NORTHROP GRUMMAN

National Aeronautics and Space Administration

NASA

OVERVIEW

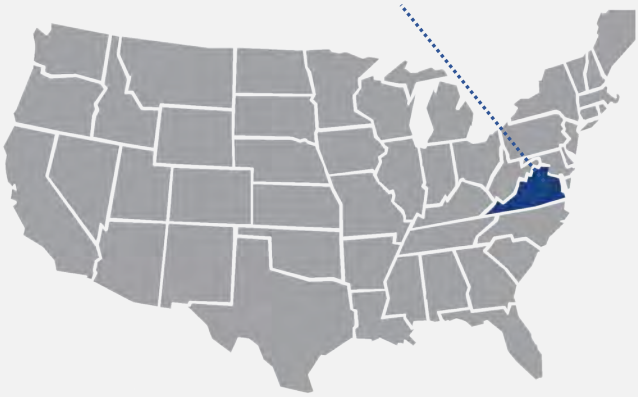
CRS-13 Mission

Northrop Grumman's 13th contracted cargo resupply mission (CRS-13) with NASA to the International Space Station will deliver about 8,000 pounds of science and research, crew supplies and vehicle hardware to the orbital laboratory and its crew. This will be the second mission under Northrop Grumman's Commercial Resupply Services-2 contract with NASA. Launch is set for Sunday, Feb. 9.

Launch Vehicle
Antares 230+ Rocket

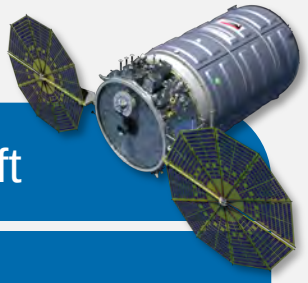
- Second flight of Antares 230+ Rocket
- Provides increased mass capability

Launch Site:
Wallops Flight Facility, Virginia



S.S. Robert Lawrence

The Cygnus spacecraft for this space station resupply mission is named in honor of U.S. Air Force Maj. Robert Lawrence who was the first African-American astronaut selected by any program, specifically chosen for the Air Force's Manned Orbital Laboratory Program in June 1967. Lawrence died in an F-104 Starfighter aircraft accident at Edwards Air Force Base, California six months later at the age of 32.



Cygnus Spacecraft

- Will deliver hardware and supplies to support dozens of science and research investigations
- Will conclude its NASA mission after 3 months attached to the space station's Unity module
- Will perform secondary mission objectives after departing station

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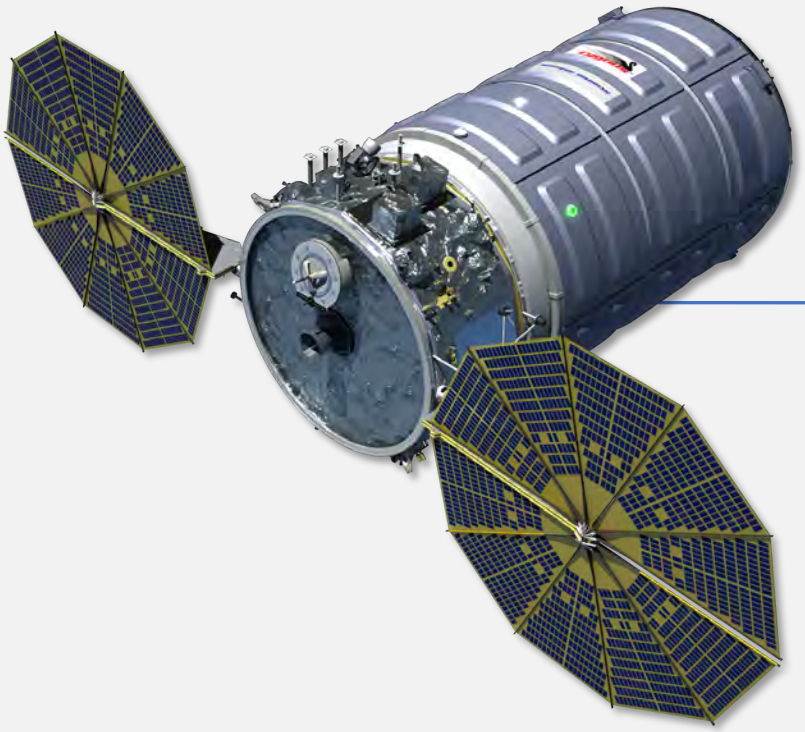
CARGO

CRS-13 Mission

*Masses are subject to change prior to launch



Crew Supplies
1,669 lbs. / 757 kg

Science Investigations
2,174 lbs. / 986 kg

Spacewalk Equipment
200 lbs. / 91 kg

Vehicle Hardware
3,534 lbs. / 1,603 kg

Computer Resources
64 lbs. / 29 kg

Total Cargo:	**8,009 lbs. / 3,633 kg**
Total Pressurized Cargo with Packaging:	**7,641 lbs. / 3,466 kg**
Unpressurized Cargo (NanoRacks Deployer):	**368 lbs. / 167 kg**

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HARDWARE

CRS-13 Mission

Highlights

Columbus Ka-band Terminal (COLKa) Assembly: Module enhancement hardware to upgrade the communications capability in Columbus science module.

