



# Payload Operations Integration Center

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## International Space Station Research Starts Here

The Payload Operations Integration Center is the science command post for the International Space Station or ISS. The operation center's unique capabilities allow science experts and researchers around the world to perform cutting-edge science in the unique space environment. Dedicated professionals at the center manage all NASA science activities on the ISS. Before and during the mission, the team trains astronauts and ground personnel on payloads, and coordinates the plans for payload activities with scientists and control centers around the world.

### ISS Fast Facts

**SPEED:** 17,500 mph. 25 times faster than speed of sound or 12 times faster than top speed of an F-16.

**ALTITUDE:** Orbits Earth ranging from 230 to 286 miles.

**PRESSURIZED VOLUME:** Equivalent to a five-bedroom house with two bathrooms, a gym and a 360-degree bay window.

**MASS:** 924,739 pounds. Equivalent to 320 automobiles.

**LENGTH:** 357 feet end to end. Equivalent to an American football field with end zones.

**CREW MEMBERS:** Ranges from three to six people.

#### ISS LAUNCH AND LOGISTICS CAPABILITIES:

- Dragon (cargo) and Cygnus (cargo) [United States]
- Soyuz (crew), Progress (cargo) [Roscosmos]
- Automated Transfer Vehicle, ATV (cargo) [ESA]
- H-II Transfer Vehicle, HTV (cargo) [JAXA]

#### ISS PARTNERS:

- CSA – Canadian Space Agency
- ESA – European Space Agency
- JAXA – Japan Aerospace Exploration Agency
- Roscosmos – Russian Federal Space Agency



### Did You Know?

- During the first 12 years of permanent ISS habitation, more than 1,500 investigations (research experiments) were conducted by researchers in 60+ countries.
- The U.S. ISS assembly started in 1998 and was finished in 2011. With assembly complete, the focus shifted to payload operations. The completion of ISS marked the first time modules built by different nations were successfully connected in space without first being tested together on the ground.
- NASA is budgeted 1/2 cent of every federal tax dollar within the national budget.

# How the ISS Benefits You

**Ultrasound from a Distance:** The American College of Surgeons uses ultrasound training methods developed for spaceflight to teach ultrasound to surgeons. These methods could be adapted for diagnosis of injuries and illnesses in remote locations on Earth, including rural areas, disaster areas, and the battlefield.

**Vaccine Development:** Studies of Salmonella bacteria on the ISS have identified the controlling gene responsible for its increased virulence in microgravity, resulting in the discovery of a candidate vaccine. Salmonella is one of the most common forms of food poisoning and a major cause of childhood death worldwide.

**Fluid Flow Models:** Capillary flow experiments on the ISS produced the first space-validated models describing fluid behavior, and may lead to models predicting fluid flows such as groundwater and high-performance wicks used in electronics cooling.

**Human-Like Space Robot Technology:** Robonaut's job on the ISS is demonstrating how a robot can manipulate mechanisms in a microgravity environment, operate in the space environment for extended periods of time, assist with station tasks, and eventually interact with the crew. General Motors co-developed this technology with NASA, and plans to use it in future advanced vehicle safety systems and manufacturing plant applications.

**Planetary Contamination and Monitoring:** A handheld device for rapid detection of biological and chemical substances on surfaces on the ISS is being used to assess fluids used in pharmaceutical processing. This technology has the potential to provide quick medical diagnostics in clinical applications and to provide environmental testing capabilities that may serve homeland security.



## Cancer Treatment Delivery:

The microgravity environment on ISS led the way for better methods of micro-encapsulation on Earth which is a process of forming micro-balloons containing various drug solutions, providing better drug delivery for several diseases including cancer and diabetes.



**Materials:** Studies in space have investigated the internal structure of fluids that change properties in response to magnetic fields, without additional gravitational effects. Resulting technology has promise to improve the design of structures, such as buildings and bridges, to better withstand earthquakes.

**Combustion:** Predicting the shape and temperature of burning gases is complicated on Earth due to buoyancy effects. However, combustion research in space allows researchers to observe the temperature and shape of flames leading to better computer models of flames. Understanding this phenomenon will help to improve the design and efficiency of combustion technologies such as engines and furnaces and can contribute to reducing pollution in the atmosphere.

For more benefits, visit here:

[http://www.nasa.gov/mission\\_pages/station/research/benefits/index.html](http://www.nasa.gov/mission_pages/station/research/benefits/index.html)

## Want to Learn More?

Read the latest ISS news:

<http://www.nasa.gov/station>

- Get your research on the ISS: click "Space Station for Researchers"
- ISS fun for students: click "Space Station for Kids"
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Touching lives by space technology:

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National Aeronautics and Space Administration

George C. Marshall Space Flight Center

Huntsville, AL 35812

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