SpaceX Dragon to deliver research to Space Station

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This is the explosion of a massive star blazes, or a supernova, observed by the NASA Hubble Space Telescope. The bright spot at top right of the image is a stellar blast, called a supernova. The Neutron Star Interior Composition Explorer (NICER) investigation, affixed to the exterior of the International Space Station, studies the physics of these stars, providing new insight into their nature and behavior. Credit: NASA, ESA, A.V. Filippenko (University of California, Berkeley), P. Challis (Harvard-Smithsonian Center for Astrophysics), et al.

SpaceX is scheduled to launch its Dragon spacecraft for its eleventh

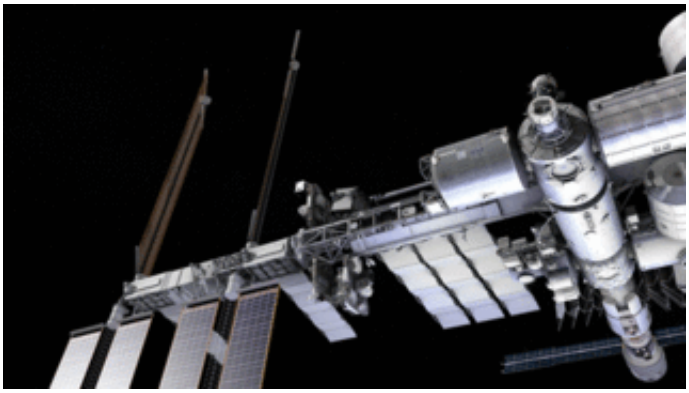
commercial resupply mission to the International Space Station June 1 from NASA's Kennedy Space Center's historic pad 39A. Dragon will lift into orbit atop the Falcon 9 rocket carrying crew supplies, equipment and scientific research to crewmembers living aboard the station.

The flight will deliver investigations and facilities that study neutron stars, osteoporosis, solar panels, tools for Earth-observation, and more. Here are some highlights of research that will be delivered to the orbiting laboratory:

New solar panels test concept for more efficient power source

Solar panels are an efficient way to generate power, but they can be delicate and large when used to power a spacecraft or satellites. They are often tightly stowed for launch and then must be unfolded when the spacecraft reaches orbit. The Roll-Out Solar Array (ROSA), is a solar panel concept that is lighter and stores more compactly for launch than the rigid solar panels currently in use. ROSA has solar cells on a flexible blanket and a framework that rolls out like a tape measure. The technology for ROSA is one of two new solar panel concepts that were developed by the Solar Electric Propulsion project, sponsored by NASA's Space Technology Mission Directorate.

The new solar panel concepts are intended to provide power to electric thrusters for use on NASA's future space vehicles for operations near the Moon and for missions to Mars and beyond. They might also be used to power future satellites in Earth orbit, including more powerful commercial communications satellites. The demonstration of the deployment of ROSA on the space station is sponsored by the Air Force Research Laboratory.



This is the Neutron Star Interior Composition Explorer (NICER) payload, affixed to the exterior of the space station, will study the physics of neutron stars, providing new insight into their nature and behavior Credit: NASA

Investigation studies composition of neutron stars

Neutron stars, the glowing cinders left behind when massive stars explode as supernovas, are the densest objects in the universe, and contain exotic states of matter that are impossible to replicate in any ground lab. These stars are called "pulsars" because of the unique way they emit light - in a beam similar to a lighthouse beacon. As the star spins, the light sweeps past us, making it appear as if the star is pulsing. The Neutron Star Interior Composition Explorer (NICER) payload, affixed to the exterior of the space station, studies the physics of these stars, providing new insight into their nature and behavior.

Neutron stars emit X-ray radiation, enabling the NICER technology to observe and record information about its structure, dynamics and energetics. In addition to studying the matter within the neutron stars, the payload also includes a technology demonstration called the Station Explorer for X-ray Timing and Navigation Technology (SEXTANT), which will help researchers to develop a pulsar-based, space navigation

system. Pulsar navigation could work similarly to GPS on Earth, providing precise position for spacecraft throughout the solar system.

Investigation studies effect of new drug on osteoporosis

When people and animals spend extended periods of time in space, they experience bone density loss, or osteoporosis. In-flight countermeasures, such as exercise, prevent it from getting worse, but there isn't a therapy on Earth or in space that can restore bone that is already lost. The Systemic Therapy of NELL-1 for osteoporosis (Rodent Research-5) investigation tests a new drug that can both rebuild bone and block further bone loss, improving health for crew members.

This is Hurricane Edouard, as observed by NASA astronaut Reid Wiseman during Expedition 41. The MUSES platform will host Earth-viewing instruments such as high-resolution digital cameras and provide information like disaster relief information. Credit: NASA

Exposure to microgravity creates a rapid change in bone health, similar

to what happens in certain bone-wasting diseases, during extended bed rest and during the normal aging process. The results from this ISS National Laboratory-sponsored investigation build on previous research also supported by the National Institutes for Health and could lead to new drugs for treating bone density loss in millions of people on Earth.

Research seeks to understand the heart of the matter

Exposure to reduced gravity environments can result in cardiovascular changes such as fluid shifts, changes in total blood volume, heartbeat and heart rhythm irregularities, and diminished aerobic capacity. The Fruit Fly Lab-02 study will use the fruit fly (Drosophila melanogaster) to better understand the underlying mechanisms responsible for the adverse effects of prolonged exposure to microgravity on the heart. Flies are smaller, with a well-known genetic make-up, and very rapid aging that make them good models for studying heart function. This experiment will help to develop a microgravity heart model in the fruit fly. Such a model could significantly advance the study of spaceflight effects on the cardiovascular system and facilitate the development of countermeasures to prevent the adverse effects of space travel on astronauts.

Investigation shapes the way humans survive in space

Currently, the life-support systems aboard the space station require special equipment to separate liquids and gases. This technology utilizes rotating and moving parts that, if broken or otherwise compromised, could cause contamination aboard the station. The Capillary Structures investigation studies a new method of water recycling and carbon dioxide removal using structures designed in specific shapes to manage fluid and gas mixtures. As opposed to the expensive, machine-based processes currently in use aboard the station, the Capillary Structures equipment is made up of small, 3-D printed geometric shapes of varying

sizes that clip into place.

Using time lapse photography, on-ground research teams will observe how liquids evaporate from these capillary structures, testing the effectiveness of the varying parameters. Results from the investigation could lead to the development of new processes that are simple, trustworthy, and highly reliable in the case of an electrical failure or other malfunction.

Facility provides platform for Earth-observation tools

Orbiting approximately 250 miles above the Earth's surface, the space station provides views of the Earth below like no other location can provide. The Multiple User System for Earth Sensing (MUSES) facility, developed by Teledyne Brown Engineering, hosts Earth-viewing instruments such as high-resolution digital cameras, hyperspectral imagers, and provides precision pointing and other accommodations.

This National Lab-sponsored investigation can produce data to be used for maritime domain awareness, agricultural awareness, food security, disaster response, air quality, oil and gas exploration and fire detection.

These investigations will join many other investigations currently happening aboard the space station. Follow @ISS_Research for more information about the science happening on station.

Provided by NASA