Orbital testing begins for advanced small spacecraft communications

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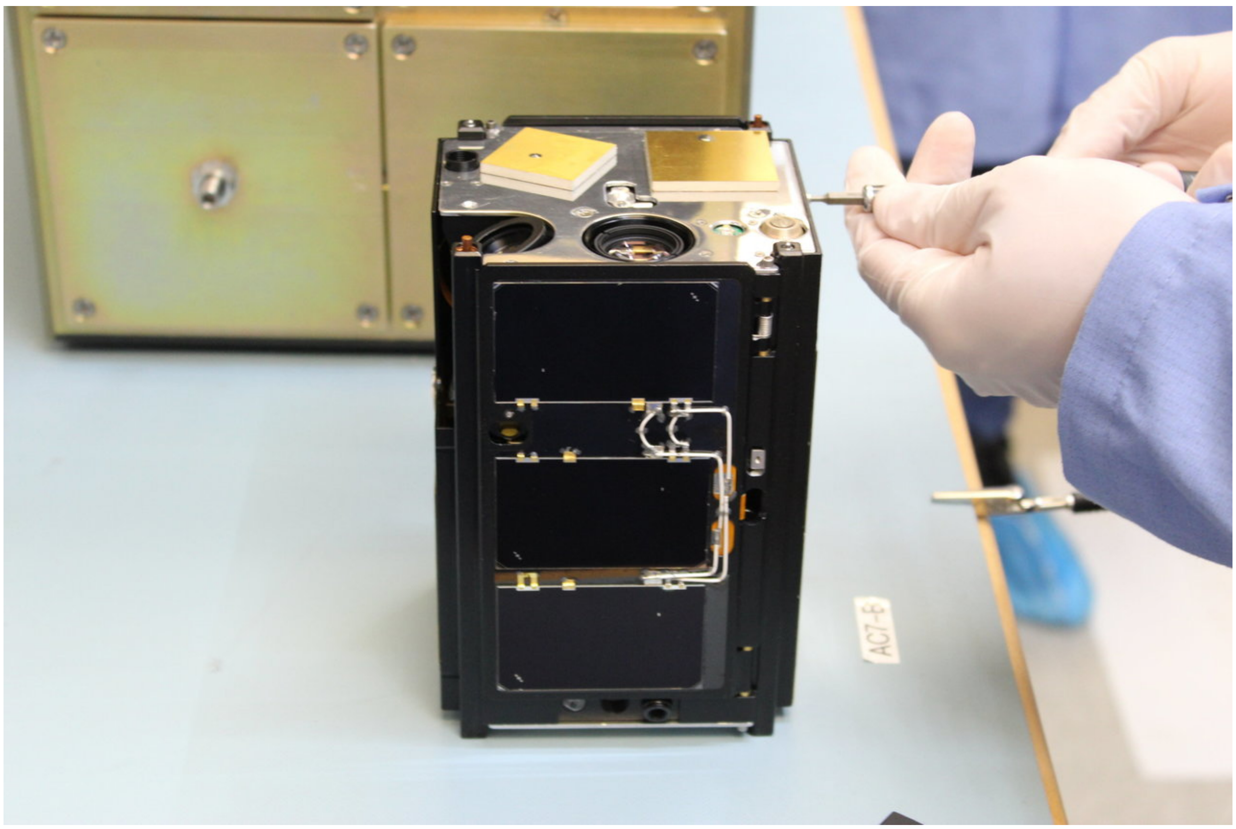


The Optical Communications and Sensor Demonstration (OCSD) small spacecraft mission will enable multiple small spacecraft to operate cooperatively during science or exploration missions, to approach another spacecraft or object for in-space observation or servicing, or to connect small spacecraft together to form larger systems or networks in space. Credit: NanoRacks

NASA Small Spacecraft Technology Program's Integrated Solar and Reflectarray Antenna, or ISARA, and Optical Communications and Sensor Demonstration, or OCSD, spacecraft recently completed systems checkout and have moved into the operational phase to demonstrate a number of technology firsts.

