



# International Space Station

The Payload Operations Integration Center at NASA's Huntsville Operations Support Center

The International Space Station (ISS) Payload Operations Integration Center at NASA's Marshall Space Flight Center in Huntsville, Alabama, is the heartbeat for space station research operations. As NASA's primary space station science command post, the payload operations team coordinates all U.S. scientific and commercial experiments on the station, synchronizes payload activities of international partners, and directs communications between researchers around the world and their onboard experiments.

The Payload Operations Integration Center, Laboratory Training Complex and simulation rooms used to prepare for space station expeditions are housed in the Huntsville Operations Support Center at Marshall. Some 250 miles overhead, the space station is used to study the impact of microgravity and other effects on various aspects of human life on Earth and in space. Astronauts conduct daily science experiments across a variety of fields, including human life sciences and physiology, physical and materials science, and Earth and space science.

Since 1998, more than 2,600 scientific investigations and experiments have been completed on station. In recent years, the number of science hours has more than doubled. To help the crew conduct record amounts of scientific study, the operations center is staffed 24 hours a day, 365 days a year, by three shifts of flight controllers.

The payload operations team integrates research timelines and requirements, schedules ground and crew training, plans the orbital research schedule, and ensures missions and experiments are safely executed. During each six-month space station research expedition, controllers manage payload resources on station, handle science communications with the crew, and oversee all transmissions to and from the orbiting research center. They process hundreds of payload commands in support of investigations each day, and continuously monitor the health and status of scientific instruments deployed on the space station.



SAFacts  
NASA

The Payload Operations Integration Center at NASA's Marshall Space Flight Center. (NASA)

Because the payload operations team works around the clock, they also conduct experiments remotely while the crew is sleeping. In this manner, science on the station continues even when the crew is busy with other activities. By serving as virtual extra crew members, the ground-based team increases experiment efficiency, which saves precious crew time for operations requiring a human touch. The Payload Operations Integration Center sends commands to the space station as fast as eight per second. It's their mission to ensure each crew and payload operations team member has the knowledge and resources to assist the scientists in achieving the best possible science results.

Each payload operations team member performs critical functions maximizing science return:

### **Payload Operations Director (POD)**

The Payload Operations Director manages day-to-day operations of payloads aboard the space station. This position is the single point of authority to the ISS Mission Control Center flight director at NASA's Johnson Space Center in Houston for all NASA payload operations. The POD oversees team members managing payload mission planning, ground commanding of space station payloads, communications with the crew, and use of the payload support, video and data systems. The POD ensures compliance with established safety requirements, flight rules and payload regulations.

### **Operations Controller (OC)**

The Operations Controller ensures scheduled research activities are accomplished safely and on time, while managing and tracking available resources. The OC monitors troubleshooting of onboard systems to identify possible impacts to payload operations, and coordinates resolution of potential anomalies.

### **Timeline Change Officer (TCO)**

The Timeline Change Officer assesses change requests for impacts to the existing science timeline, payload hardware assets and resources required for science, such as crew time and electrical power. The TCO evaluates requests by scientists for changes to the experiment timeline, and then implements changes to the science operations plan aboard the station.

### **Payload Rack Officer (PRO)**

The Payload Rack Officer provides real-time command and control for these NASA facilities: EXpedite PProcessing of Experiments to the Space Station (EXPRESS) Racks, Window Observational Research Facility (WORF), Minus Eighty-degree Laboratory Freezer for ISS (MELFI) and EXPRESS Logistics Carriers. The PRO coordinates and monitors use of Payload Support Systems resources, which includes power, water flow, vacuum and nitrogen gas usage for all NASA payload facilities and sub-rack payloads. The PRO configures the system to

allow flight controllers and remote users to send commands to their equipment on the space station.

### **Data Manager Coordinator (DMC)**

The Data Management Coordinator is responsible for command, control, data handling, communications and tracking for science payloads on the space station. The DMC manages the integrated high-data-rate Ku-band communications link between the ground and the station. This position manages data system traffic, downlink video, ensures ground data quality with NASA users and assesses data system change requests. The DMC also manages video coverage of research on the station while monitoring, configuring and coordinating the use of the video system.

### **Payload Communications Manager (PAYCOM)**

The Payload Communications Manager, using the call sign "Huntsville," is the primary communicator with the ISS astronaut crew regarding science operations. The PAYCOM enables researchers around the world to talk directly with the crew about experiments and manage payload conferences. Additionally, the PAYCOM reviews requests for changes to payload activity to assess impact on the crew.

### **Marshall Ground Control (MGC)**

The Marshall Ground control team ensures that all ground equipment such as servers, hardware and software are fully operational. They also make sure that all data is successfully sent to and received from the satellites.

### **Stowage**

The Stowage position daily evaluates onboard stowage and inventory, ensuring the crew has all parts and materials required for their research. Additionally, the stowage team identifies sites where the crew can store hardware when not in use, and helps maintain a database of locations and configurations of all payload science equipment.

### **Laboratory Training Complex**

During a mission, controllers sometimes encounter situations in which they need aid to resolve issues that arise while station astronauts perform experiments in space. The Laboratory Training Complex provides a hands-on training environment to support science operations aboard the space station. Physical mock-ups and glass rack models replicate station facilities and simulate flight and ground interfaces. Inside the complex, flight controllers practice station experiment operations before missions. The Laboratory Training Complex provides opportunities for the payload operations team at Marshall to train and familiarize themselves with flight facilities and experiments, including new station experiments. Some mock-up hardware was built through an educational program with regional high schools known as HUNCH, or High Schools United with NASA to Create Hardware.

National Aeronautics and Space Administration

**George C. Marshall Space Flight Center**

Huntsville, AL 35812

[www.nasa.gov/marshall](http://www.nasa.gov/marshall)

[www.nasa.gov](http://www.nasa.gov)