National Aeronautics and Space Administration

OVERVIEW

SpaceX CRS-19 Mission

SpaceX's 19th contracted cargo resupply mission to the International Space Station for NASA will deliver more than 5,700 pounds of science and research, crew supplies and vehicle hardware to the orbital laboratory and its crew.

Launch is targeted for Wednesday, Dec. 4, 2019 at 12:51 p.m. EDT.

Launch Vehicle
Falcon 9 Rocket

- First flight of this booster
- Second to last flight on CRS-1 SpaceX contract

Launch Site:
Space Launch Complex 40,
Cape Canaveral Air Force Station in Florida

Robotic Arm Operators for Dragon Capture

Luca Parmitano (prime)
NASA

Andrew Morgan
NASA

Dragon Spacecraft

- Hardware and supplies will support dozens of science and research investigations.
- This Dragon previously flew on SpaceX CRS-6 and CRS-11. It will be attached to station's Harmony module.
- In January, it will re-enter Earth's atmosphere and splash down in the Pacific Ocean off the coast of Baja California with 3,600 pounds of return cargo.

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

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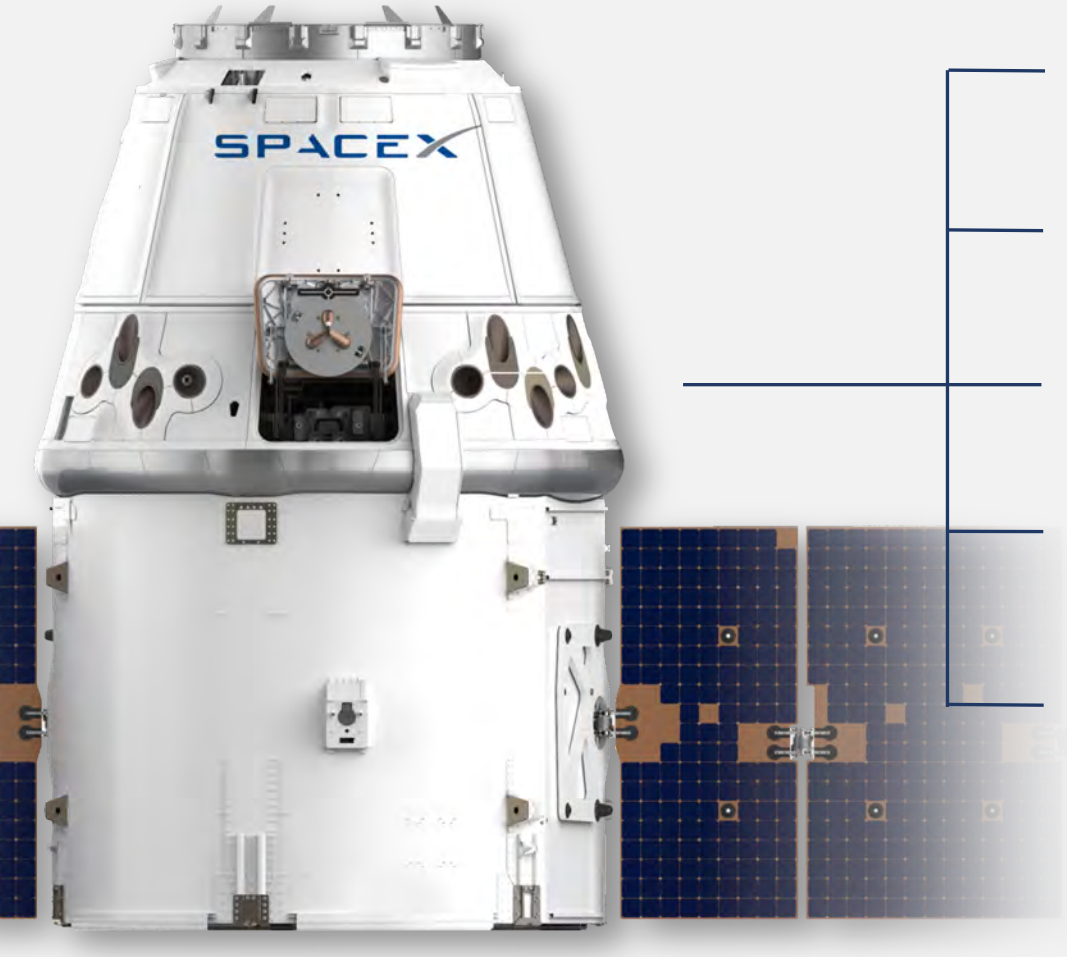
CARGO