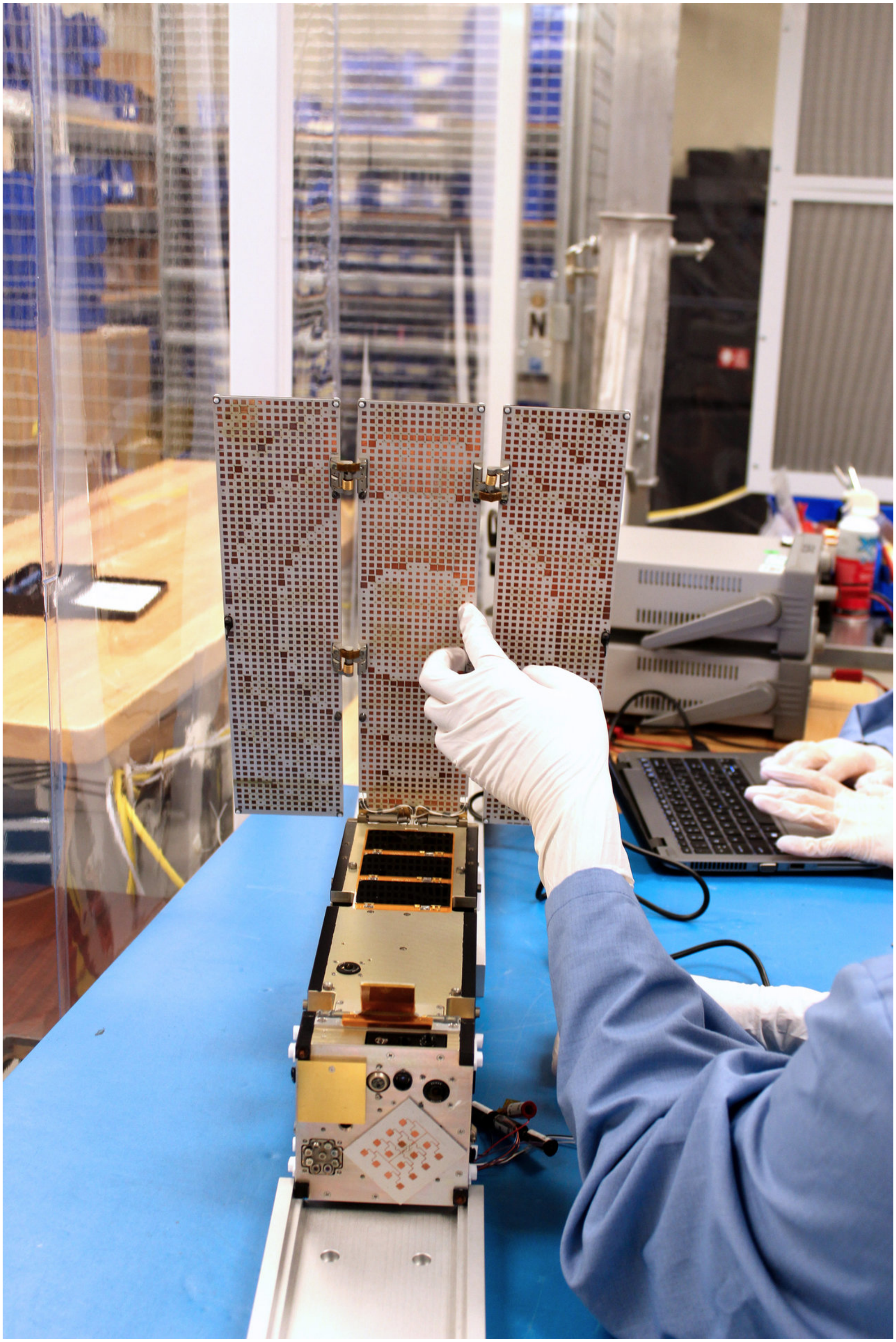
The ISARA mission is the first in-space demonstration of a reflectarray antenna, as well as that of an integrated antenna and solar array. ISARA is also the first demonstration of the radio frequency Ka-band from a reflectarray antenna. A relatively new type of antenna, the reflectarray consists of flat panels with an array of printed circuit board patches arranged to focus the radio signal in a similar manner as a parabolic dish.

ISARA initiated demonstration of its radio frequency communications technology by successfully generating a signal tone through its reflectarray antenna to the ground station at NASA's Jet Propulsion Laboratory in Pasadena, California. This demonstration enables high-bandwidth radio downlink of data from a CubeSat-scale spacecraft. The ISARA team will continue to characterize the reflectarray antenna to include measurements related to signal strength and solar array power attainment.

OCSD consists of a pair of spacecraft each equipped with lower power laser communication systems. Each spacecraft also has a limited water-based propulsion system. OCSD will demonstrate the first-ever high-speed laser communication from a CubeSat to a ground station. OCSD will also demonstrate an optical communications uplink to a CubeSat for the first time.

