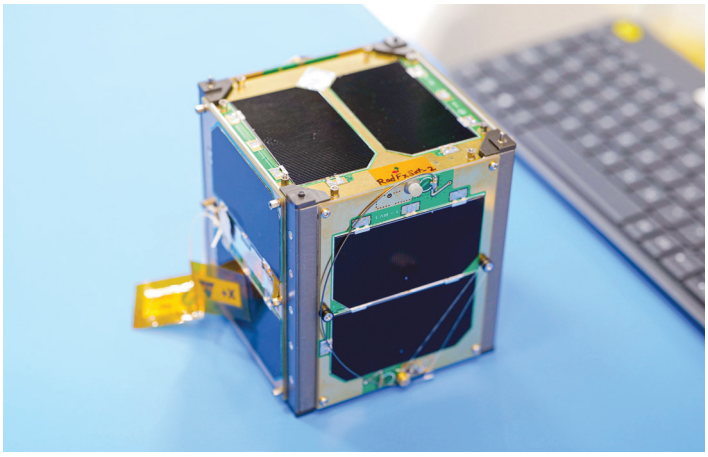
PolarCube is a scientific investigation mission to determine sea ice concentration and extent while collecting profile data on atmospheric temperature. It will collect brightness temperature spectra at high spatial resolution at a very low cost for remote sensing science and technology evaluation. It will correlate freeze-thaw ice data from SMAP, an Earth-observation satellite launched in 2015, with atmospheric temperature data. The passive microwave sensor will provide a template for future development of small satellite-borne passive microwave atmospheric sensors for collecting data on temperature, moisture, precipitation, cloud water and ice, and cryospheric surface features such as snow cover and sea ice concentration.



Q-PACE

University of Central Florida, Orlando, Florida

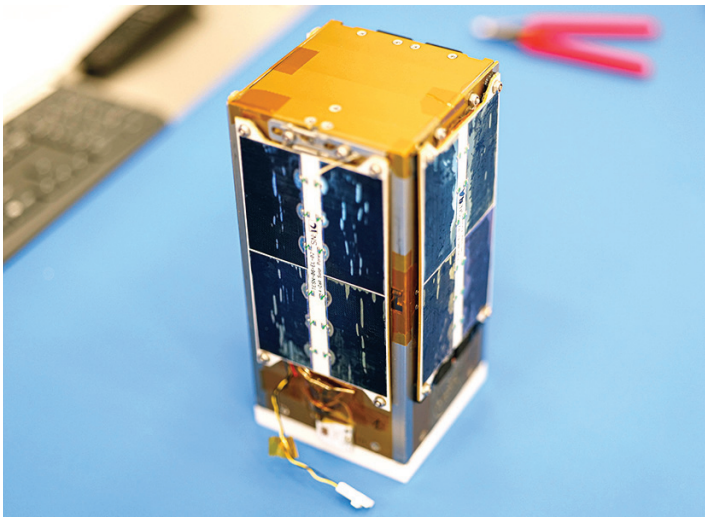
Q-PACE is a scientific investigation mission to perform long-duration microgravity experiments to study collisions in the early protoplanetary disk. It will observe low-velocity collisions between cm-scale and smaller particles and the formation of clusters of particles. The experiments run during this three-year mission will make it possible to determine whether collisional growth can proceed into this size range, confronting the decades-old question of how bodies grow past the meter-size barrier into planetesimals that can go on to become planets through gravitational buildup.



RadFXSat-2

Vanderbilt University, Nashville, Tennessee

RadFXSat-2 is a technology demonstration mission to improve understanding the effects of space radiation on microelectronic components. The data collected will be used to validate and improve computer models used to predict radiation tolerance of integrated circuits. This mission will demonstrate a short interval, cost-effective, on-orbit platform for evaluation of components for space flight. The payload includes three experiments that host memories at various technology nodes including a FinFET process. The effect of space radiation on these memories is recorded and transmitted using data under voice on the amateur radio repeater.



TechEdSat-7

NASA Ames Research Center,
Moffett Field, California

TechEdSat-7 is a technology advancement mission that will test a variety of new concepts. The 'Disposal' Exo-Brake is a high packing-density drag device that will help de-orbit satellites from higher orbits (in this case, 500km) in 6-8 months, instead of years. The mission will collect performance data of rapid command/control as well as encryption for the Iridium L-band communication network. It will also test the 'Tardigrade' omni-board that features a Vorago rad-tolerant processor. Lastly, there are two tracking experiments which will permit future nano-sats to be more accurately tracked. TechEdSat-7 is sponsored by NASA's Entry System Modeling Project and the Small Satellite Technology Program.

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