NORTHROP GRUMMAN

National Aeronautics and Space Administration

NASA

OVERVIEW

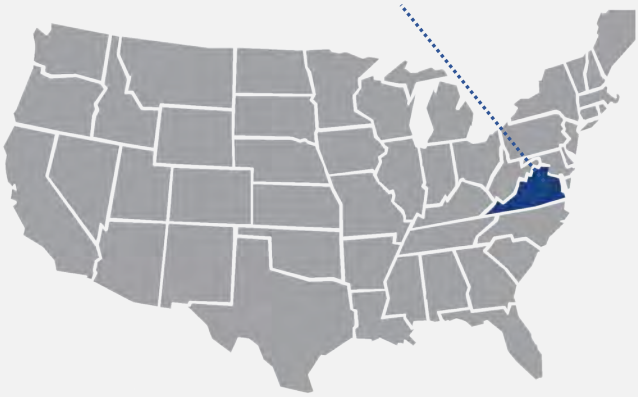
CRS-12 Mission

Northrop Grumman's 12th contracted cargo resupply mission (CRS-12) with NASA to the International Space Station will deliver about 8,200 pounds of science and research, crew supplies and vehicle hardware to the orbital laboratory and its crew. This is the first under NASA's Commercial Resupply Services 2 contract. Launch is set for Saturday, Nov. 2, 19 years since the first station crew arrived.

Launch Vehicle
Antares 230+ Rocket

- First flight of Antares 230+ Rocket
- Additional fuel tank for mass capability

Launch Site:
Wallops Flight Facility, Virginia



S.S. Alan Bean

The Cygnus spacecraft for this space station resupply mission is named in honor of Alan Bean. The late Apollo 12 astronaut flew to the Moon on Apollo 12 and became the fourth human to walk on the lunar surface.

Cygnus Spacecraft

- Will deliver hardware and supplies to support dozens of science and research investigations
- Will conclude its NASA mission after 2 months attached to the space station's Unity module
- Will demonstrate a late load capability before launch and secondary mission objectives after departing station

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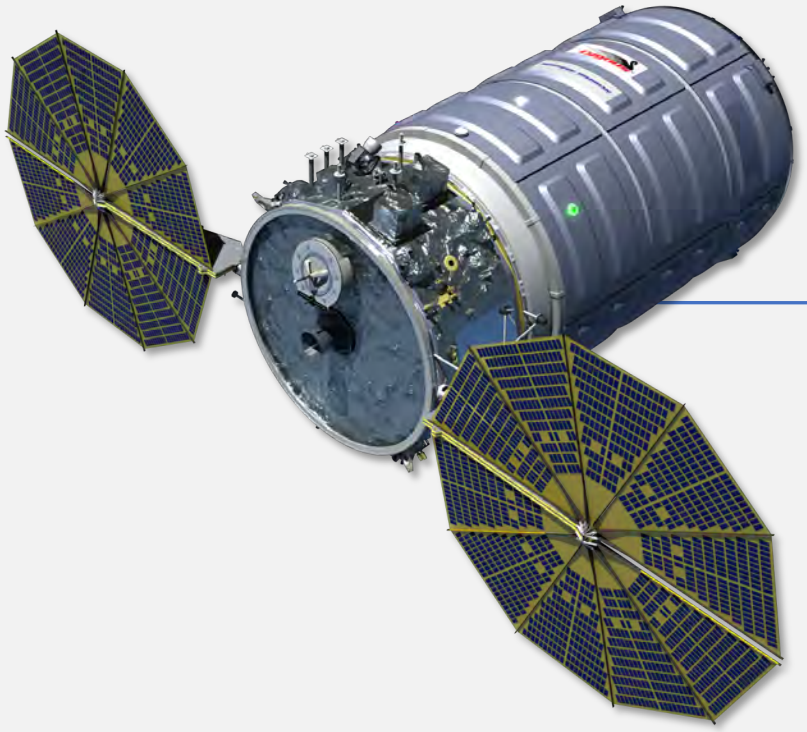
CARGO

CRS-12 Mission

*Masses are subject to change prior to launch



Crew Supplies
1,499 lbs. / 680 kg

Science Investigations
4,372 lbs. / 1,983 kg

Spacewalk Equipment
229 lbs. / 104 kg

Vehicle Hardware
1,667 lbs. / 756 kg

Computer Resources
37 lbs. / 17 kg

Russian Hardware
24 lbs. / 11 kg

NG Hardware
77 lbs. / 35 kg

Total Cargo:	**8,168 lbs. / 3,705 kg**
Total Pressurized Cargo with Packaging:	**7,905 lbs. / 3,586 kg**
Unpressurized Cargo (NanoRacks Deployer):	**262 lbs. / 119 kg**

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HARDWARE

CRS-12 Mission

Highlights

Treadmill: Critical exercise equipment for the crew. This treadmill is flying to replenish the on-orbit spare consumed from the remove and replace of the failed treadmill earlier this year.

