

# MARSHALL STAR

## NASA's James Webb Space Telescope Completes Second Round of Cryogenic Mirror Testing

By Kim Newton

The Marshall Space Flight Center has completed final cryogenic testing on 12 of the 18 mirror segments that will form NASA's James Webb Space Telescope's primary mirror. The eight-week test includes two test cycles in which the mirrors were chilled down to -379 Fahrenheit, then back to ambient temperature to ensure the mirrors respond as expected in the extreme temperatures of space.

*Image right: NASA completes final cryogenic testing on 12 of the 18 mirror segments that will form NASA's James Webb Space Telescope's primary mirror. (NASA/MSFC/Emmett Given)*



During the recent round of cryogenic testing, a second set of six primary mirror segments was subjected to extreme temperatures in the 7,600 cubic-foot helium-cooled vacuum chamber, which permits engineers and scientists from Ball Aerospace and Technologies Corp., in Boulder, Colo., and the University of Alabama in Huntsville to measure in extreme detail how the shape of the mirrors change as they cool -- just as each mirror will change shape when exposed to a range of operational temperatures in space.

The X-ray and Cryogenic Facility at the Marshall Center provides the space-like environment to help engineers and scientists measure the mirror segments to see how well the telescope will image infrared sources once in orbit. The cryogenic test series will help NASA predict how well the telescope will read infrared sources in those conditions.

The final cryogenic test will confirm the exacting processes that have resulted in flight mirrors manufactured to tolerances as tight as 20 nanometers or less than a millionth of an inch. The final six mirror assemblies will arrive at Marshall in late fall to begin testing, and be completed by the end of the calendar year.

Each mirror segment measures approximately 4.3 feet in diameter to form the 21.3-foot hexagonal telescope mirror assembly critical for infrared observations. Each of the 18 hexagonal-shaped mirror assemblies weighs approximately 88 pounds. The mirrors are made of a light and strong metal called beryllium, and coated with a microscopically thin coat of gold, enabling the mirror to efficiently collect light.

The Webb telescope is predicted to be the most scientifically powerful telescope NASA has ever built -- 100 times more powerful than the Hubble Space Telescope. The Webb telescope will find the first galaxies that formed in the early universe, connecting the Big Bang to our own Milky Way Galaxy. It will also peer through dusty clouds to see stars and planets being born, connecting star formation in our own galaxy with the solar system.

The telescope is a combined project of NASA, the European Space Agency and the Canadian Space Agency. Northrop Grumman is the prime contractor under NASA's Goddard Space Flight Center. Ball Aerospace & Technologies Corp. in Boulder, Colo., is responsible for mirror development. L-3- Tinsley Laboratories Inc. in Richmond, Calif., is responsible for mirror grinding and polishing.

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