National Aeronautics and
Space Administration

OVERVIEW

Northrop Grumman CRS-15 Mission

Northrop Grumman's 15th contracted cargo resupply mission (CRS-15) with NASA to the International Space Station will deliver more than 8,000 pounds of science and research, crew supplies, and vehicle hardware to the orbital laboratory and its crew. This will be the fourth mission under Northrop Grumman's Commercial Resupply Services-2 contract with NASA. Launch is set for Saturday, Feb. 20 at 12:36 p.m. EDT.

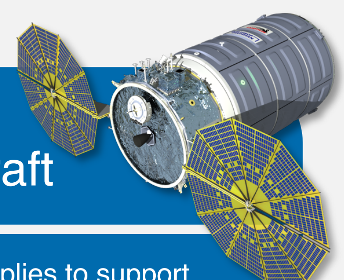
Launch Vehicle
Antares 230+ Rocket

- Fourth flight of Antares 230+ Rocket
- Launch vehicle that carries Cygnus to low-Earth orbit

Launch Site:
Wallops Flight Facility, Virginia

S.S. Katherine Johnson

The Cygnus spacecraft for this space station resupply mission is named in honor of Katherine Johnson, a NASA mathematician and Black woman who broke through barriers of gender and race, and whose work was critical in sending the first Americans into space.



Cygnus Spacecraft

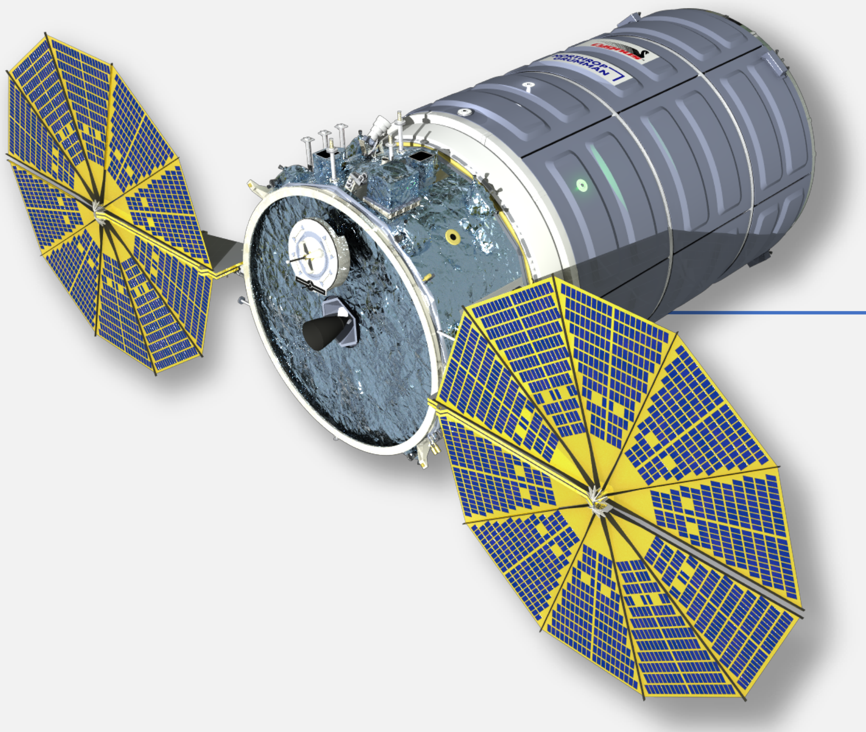
- Will deliver hardware and supplies to support dozens of science and research investigations
- Will conclude its NASA mission after about two months attached to the space station's Unity module
- Will perform secondary mission objectives after departing station

For more information, visit www.nasa.gov/northropgrumman

CARGO

Northrop Grumman CRS-15 Mission

*Masses are subject to change prior to launch



Crew Supplies
2,054 lbs. / 932 kg

Science Investigations
2,484 lbs. / 1,127 kg

Spacewalk Equipment
52 lbs. / 24 kg

Vehicle Hardware
3,115 lbs. / 1,413 kg

Computer Resources
2 lbs. / 1 kg

Russian Hardware
52 lbs. / 24 kg

Total Cargo:	**8,399 lbs. / 3,810 kg**
Total Pressurized Cargo with Packaging:	**8,232 lbs. / 3,734 kg**
Unpressurized Cargo:	**167 lbs. / 76 kg**

HARDWARE

Northrop Grumman CRS-15 Mission

Highlights

Brine Processing Assembly and Bladder: The Environmental Control and Life Support System (ECLSS) is a system of regenerative life support hardware that provides clean air and water to the space station crew. The system will get an upgrade thanks to the Exploration ECLSS: Brine Processor System, which demonstrates technology to recover additional water from the Urine Processor Assembly using a membrane distillation process. Long-duration crewed exploration missions require about 98% water recovery, and there is currently no state-of-the-art technology in brine processing that can help achieve this goal. This Brine Processor System plans to close this gap for the urine waste stream of the space station.

Crew Alternate Sleep Accommodation (CASA): Additional crew sleeping quarters capability to support increased crew in the Commercial Crew era, scheduled for use in the Columbus module.

Nitrogen/Oxygen Recharge System (NORS) Recharge Tanks: Supplemental nitrogen to support payloads and other activities onboard the ISS that requires high pressure nitrogen.