SpaceX CRS-19 Mission

*Masses are subject to change prior to launch



Crew Supplies
564 pounds / 256 kilograms

Science Investigations
2,154 pounds / 977 kilograms

Spacewalk Equipment
141 pounds / 65 kilograms

Vehicle Hardware
675 pounds / 306 kilograms

Computer Resources
33 pounds / 15 kilograms

Unpressurized Payloads:
2,037 pounds / 924 kilograms

Total Cargo:	**5,769 pounds / 2,617 kilograms**
Total Pressurized Cargo with Packaging:	**3,732 pounds / 1,693 kilograms**
Unpressurized Payloads:	**2,037 pounds / 924 kilograms**

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HARDWARE

SpaceX CRS-19 Mission

Hardware Launching

Common Cabin Air Assembly (CCAA) Heat Exchanger: Spare to be installed this fall in support of Temperature Humidity Control (THC) capability on-orbit.

Lithium Ion Battery and Adapter Plate: Replacement battery for battery damaged by a Battery Charge/Discharge Unit (BCDU) earlier this year.

Robotic Tool Stowage Assembly (RiTS): External docking station to be installed in an upcoming spacewalk to support ammonia leak detection.

Multifiltration Bed (MFB): Exploration Environmental Control and Life Support System (ECLSS) item to demonstrate newly developed technology within the MFB.

Thermal Amine Scrubber Blower: Repaired blower to support critical ammonia scrubbing capability on-orbit.

Rodent Research Resupply: Launching hardware to support Rodent Research-19 (RR-19).

Microgravity Science Glovebox (MSG) / Life Sciences Glovebox (LSG) Resupply: Hardware and consumables to support major payloads operations in 2019/2020.

Hardware Returning

Failed or expended hardware no longer needed on the space station.

CCAA Heat Exchanger: Currently a degraded unit installed on-orbit, this item is being replaced by the launch spare and will be returned to ground for refurbishment.

Main Bus Switching Unit (MBSU): Following a communicating failure in April 2019, this spare is being returned to ground for evaluation and refurbishment.

Battery Charge/Discharge Unit (BCDU): This unit represents the second such failure in the last year, after almost 20 years of solid performance. The teams are returning this unit to do a quick evaluation and repair to protect for future possible anomalies.

Rodent Research Habitats and Transporters: Returning used habitats and transporters to support future rodent missions in 2020.

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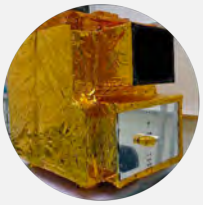
RESEARCH

SpaceX CRS-19 Mission

The SpaceX cargo spacecraft will deliver dozens of investigations to the International Space Station, including studies in biology, physics, and materials science.



The Japanese Space Agency (JAXA) Hyperspectral Imager Suite (HISUI) is a next-generation, hyperspectral Earth imaging system. Every material on the Earth's surface: rocks, soil, vegetation, snow/ice, and man-made objects has a unique reflectance spectrum. HISUI provides space-based observations for tasks such as resource exploration and applications in agriculture, forestry and other environmental areas.

Barley contains antioxidants, vitamins and minerals. Malting converts starches from the raw grain into various sugars suitable for use in brewing, distilling and food production. Understanding how barley responds to microgravity could identify ways to adapt it for nutritional use on long-duration spaceflights. Malting ABI Voyager Barley Seeds in Microgravity tests an automated malting procedure and compares malt produced in space and on the ground for genetic and structural changes.

Understanding how fire spreads and behaves in space is crucial for the safety of future astronauts and for understanding and controlling fire here on Earth. The Confined Combustion investigation examines the behavior of flame as it spreads in differently-shaped confined spaces in microgravity. Studying flames in microgravity gives researchers a better look at the underlying physics and basic principles of combustion by removing gravity from the equation.

NASA is launching the Robotic Tool Stowage (RiTS), a docking station that allows the Robotic External Leak Locator (RELL) units to be stored on the outside of space station, making it quicker and simpler to deploy the instruments. Outside storage eliminates the need to rely on crew member and airlock availability to move a unit to the outside. These capabilities can be applied to any place that humans live in space, including Gateway and eventually habitats on the Moon, Mars and beyond.

Rodent Research-19 (RR-19) investigates myostatin (MSTN) and activin, molecular signaling pathways that influence muscle degradation, as possible targets for preventing muscle and bone loss during spaceflight and enhancing recovery following return to Earth. This study also could support the development of therapies for a wide range of conditions that cause muscle and bone loss on Earth.