SPACEX CRS-12 MISSION OVERVIEW

SpaceX's twelfth contracted cargo resupply mission with NASA to the International Space Station will deliver more than 6,400 pounds of science and research, crew supplies and vehicle hardware to the orbital laboratory and its crew. Launch is targeted for Monday, Aug. 14, 2017.

The Dragon spacecraft will launch aboard a Falcon 9 rocket from Launch Complex 39A at NASA's Kennedy Space Center in Florida and arrive at the space station August 16. **Expedition 52** crew members Peggy Whitson, Jack Fischer and Randy Bresnik of NASA, Paolo Nespoli of ESA (European Space Agency) and cosmonauts Fyodor Yurchikhin and Sergey Ryazanskiy of Roscosmos are currently living aboard the orbiting laboratory. Fischer and Nespoli will use the station's robotic arm to capture Dragon when it arrives on station. The spacecraft will be berthed to the Earth-facing port on the Harmony module.

Dragon will carry hardware and supplies to support dozens of the of approximately 250 science and research investigations that will occur during Expeditions 52 and 53. The unpressurized trunk of the spacecraft will also hold the Cosmic-Ray Energetics and Mass investigation (CREAM) to measure the charges of cosmic rays over a period of three years to address fundamental science questions about our universe.

TOTAL CARGO:	**6415.4 lbs. / 2910 kg**
TOTAL PRESSURIZED CARGO WITH PACKAGING:	**3642 lbs. / 1652 kg**
• *Science Investigations*	*2019.4 lbs. / 916 kg*
• *Crew Supplies*	*485 lbs. / 220 kg*
• *Vehicle Hardware*	*747.4 lbs. / 339 kg*
• *Spacewalk Equipment*	*66.1 lbs. / 30 kg*
• *Computer Resources*	*116.8 lbs. / 53 kg*
UNPRESSURIZED	**2773.4 lbs. / 1258 kg**
• *Cosmic-Ray Energetics and Mass (CREAM)*	*2773.4 lbs. / 1258 kg*

Installation and Undocking Overview:
About 10 minutes after launch, Dragon reaches its preliminary orbit. It then deploys its solar arrays and begins a carefully choreographed series of thruster firings to reach the space station. After a two-day trip, Jack Fischer will use the station's 57.7-foot (17.6-meter) robotic arm to reach out and capture the Dragon spacecraft as they operate from the station's Cupola. Ground commands will be sent for the station's arm to install Dragon on the bottom side of the Harmony module for its stay at the International Space Station. By the next day, the crew will pressurize the vestibule between the station and Dragon and open the hatch that leads to the forward bulkhead of Dragon.

During the next four weeks, the crew will unload the spacecraft and reload it with cargo to return to Earth. About five and a half hours after it departs the station, it will splash down in the Pacific Ocean off the coast of Baja California.

SPACEX CRS-12 SCIENCE OVERVIEW

The twelfth SpaceX cargo resupply launch to the International Space Station will deliver investigations and facilities that study cosmic rays, protein crystal growth, a nanosatellite technology demonstration, and more. Highlights include:

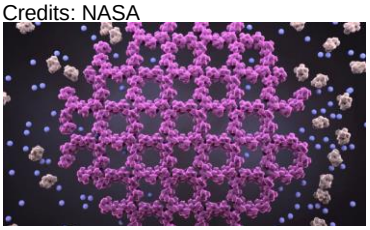
The Cosmic Ray Energetics and Mass (CREAM) instrument, attached to the Japanese Experiment Module Exposed Facility, measures the charges of cosmic rays ranging from hydrogen to iron nuclei. The data collected from the CREAM instrument will be used to address fundamental science questions on the origins and history of cosmic rays. CREAM's three-year mission will help the scientific community build a stronger understanding of the fundamental structure of the universe.

Crystallization of Leucine-rich repeat kinase 2 (LRRK2) under Microgravity Conditions (CASIS PCG 7) will use the orbiting laboratory's microgravity environment to grow larger versions of this important protein, implicated in Parkinson's disease. Developed by the Michael J. Fox Foundation, Anatrace and Com-Pac International, researchers will look to take advantage of the station's microgravity environment which allows protein crystals to grow larger and in more perfect shapes than earth-grown crystals, allowing them to be better analyzed on Earth. Defining the exact shape and morphology of LRRK2 would help scientists to better understand the pathology of Parkinson's and aid in the development of therapies against this target.

The Kestrel Eye (NanoRacks-KE IIM) investigation is a microsatellite carrying an optical imaging system payload, including a Commercial Orbital Transportation System telescope. This investigation validates the concept of using microsatellites in low-Earth orbit to support critical operations, such as providing lower-cost Earth imagery in time-sensitive situations such as tracking severe weather and detecting natural disasters. Sponsored by the space station U.S. National Laboratory, the overall mission goal for the investigation is to demonstrate that small satellites are viable platforms for providing critical path support to operations and hosting advanced payloads.

The Effect of Microgravity on Stem Cell Mediated Recellularization (Lung Tissue) uses the microgravity environment of space to test strategies for growing new lung tissue. Using bioengineering techniques, the Lung Tissue investigation cultures different types of lung cells in controlled conditions aboard the space station. The cells are grown in a specialized framework that supplies them with critical growth factors so that scientists can observe how gravity affects growth and specialization as cells become new lung tissue. Tissue mimic models such as this also have the potential to be used for assessing drug or chemical toxicity by biotechnology and pharmaceutical companies and could allow for rapid testing of new chemicals and compounds, considerably lowering the overall costs for research and development of new drugs. The ultimate goal of this investigation is to produce bioengineered human lung tissue that can be used as a predictive model of human responses allowing for the study of lung development, lung physiology or disease pathology.

View of the CREAM instrument prior to launch aboard a long-duration balloon. The instrument will gather higher energy data from its mounted location on the exterior of station
Credits: NASA



CASIS PCG 7 will use the orbiting laboratory's microgravity environment to grow larger and more perfectly shaped protein crystals to better understand the pathology of Parkinson's and aid in therapies.
Credits: NASA

Human lung scaffold pieces (0.5 mm3) can be made, for use as a scaffold to support growth of bioengineered lung for research studies like Lung Tissue.
Credits: Joan Nichols