Commercial Air Tanks: First flight disposable air tanks to will support routine cabin repress activities on-orbit.

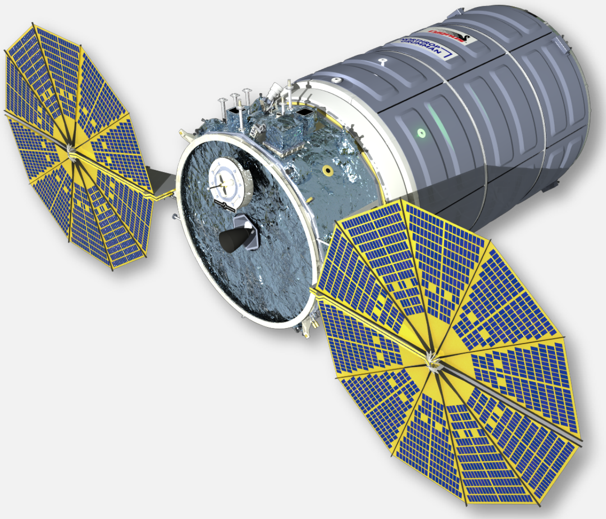
Universal Waste Management System (UWMS) Hardware: Critical consumable items to support operations of the next generation toilet system during the 2021 timeframe.

Waste and Hygiene Compartment (WHC) Separator Pump: Critical spare for the legacy toilet capability to be maintained throughout 2021 to support increased crew in conjunction with initial UWMS operations.

Robotic Arm Operators for Cygnus Capture

Soichi Noguchi (prime)
JAXA

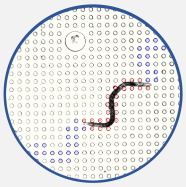
Mike Hopkins
NASA



RESEARCH

Northrop Grumman CRS-15 Mission

The NG-15 mission supports science from human health to high-powered computing, and utilizes the space station as a proving ground for the technologies we'll need to get us back to the Moon and on to Mars.

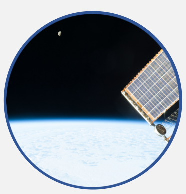


Tiny worms could help us determine the cause of muscle weakening that astronauts can experience in microgravity. Thanks to a new device for measuring the muscle strength of tiny *C. elegans* worms, researchers with the Micro-16 study can test whether decreased expression of muscle proteins is associated with this decreased strength. Results of this experiment may provide a better understanding of the links between gene expression and muscle strength, support the development of countermeasures to help maintain crew member health, and support new therapies to combat the effects of age-related muscle loss on Earth.

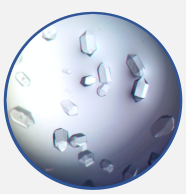
The ESA (European Space Agency) Dreams experiment will take a closer look at astronaut sleep. The investigation serves as a technology demonstration of the Dry-EEG Headband in microgravity, while also monitoring astronaut sleep quality during a long-duration flight mission. Raw data will be available to scientists for their analysis, while the crew also can input direct feedback on their sleep with a tablet application. Sleep is central to human health, so a better understanding of sleep in space provides a more comprehensive understanding of human health in microgravity.

Although relying on ground-based computers is possible for space exploration on the Moon or in low-Earth orbit, this solution will not work for exploration farther into the solar system. Launched in 2017, the Spaceborne computer study ran a high-performance commercial off-the-shelf computer system in space, **successfully** performing more than 1 trillion calculations (or one teraflop) per second for 207 days without requiring reset. Now launching on Northrop Grumman's CRS-15 mission, Spaceborne Computer-2 explores how commercial off-the-shelf computer systems can advance space exploration by processing data significantly faster in space, speeding scientists' time-to-insight from months to minutes.

Millions of people on Earth suffer from retinal degenerative diseases. Artificial retinas or retinal implants may provide a way to restore meaningful vision for those affected. In 2018, startup LambdaVision sent their first experiment to the space station to determine if the process used to create artificial retinal implants by forming a thin film one layer at a time may work better in microgravity. LambdaVision's second experiment, launching on NG CRS-15, evaluates a manufacturing system using a light-activated protein that replaces the function of damaged cells in the eye. This information could help LambdaVision uncover whether microgravity could optimize production of these retinas, and assist people back on Earth.



The International Space Station serves as a testing ground for technologies we plan to use on future missions to the Moon. The A-HoSS investigation puts tools for the crewed Artemis II mission to the test. Built as the primary radiation detection system for the Orion spacecraft, the Hybrid Electronic Radiation Assessor (HERA) was modified for operation on the space station. By verifying that HERA can operate without error for 30 days, it validates the system for crewed Artemis mission operations.



Each of the more than 100,000 proteins in the human body has a unique and complicated structure, which is closely related to its function. Revealing protein structure leads to an understanding of its function, but it is difficult to analyze protein structures here on Earth where gravity interferes with optimal growth. Previous research has shown that microgravity produces high-quality protein crystals that can be analyzed to identify possible targets for drugs to treat disease. The Real-Time Protein Crystal Growth 2 study plans to produce high-quality protein crystals for up to eight proteins, which will undergo detailed analysis back on Earth. This investigation allows for real-time adjustments through the run of the experiment.