Urine Transfer System (UTS) Hardware: Unique hardware that allows for the installation of the Universal Waste Management System (UWMS), the second toilet to be installed on ISS in 2020, and for the two toilets to work together.

Airlock Thermal Cover Stiffener: To be installed during an upcoming EVA, the cover stiffener augments and protects the hatch on-board the ISS that over time has become susceptible to damage.

Two Nitrogen/Oxygen Recharge System (NORS) Recharge Tank Assemblies (RTAs): Two RTAs are being launched to replenish oxygen used during battery and BCDU EVAs, and nitrogen lost due to ISS leakage.

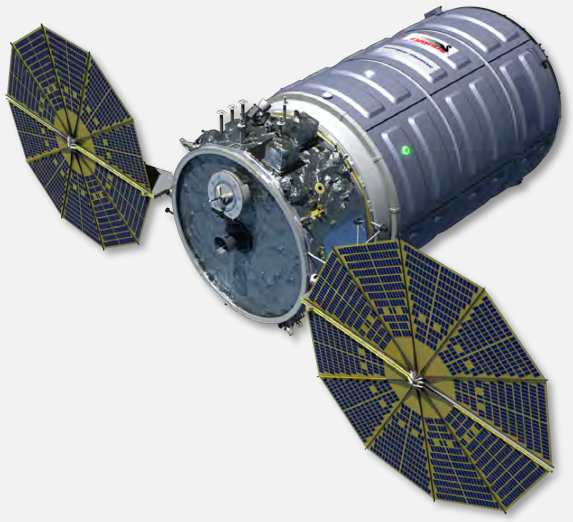
Cryochiller: Critical spare to support unique cold stowage capability on-orbit.

Animal Enclosure Module (AEM) Hardware: Critical Rodent Research (RR) transporters and habitats to support Rodent Research Missions 14 and 19 this fall.

Robotic Arm Operators for Cygnus Capture

Jessica Meir (prime)
NASA

Christina Koch
NASA



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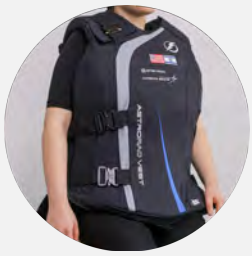
RESEARCH

CRS-12 Mission

The new experiments arriving to the orbital laboratory will challenge and inspire future scientists and explorers. Science payloads will look into different areas like radiation, recycling, and space food.

Cygnus will deliver specially-designed tools to repair the Alpha Magnetic Spectrometer-02 (AMS-02), a large science instrument fixed outside station that has been searching for dark, strange and anti-matter to help us understand how our universe was formed. Through a series of complex spacewalks, astronauts will use the tools to cut and reconnect fluid lines, a feat not done before in space, which could prove valuable for future missions at NASA's upcoming lunar Gateway or missions to Mars.



The AstroRad Vest investigation tests a garment that shields specific, radiation-sensitive organs, tissues and stem cell concentrations. Astronauts will provide input on the garment as they wear it while performing daily tasks, including how easy it is to put on, how it fits and feels, and the range of motion it allows. Garment developers can use this input to improve design. Use of the vest could protect crew members on missions to the Moon and Mars.

The Zero-G Oven examines heat transfer properties and the process of baking food in microgravity. It uses a specially-designed toaster-like oven for use aboard the space station with a top temperature of 363.3 degrees Celsius or 685 degrees Fahrenheit. On future long-duration space missions, fresh-baked food could have psychological and physiological benefits for crew members by offering a way to increase variety in flavor and nutrition of food.

The Made in Space Recycler (MIS Recycler) tests systems for reprocessing plastic into 3D printing filament for creating new items in microgravity. It recycles polymers into filament for use in the Additive Manufacturing Facility, a 3D printer operating on the station since 2016. The investigation looks at which materials process most effectively into 3D printing filament and which ones can be reprocessed many times without degrading. Researchers plan to analyze samples printed in space after they return to Earth and compare them to samples printed similarly on the ground.