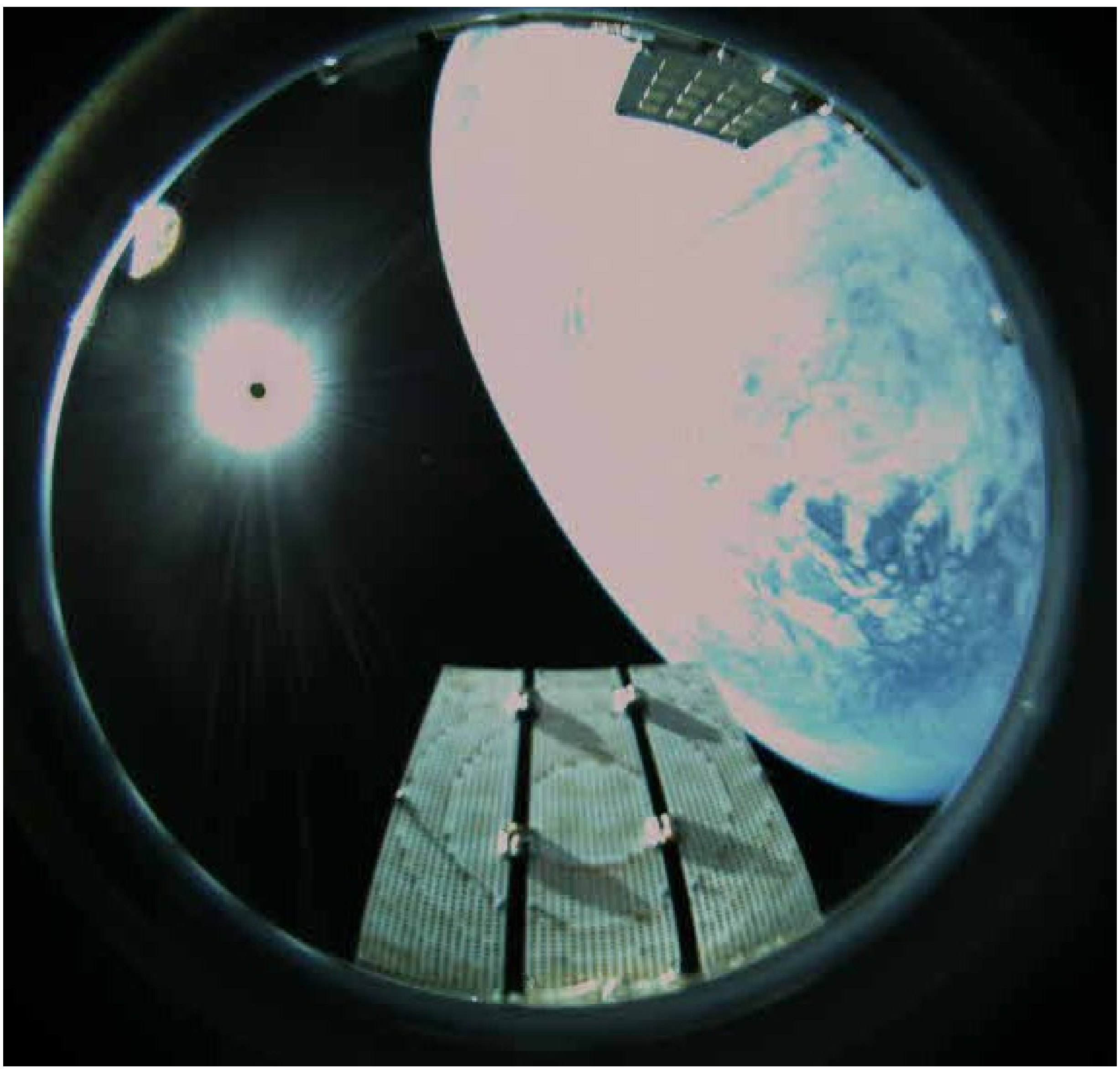
Demonstration of OCSD's optical communications payload requires nighttime operations and clear weather, due to the limited power of the laser. During the initial part of this technology demonstration phase, the mission team is working to align each spacecraft's laser with a ground station in preparation for the final demonstration of high-speed downlink optical communications. An optical telescope on Mount Wilson in Southern California will be used for the final demonstration.

An additional demonstration will involve proximity operations by maneuvering the pair of OCSD spacecraft to within 650 feet of each other. OCSD's proximity operations demonstration requires that the two spacecraft decrease their distance to three miles to enable the laser rangefinders mounted on each spacecraft to locate each other. Currently 100 miles apart, the OCSD spacecraft have fired their water-based propulsion systems to initiate maneuvers to close their distance. Over the coming days, the two spacecraft will approach to a final distance of 650 feet to begin proximity maneuvers.



The Integrated Solar and Reflectarray Antenna (ISARA) spacecraft undergoing pre-launch integration. Credit: NanoRacks

The technology demonstrations for both ISARA and OCSD will continue into the summer until completion.



ISARA's reflectarray antenna deployed in orbit in preparation for high-speed radio communications demonstration. Credit: NASA/Jet Propulsion Laboratory

Provided by NASA