National Aeronautics and Space Administration

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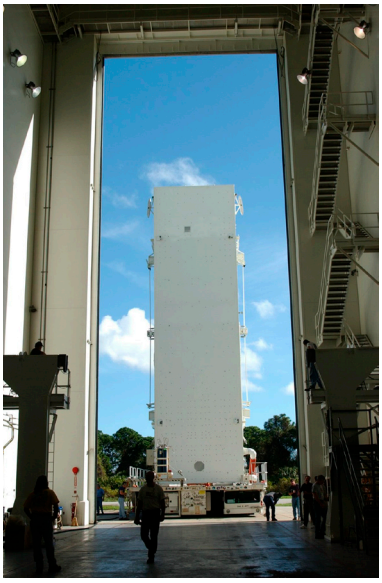
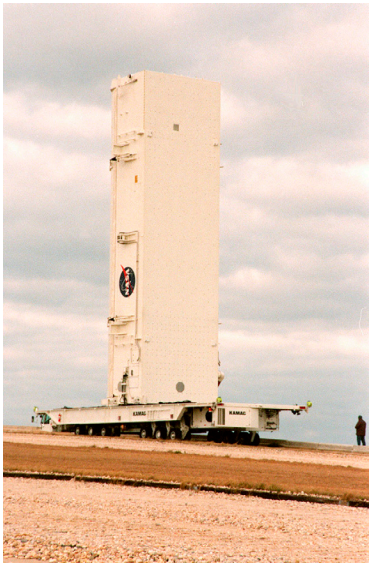
Canister Rotation Facility



A transportation canister rolls out of the Canister Rotation Facility after its rotation to the vertical position.



The STS-110 payload -- S0 truss for the International Space Station -- is transported to the pad inside the payload canister.

Rotating a Space Shuttle payload canister and the payloads it houses is no easy task, even for the highly skilled Multi-Mission Support Equipment (MMSE) team, better known as the "Can Crew." A special building (at left) – the Canister Rotation Facility (CRF) – was built in 1993 in the Industrial Area to help the team handle the challenges of canister rotation. The 142-foot high bay includes a 100-ton bridge crane and other specialized equipment required for lifting.

Size and weight of the payload canister and the payloads are some of the challenges the MMSE team faces. Each canister is 65 feet long. Empty, the canister weighs 107,000 pounds. With a payload, the canister weighs about 140,000 pounds.

Even so, the canisters periodically must be rotated to vertical or horizontal, depending on payload processing requirements. For example, processing of the STS-109 mission payload for Hubble Space Telescope Servicing Mission 3B required several rotations during payload processing and testing. Each rotation was particularly challenging because the payload had to be kept air-conditioned even during the rotation. Typically, payloads are disconnected from the air-conditioning system during the relatively brief period when rotation actually occurs.

After delivery of a vertical payload to the pad, the transportation canister is returned to the CRF to prepare for its next mission.

A power transfer from diesel to facility electric power is performed. The transporter is then aligned with four stanchions (upright supports) that will be utilized in demating the canister from the transporter. Ducts that provided conditioned air to the payload during its trip to the pad are disconnected and removed. The vertical canister is then rotated to the horizontal position using the CRF's 100-ton crane. In the horizontal position, the canister doors are opened via large pneumatic screws; processing for the next mission may now begin.

The first step is to open the canister doors and configure the trunnions (pins or pivots allowing an object to be raised or lowered). Rails are attached to either side of the canister via 14 bolts per rail. Retention fittings are then installed on the canister rails at predetermined locations to be aligned with the trunnions on the payload; the canister retention fittings hold the payload captive during transportation operations.

The second operation is to clean the entire interior of the canister, which is done with alcohol and approved clean-room wipes. Work starts on the doors and then moves down. After the alcohol cleaning, the interior is vacuumed and inspected for cleanliness.

The third operation is to verify that all the telemetry data is operational for the mission. This involves running a series of tests on the instrumentation and communication system. This system has sensors inside the canister to check accelerometers that are positioned in the canister for g-force movement, fires, temperature and any gases that are on board.

The last step is to close and lock the doors and run an air sample check for particulate and hydrocarbons. The canister is then deemed clean and configured for the next mission. The doors will not re-open until the canister begins mission operations at the designated payload processing facility.

Preparations on the transporter usually continue for several days after canister preparations have been completed. A thorough checkout of all transporter subsystems is performed prior to the caniser departing the CRF. The day prior to mission operations, the canister is powered up and moved to the CRF apron for steam cleaning; final transporter readiness is verified then.

During transportation from one of the payload processing facilities and the CRF, the canister is kept level via a complex system: The payload environmental transportation system (PETS) is a self-contained payload carrier capable of transporting payloads over the road for either short or long distances. Payload environmental parameters (a constant temperature and humidity level) inside the PETS are maintained during transport operations via the PETS' on-board environmental control system. It has gone as far as Denver to pick up a payload.

The single pallet rotation device is used to rotate payloads to the desired orientation at various payload processing locations throughout the Industrial Area at KSC (not the CRF).

It also requires the use of the payload strongback, a one-of-a-kind lifting device that supports various payload hoisting operations in the Space Shuttle Processing

The canister is lowered onto its receiving pedestals.

Facility and the Operations and Checkout facility, plus payload installations and removals from the orbiter.

It is 50 feet long, 13 feet wide, and has a bottom rail on either side that runs the entire length. The strongback rail is configured with downlink main and brace rods at locations provided by Boeing mechanical engineering. The strongback is capable of supporting single or multiple payload element handling operations.

During the early years of the Space Shuttle Program, canister rotation was performed in the Vehicle Assembly Building (VAB). Two cranes and much hands-on maneuvering were required to rotate the canister. In addition, a 15-mile round trip from payload processing facilities located in the Industrial Area to the VAB was required. The specifically designed CRF made a huge improvement in the operation. It meant using the right tool for the right job.

Technicians prepare to install a huge locking pin through the spreader bar and crane hook used to rotate the payload canister in the CRF.

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