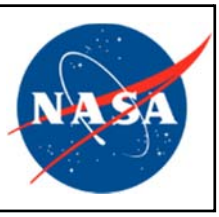
SpaceX CRS-7

Seventh Commercial Resupply Services Flight to the International Space Station

National Aeronautics and Space Administration



June 2015

OVERVIEW

The Dragon spacecraft will be filled with more than 5,000 pounds of supplies and payloads, including critical materials to directly support over 30 student research investigations and more than 35 of approximately 250 science and research investigations that will occur during Expeditions 44 and 45. Science payloads will offer new insight to combustion in microgravity, perform the first space-based observations of meteors entering Earth's atmosphere, continue solving potential crew health risks and make new strides towards being able to grow food in space. Dragon also will use its unpressurized trunk to deliver the first International Docking Adapter to enable future commercial crew vehicles to dock to the station. After more than five weeks at the space station, the spacecraft will return with more than 1,400 pounds of cargo, including crew supplies, hardware and computer resources, science experiments, space station hardware, and trash.

DRAGON CARGO

	LAUNCH ITEMS	RETURN ITEMS
TOTAL CARGO:	**5275 lbs / 2393 kg**	**1366 lbs / 620 kg**
• Crew Supplies	1490 lbs / 676 kg	70 lbs / 32 kg
Crew care packages		
Crew provisions		
Food		
• Vehicle Hardware	1016 lbs / 461 kg	44 lbs / 20 kg
Crew Health Care System hardware		
Environment Control & Life Support equipment		
Electrical Power System hardware		
Flight Crew Equipment		
Japan Aerospace Exploration Agency equipment		
• Science Investigations	1166 lbs / 529 kg	668 lbs / 303 kg
U.S. investigations		
Japan Aerospace Exploration Agency investigations		
European Space Agency investigations		
• Computer Resources	77 lbs / 35 kg	2 lbs / 1 kg
Command and Data Handling		
Photo and TV equipment		
• EVA equipment	366 lbs / 166 kg	361 lbs / 164 kg
• Misc Return Cargo/Trash	---	220 lbs/ 100 kg
• Unpressurized Cargo	1160 lbs / 526 kg	---
International Docking Adapter #1		
Total weight of cargo with packaging	5461 lbs / 2477 kg	1488 lbs / 675 kg

RENDEZVOUS AND RETURN

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, NASA astronaut Scott Kelly and Russian cosmonaut Gennady Padalka 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 from Houston 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 five 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. This is the seventh mission under the modified SpaceX Commercial Resupply Services contract with NASA.

SpaceX CRS-7

Seventh Commercial Resupply Services Flight to the International Space Station

National Aeronautics and Space Administration

RESEARCH HIGHLIGHTS

Group Combustion

The Group Combustion investigation by the Japan Aerospace Exploration Agency tests a theory that fuel sprays change from partial to group combustion as flames spread across a cloud of droplets. In the Multi-purpose Small Payload Rack in the Kibo module, droplets of decane, a component of gasoline or kerosene, are arranged randomly on thin-fiber lattice points, and the flame and droplet positions and temperature distribution are measured as the flame spreads. Microgravity blocks convection, which on Earth would quickly disperse the droplets and combustion products before such measurements could be made.

Meteor Composition Determination (Meteor)

Meteor makes the first space-based observations of the chemical composition of meteors entering Earth's atmosphere. Meteors are relatively rare and are difficult to monitor from the ground because of the interference created by Earth's atmosphere. The Meteor investigation takes high-resolution video and images of the atmosphere and uses a software program to search for bright spots, which can later be analyzed on the ground.

Telomeres

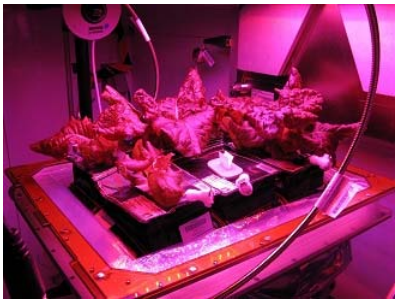
Telomeres are "caps" on the ends of chromosomes that protect them from fraying, much like the end of a shoelace, and an enzyme, called telomerase, maintains their length. Telomeres shorten over time, and the rate at which this occurs can be increased by stress, leading to accelerated aging, cardiovascular disease, cancer, and an impaired immune system. The Telomeres investigation collects crew member blood samples to determine how telomeres and telomerase are affected by space travel.

Veg-03

Organisms grow differently in space, from single-celled bacteria to plants and humans. But future long-duration space missions will require crew members to grow their own food, so understanding how plants respond to microgravity is an important step toward that goal. Veg-03 uses the Veggie plant growth facility to cultivate a type of cabbage, which is harvested in orbit with samples returned to Earth for testing.

Student Experiments

More than 30 student experiments, including those from the Student Spaceflight Experiments Program and the National Design Challenge, will be flown on Dragon and returned at the end of its mission. Utilizing NanoRacks experiment modules and sponsored by the Center for the Advancement of Science in Space (CASIS), these studies will span a wide array of scientific disciplines. Some of the science objectives include testing a new hypothesis to simulate pollination in microgravity for food crops, investigating a new type of plastic to block radiation from the sun that could protect future astronauts on a journey to Mars, analyzing the performance of Solar Liquid Power, a new energy source which combines nanotechnology and electrochemistry in the form of a paint-like coating and more. These experiments are made possible by the station's role as a U.S. National Laboratory which is managed and supported by CASIS.



The Plant Pillows growing lettuce during the Veg-01 experiment. "Tokyo Bekana" cabbage is the test crop during Veg-03

Nighttime image of a meteor taken from station. The new Meteor study will analyze the space rock's composition.

Highlighted in pink are the telomeres located on the end of a chromosome, which shorten due to a variety of stressors on the human system.