Major Constituents Analyzer (MCA) Mass Spectrometer: Critical spare to support laboratories and connecting module operations of the MCAs to detect atmospheric constituents onboard the space station.

External High Definition Camera (EHDC) Assembly: Major camera assembly spare that will replace a failed camera on-orbit during a spring 2020 EVA.

Water Stowage System (WSS) Resupply Tanks (RST): Nine water tanks to support crew and hardware requirements during the 2020 timeframe

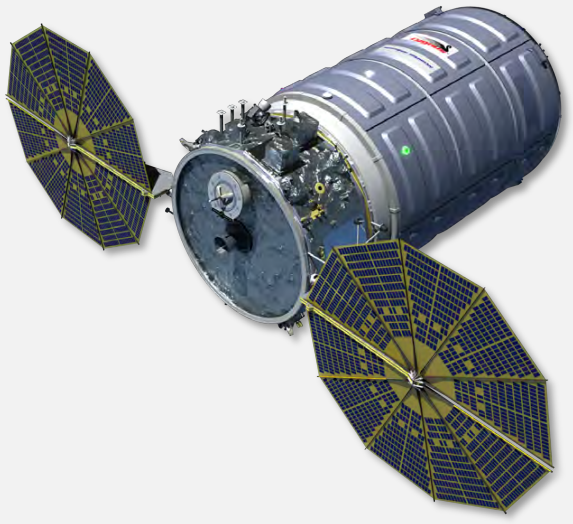
Nitrogen/Oxygen Recharge System (NORS) Tanks: Two recharge tanks to replenish on-orbit oxygen to be utilized in upcoming spacewalks, and one air tank to support the Commercial Crew Vehicle (CCV) Emergency Breathing Air Assembly (CEBAA) hardware launching in 2020.

POLAR Flight Assembly: Cold stowage capability to support payload transportation to the ISS.

Robotic Arm Operators for Cygnus Capture

Andrew Morgan (prime)
NASA

Jessica Meir
NASA



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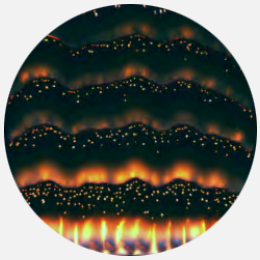
RESEARCH

CRS-13 Mission

The new experiments arriving to the orbiting laboratory will challenge and inspire future scientists and explorers, and provide valuable insight for researchers. Experiments will test new facilities for microscopic viewing and cell culturing, and particle identification, will seek to better understand how fire spreads in microgravity, and will study how bacteriophages behave in space.

The Mobile SpaceLab is a tissue and cell culturing facility that launches and returns on space station resupply vehicles to offer investigators a quick-turnaround, high-throughput platform to perform sophisticated microgravity biology experiments, including microscopy and fluid exchanges. The Mobile SpaceLab can perform a biology experiment autonomously for up to a month on the space station without the need for crew operations.



Understanding how fires spread in space is vital for developing flame-resistant materials and fire prevention measures, but it is difficult to perform flame growth and prevention experiments aboard a spacecraft. The Spacecraft Fire Experiment-IV (Saffire-IV) investigation uses the Cygnus resupply vehicle after it leaves the space station to examine fire growth in different materials and environmental conditions. It also demonstrates fire detection, monitoring and post-fire cleanup capabilities.

Mochii is a miniature scanning electron microscope that helps in rapid identification of particles found on the space station, many invisible to the naked eye. Such particles can cause vehicle and equipment malfunctions and threaten crew health, but currently, samples must be returned to Earth for analysis, leaving crew and vehicle at risk. Mochii also provides a powerful new analysis platform to support novel microgravity science and engineering.

Bacteriophages, or phages, are viruses that invade and destroy targeted bacteria without harming human cells or the body's beneficial bacterial population. Evolution of New Phage-Bacteria Interactions from Exposure to Space Environment (Phage Evolution) examines the effects of microgravity and radiation exposure on phage and bacterial host interactions, including phage specificity for a bacterial host and host resistance to specific phages. Characterizing microgravity's effects on phages could lead to improved therapies that provide alternative treatments for antibiotic-resistant infections.