NASA video shows GPM's journey to Japan

January 17 2014

GPM on its last truck. On the back of the shipping container sits the Environmental Control Unit (left), as well as its generator (green on the right). The ECU has heaters and air conditioners to regulate temperature and humidity as well as filters on the air vents to keep out any contaminants. Credit: NASA Goddard/Michael Starobin

(Phys.org) —Pack it up, put it on a plane and fly it to Japan. It sounds simple enough, but a new video from NASA shows when your package is a satellite, it's anything but.

NASA's new video, "GPM's Journey to Japan," highlights the unique shipment of the Global Precipitation Measurement mission's Core Observatory by air, land and sea. Built at NASA's Goddard Space Flight Center in Greenbelt, Md., the GPM spacecraft travelled roughly 7,300 miles (11,750 kilometers) to its launch site at Tanegashima Space Center on Tanegashima Island, Japan, where it is scheduled for liftoff on Feb. 27, 2014, at 1:07 p.m. EST.

GPM's Core Observatory is a joint mission between NASA and the Japan Aerospace Exploration Agency to study rainfall and snowfall around the globe, including the type of weather and storms that the Core Observatory previewed on its trans-Pacific journey.

During the video, viewers will see that unlike missions launching from the United States that are trucked or flown to their launch site, GPM traveled by truck, plane and boat to get to the launch site in Japan. Its shipping container went through half-a-dozen transfers among the various modes of transportation. GPM's transportation was unique because of the complexity of the journey, said Art Azarbarzin, GPM's project manager at Goddard.

The logistics took more than two years to plan, with hundreds of details from customizing GPM's container and the truck that transferred it to the U.S. Air Force Super Galaxy C-5 cargo plane; arranging the flight, the cargo ship and cranes to move the container; lining up wide-load permits in the United States and Japan; and working with Japanese customs. Then there was the task of organizing people involved. The GPM mechanical team worked with the U.S. Air Force crew to load and unload the C-5, then worked with Japanese contractors who managed the cranes and transported the support equipment.

"It was above and beyond the mundane stuff," said Jean Manall, of Goddard's Logistics and Project Support Branch, who led the effort. "I

can ship a spacecraft down to Kennedy [Space Center in Florida] with my eyes closed, you know, but this involved a lot more."

In its big white shipping container, the GPM spacecraft traveled by truck from Goddard to Joint Base Andrews in Maryland where it was loaded aboard a U.S. Air Force Super Galaxy C-5 cargo plane. On Nov. 21, 2013, the C-5 took off from Maryland, flying north. When strong headwinds prevented the originally planned in-flight refuel, the C-5 landed at Elmendorf Air Force Base in Anchorage, Alaska, to gas up. Then a winter storm swept in, and the two-hour stopover turned into two days.

The unexpected landing threw off GPM's timetable, and Manall was on the phone as soon as the plane landed, calling ahead to adjust the arrangements already in place in Japan. Two members of her team, Mike Miller and Neil Patel of Goddard, were busy setting up a different sort of refuel: diesel for the generator that ran the environmental control unit on the shipping container. Anchorage was at below-freezing temperatures, and despite the satellite being designed for space, the GPM engineering team wanted to avoid any condensation inside the shipping container.

"It's the relative humidity that's the driving concern," said Miller. He and Patel had customized the shipping container for GPM and were responsible for monitoring the spacecraft conditions 24/7 throughout the journey. Humidity and any subsequent condensation of water are bad for the electronics, so the air conditioners and heaters on the environmental control unit are programmed to keep the humidity below 60 percent and the temperature, which contributes to how much moisture the air can hold, between 60 F and 80 F. Sensors inside the shipping container sent real-time data to a laptop that monitored conditions throughout the trip. They also recorded shock and vibration to see if the spacecraft was getting shaken up at all. It wasn't. In fact, said Miller, the readings were

steady and within their specifications for the entire flight.

On Nov. 23, the C-5 continued on to Japan, crossing the international date line and landing at Kitakyushu Airport on Nov. 24. After being loaded onto another truck, the GPM shipping container traveled about a mile to the port where a cargo ship was waiting. Weather again interrupted the journey, when winds and rough seas forced the freighter to anchor for 24 hours at the port of Saiki, halfway down the coast of Kyushu Island. Miller and Patel, who were on the freighter as well, spent most of the downtime sleeping off the time change.

The freighter arrived at Tanegashima Island on Nov. 26, and the container was offloaded to another truck. After waiting until midnight, when the roads would be clear of traffic, the GPM Core Observatory travelled the last few miles to Tanegashima Space Center.

"It was pretty emotional last night when the thing went in the air lock," Manall said afterward. "It was like, phew!"

The spacecraft had arrived safely and with no problems, despite the delays.

Early the next morning, the GPM mechanical team was back on deck, suited up to crack open the shipping container and move the spacecraft into the clean room. There, the satellite began the first of its final inspections and performance tests to ensure that it's ready for launch.

Provided by NASA