Orbital-2 Mission to the International Space Station

National Aeronautics and Space Administration

July 2014

OVERVIEW

Orbital Sciences Corporation's second contracted cargo resupply mission with NASA to the International Space Station will deliver more than 3,000 pounds of science and research, crew supplies, vehicle hardware and spacewalk tools to the orbital complex and its crew. The scientific payloads on the Cygnus spacecraft include a group of small nanosatellites that will capture imagery of Earth, an investigation that will be used to help develop a devise that could enable small sample returns from the space station, and a suite of student-designed experiments that focus on studies ranging from food growth to the effects of microgravity on oxidation. Cygnus will spend approximately one month attached to the space station, at which point the crew will detach it from the Harmony module before its release. The spacecraft will dispose of approximately 3,000 pounds of trash during its fiery demise upon reentry into Earth's atmosphere.

CYGNUS CARGO

TOTAL CARGO:	**3293 pounds / 1493.8 kg**
• Crew Supplies Crew care packages Crew provisions Food	1684 pounds / 764.2 kg
• Vehicle Hardware Crew Health Care System hardware Environment Control and Life Support equipment Electrical Power System hardware Extravehicular Robotics equipment Flight Crew Equipment PL Facility Struc & Mech equipment Internal Thermal Control System hardware	783 pounds / 355.1 kg
• Science Investigations CubeSats and deployers Japan Aerospace Exploration Agency Dynamic Surf Hardware Human Research Program resupply	721 pounds / 327.0 kg
• Computer Resources Command and Data Handling Photo and TV equipment	18 pounds / 8.1 kg
• EVA equipment	87 pounds / 39.4 kg

LAUNCH AND RENDEZVOUS

The launch sequence of the mission will take approximately 10 minutes from Antares liftoff through separation of Cygnus at its initial orbit. When it arrive to the orbiting laboratory four days later, Cygnus will be grappled by Expedition 40 Commander Steve Swanson of NASA. He will use the space station's robotic arm to take hold of the spacecraft. Ground commands will be sent from mission control in Houston for the station's arm to rotate Cygnus around and install it on the bottom side of the station's Harmony module, enabling it to be bolted in place for its stay at the International Space Station. Under Orbital's Commercial Resupply Services contract with NASA, the company will deliver approximately 44,000 pounds, or 20 metric tons, of cargo to the space station over the course of eight missions. Orbital-2 is the second of these missions. It will make the fourth Antares launch conducted by Orbital in 14 months from Pad-0A at the Mid-Atlantic Regional Spaceport at NASA's Wallops Flight Facility.



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RESEARCH HIGHLIGHTS

Planet Labs' Flock 1b

On the Orbital-1 mission in January, Planet Labs of San Francisco launched an initial fleet of 28 CubeSats, individually known as Dove satellites, from the space station. This collective group of small, relatively inexpensive, nanosatellites, known as Flock 1, will be joined by 28 additional Dove satellites, Flock 1b, on the Orbital-2 mission. They will deploy using the NanoRacks Smallsat Deployment Program to launch from the space station's Japanese Experiment Module (JEM) airlock. Once deployed, these two flocks will work in unison and capture imagery of the entire planet on a more frequent basis. These images can be used to help identify and track natural disasters and responses to them, as well as improve environmental and agricultural monitoring and management.

TechEdSat-4

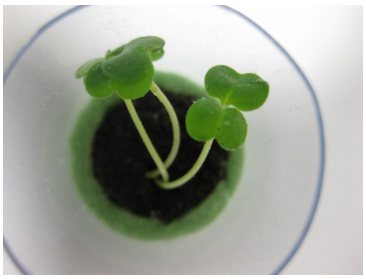
The satellite-related investigation TechEdSat-4 is part of a larger ongoing study, the Small Payload Quick Return system, which provides a means of returning small payloads in a temperature and pressure controlled environment from the space station. TechEdSat-4 will deploy using the JEM Small Satellite Orbital Deployer. Its primary objectives are to further develop a tension-based drag device, or "Exo-Brake," and demonstrate frequent uplink/downlink control capabilities. Engineers believe exo-brakes eventually will enable small samples return from the station or other orbital platforms to Earth.

Student Spaceflight Experiment Program

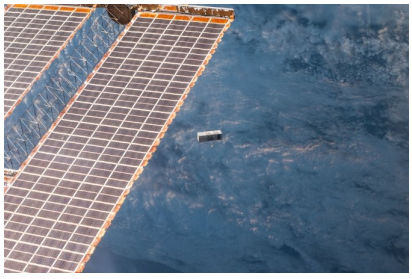
The National Center for Earth and Space Science-Charlie Brown, in association with the Student Spaceflight Experiment Program (SSEP), is an initiative of the National Center for Earth and Space Science Education, held in partnership with NanoRacks LLC. This STEM education initiative provides numerous students across the U.S. the ability to propose and design real experiments to fly on the space station. This investigation consists of 15 independent studies that were selected out of 1,344 student team proposals. These individual studies range from food growth and consumption, to determining the effect of microgravity on oxidation, to even the production of penicillin on the space station.



Two of the 28 Planet Labs Dove satellites that make up the Flock 1 constellation are seen launching into orbit earlier this year from the space station.



A close-up of the plant incubator in the NanoRacks Girl Scouts of Hawaii Microgreen Plant Growth investigation.



TechEdSat-3p deploys from the Japanese Small Satellite Orbital Deployer aboard the International Space Station.