SpaceX-3 Cargo By-The-Numbers and Science Highlights

Launch: Approximately 2.4 tons

Total weight of pressurized cargo: 3347 pounds/1518 kilograms
- Science and research: 1576 pounds/715 kilograms
- Crew supplies: 1049 pounds/476 kilograms
- Vehicle hardware: 449 pounds/204 kilograms
- Spacewalk tools: 271 pounds/123 kilograms
- Computer resources: 1.3 pounds/0.6 kilograms

Total weight of unpressurized cargo: 1261 pounds/571 kilograms

Total weight of secondary deployables: 62 pounds/ 28 kilograms

Return: Approximately 1.8 tons

Total weight of cargo: 3447 pounds/1563 kilograms
- Science and research 1633 pounds/741 kilograms
- Crew supplies: 349 pounds/158 kilograms
- Vehicle hardware: 828 pounds/376 kilograms
- Spacewalk tools: 627 pounds/285 kilograms
- Computer resources: 8 pounds /4 kilograms

SpaceX-3 Science Highlights

The cargo delivered to the space station on SpaceX-3 will support more than 150 investigations that will occur during Expeditions 39 and 40.

Science payloads are flying on Dragon that focus on:

- Demonstrating the potential for using a laser to transmit data to Earth from space
- Providing the necessary lighting and nutrient delivery for efficient plant growth in space
- Seek the cause of a depression in the human immune system while in microgravity
- Placing four commercially available high definition cameras on the exterior of the space station for use in streaming live video of Earth for online viewing

<u>Optical Payload for Lasercomm Science (OPALS)</u>
The Optical Payload for Lasercomm Science (OPALS) investigation tests the use of laser optics to transfer information to the ground. The switch from radio frequency to a laser beam—which can be hundreds to thousands of times narrower in comparison to

radio waves—could improve communication data rates by a factor of 10 to 100. This advanced approach stands to increase the amount of data future missions can send using the same power resources, optimizing research return.

Vegetable Production System (VEGGIE)
VEGGIE is a deployable plant growth unit capable of producing salad-type crops to provide the crew with appetizing, nutritious, and safe, fresh food and support crew relaxation and recreation. The VEGGIE unit provides lighting and nutrient delivery, but uses the cabin environment for temperature control and as a source of carbon dioxide to promote growth. This study will emphasize the focus on human habitability in space, since growing food in space may greatly improve long-duration spaceflight. VEGGIE can support a variety of experiments used to determine how plants sense and respond to gravity. The plants will be harvested for further investigation and, if found to be safe after study, consumed by the crewmembers. VEGGIE's growth volume will be the largest volume available to date for plant growth on the space station, which will enable growth of larger plants than was previously available due to size restrictions. This improved understanding of plant growth and development in microgravity has important implications for improving plant production on Earth.

T-Cell Activation in Space
The T-Cell Activation in Space investigation, which is funded by the National Institutes of Health, seeks to identify the defect in T-cell activation, an immune response used to fight foreign antigens, during microgravity exposure. This research also can help in understanding and treating a range of auto-immune diseases such as arthritis and diabetes. Identifying this defect may someday inhibit the decline of the immune system as a normal part of the aging process.

High Definition Earth Viewing (HDEV)
The HDEV investigation places four commercially available high definition cameras on the exterior of the space station for use in streaming live video of Earth for online viewing. The cameras are enclosed in a temperature-specific case and exposed to the harsh radiation of the space environment. Analysis of the effect of space on the video quality during the HDEV operational period may help engineers determine the best types of commercially available cameras to use on future missions. Using available products may be more cost-effective than designing new products. High school students helped design some of the cameras' components, through the High Schools United with NASA to Create Hardware program, and student teams will operate the experiment.