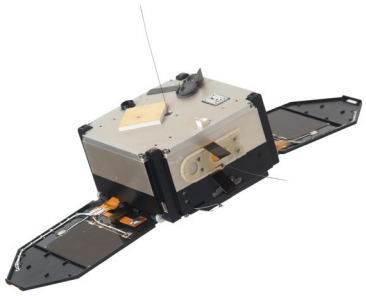
AEROSPACE

Delivering Large Capabilities in Small Packages

The rapid escalation of the production and launch of small satellites has revolutionized the space industry. Aerospace has been on the front lines of this minimalist movement for 20 years, leveraging the remarkable work of our picosat lab to produce breakthroughs in design and construction of small satellites.

Aerospace has its own crop of CubeSats, known as AeroCubes, and we have 13 operational satellites in orbit on a variety of missions. Recent work by our specialists includes laser communications to increase data downlink rates by one to two orders of magnitude, and proximity operations for formation flying. Other Aerospace missions are to study the atmosphere and to seeking methods to improve remote sensing and Earth imaging at night.

Our staff of experts has been nationally recognized for setting the standard for reliability and technology development within the CubeSat community.



AeroCube 6 was launched in June, 2014. It was deployed as a one-unit CubeSat that then split into the world's only two half-unit CubeSats (a half-unit is shown above). The two satellites fly in the same orbit, a few seconds apart, and have collected radiation data continuosly for three years..

NASA Optical Communications and Sensor Demonstration

On November 12, 2017, two innovative 1.5-unit CubeSats designed and built by Aerospace were successfully launched from the Wallops Flight Facility on the OA-8 resupply mission to the International Space Station. CubeSats were developed for NASA Ames Research Center's Optical Communications and Sensor Demonstration (OCSD) mission, focused on two significant capabilities not previously demonstrated in smallsat missions: high-speed optical transmission of data and proximity operations between two small satellites.

For the primary mission, each spacecraft is equipped with ultra-small star trackers, critical for precision pointing of the laser communications hardware. The laser is hard-mounted to the CubeSat body so that the beam is pointed by controlling the orientation of the entire spacecraft. The laser communications capability is tested by a downlink to the optical ground station.

The proximity operations mission involves the two satellites approaching and maneuvering around one another, within a range of 200 to 2000 meters. The operations will involve relative position measurements using cameras, beacons and laser rangefinders, and relative maneuvering using variable drag and propulsion. A novel propulsion system onboard the OCSD uses water as a propellant, which is exhausted as steam. Capabilities in proximity operations will enable multiple small spacecraft to operate cooperatively during future scientific or space exploration missions.

AeroCube Facts

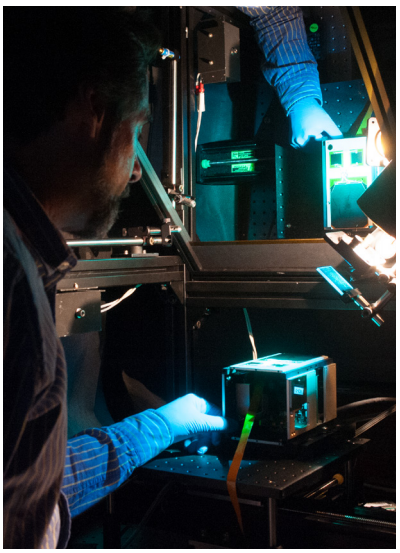
- There are currently 10 AeroCubes on orbit in the Aerospace constellation
- The OCSD mission has two functions: laser communications and proximity operations
- OCSD has a novel propulsion system that uses water as a propellant and exhausts it as steam
- R-cubed is a three-unit CubeSat designed to carry a custom telescope

A pair of Aerospace nanosatellites are released from the International Space Station.

World-Class Expertise

Aerospace's deep bench of engineers and researchers, with expertise in every aspect of spacecraft design and operation, consistently and successfully develop and integrate state-of-the-art components into functioning miniature space systems.

Aerospace's AeroCube team has constructed and flown over 30 spacecraft ranging in size from a quarter-kilogram to six kilograms. Our experts continue to advance and refine smallsat technology, making advances in propulsion, laser communications, control systems, thermal management, and electro-optical systems, among many others.



An Aerospace scientist tests an AeroCube prior to launch and deployment.

What's Next for AeroCube?

R-Cubed (AeroCube-11) is expected to launch in mid–2018. This three-unit CubeSat will be carrying a custom telescope designed to support on-orbit testing of experimental focal-plane array technologies used to convert optical images into electrical signals that can be digitally recorded. The R-Cubed focal-plane array is known as a "pushbroom" imager that uses multicolored filters and a linear scanning process to produce multispectral images. Additionally, this mission will include testing of on-orbit calibration techniques and carries a communications laser for the downloading of large data volumes.

As demands for greater capability continue to grow, Aerospace will continue to apply lessons learned and successful solutions to new challenges in the smallsat regime, assuring mission success in research, exploration, and commercialization to its U.S. Air Force, NASA, NOAA, and commercial customers.

The Aerospace Corporation

Aerospace is a nonprofit corporation that operates a federally funded research and development center (FFRDC) for the United States Air Force. This FFRDC spans the entire space domain for government as well as civil space and other federal agencies. With a world-class workforce of roughly 3,000 engineers and scientists, Aerospace is able to respond with agility to the unique challenges posed by national security space requirements, delivering well-defined, innovative solutions that assure mission success.

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