

James Webb Space Telescope

Milestone achievements in 2010

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Key Achievement:

The Mission Critical Design Review (MCDR) for NASA's James Webb Space Telescope was successfully completed, confirming that the integrated observatory will meet all science and engineering requirements for the mission.

Mirrors

- Two mirror segments, one an engineering development unit and the other the first flight segment, were polished to their exact prescriptions and verified at operational cryogenic temperatures.
- These mirror segments, along with the tertiary and fine steering mirrors, progressed to the last step in the mirror manufacturing process: undergoing an ultra-thin coating of gold to increase reflective properties. This sets the stage for the remaining 17 flight segments to follow in the polishing and gold-coating process.

- Webb teammate ITT verified placement accuracies for robotic mirror installation equipment that installs the mirror segments onto the backplane. The segments' position will be fine-tuned to tolerances of a fraction of the width of a human hair.
- Mirror control electronics for the first flight mirror were completed.

Thermal Performance

- Substantial progress was made in validating and optimizing thermal performance in systems engineering.
- Data from tests performed on a two-story facsimile of the telescope's core section was successfully correlated to within 10-15% of cryogenic heat flow, i.e., out of 100,000 milliwatts, the heat flow in the core region is understood to a handful of milliwatts.

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Sunshield

- Completion of a one-third scale model test in a thermal vacuum chamber verified that the sunshield design can block and redirect the sun's energy before it reaches the telescope.
- Accuracy of computer thermal models used to predict how the full-size sunshield will perform was verified.
- Testing was completed on a full-scale light line test fixture that simulates the precise shadow cast by the sunshield in which the telescope will operate.
- Three sunshield test articles underwent launch depressurization simulations to verify how the intricately folded sunshield membranes will perform under a rapid loss of pressure during launch. Tests showed the membranes stayed in their stowed shape and allowed trapped air to escape safely, both critical to sunshield deployment and performance.
- Tests have begun with a Light Detection and Ranging device (LIDAR) which can see through a window into the chamber and measure the shape of layer 5, the coldest

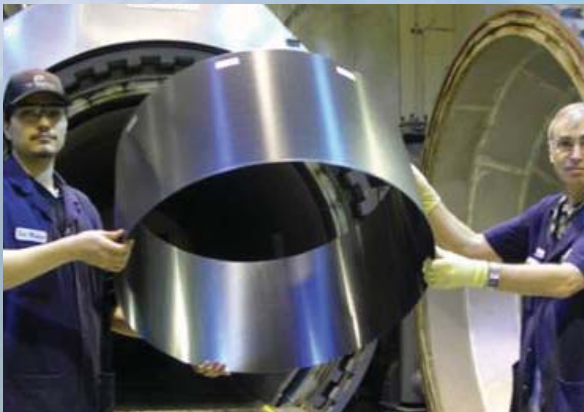
layer, near its cryogenic operating temperature, approximately 77°K (-320.8°F). This test will allow engineers to confirm whether the computer model's prediction of shape at temperature is correct.

- Template layer manufacturing is underway for the sunshield – the first step before manufacturing the flight sunshield.

Deployment Tower Assembly

- Progress was made on the deployment tower assembly which is a 9.6 ft. telescoping tower that supports the primary mirror. The deployment tower test article, the outer cylinder of a composite structure, was successfully tooled and bonded.
- Engineering model testing was completed for the spacecraft's Command and Data Handling system, the electronic brain that sends science data to the ground station.

The James Webb Space Telescope is a joint project of NASA, the European Space Agency and the Canadian Space Agency. Northrop Grumman is leading the design and development effort for the Webb telescope.



Deployment Tower Assembly (DTA) development article



Aft Optics Bench for Cryo Test



Sunshield Membrane Fixture

▼ www.northropgrumman.com/aerospacesystems