

James Webb Space Telescope coming together over next two years

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The full-scale James Webb Space Telescope model was at South by Southwest in Austin. Credit: NASA/Chris Gunn

The year 2015 marked big progress on NASA's James Webb Space Telescope and there are still a number of large milestones before the next generation telescope is launched in 2018. Recently, all of the 18

segments of the Webb telescope primary mirror segments were installed on the observatory's backplane at NASA's Goddard Space Flight Center in Greenbelt, Maryland. But that's just one component of the Webb.

Over the next two years, more components of the Webb will be integrated onto the spacecraft and it will visit three more locations before launch.

"From 2016 to 2018, there are installations and tests for the telescope and the telescope plus the instruments, followed by shipping to NASA's Johnson Space Center in Houston, Texas where end-to-end optical testing in a simulated cryo-temperature and vacuum space environment will occur," said Paul Geithner, Webb telescope manager - Technical, at NASA Goddard. "Then all the parts will be shipped to Northrop Grumman for final assembly and testing, then to French Guiana for launch."

Here is a general list of milestones before launch:

At NASA Goddard:

- Aft-Optics System installation
- Secondary mirror installation
- Integrated Science Instrument Module (ISIM) Installation into Telescope Structure
- Metrology [test](#) of Telescope and Instruments
- Vibration test of Telescope and Instruments
- Acoustic test of Telescope and Instruments

At NASA Johnson Space Center:

- Optical test of Telescope and Instruments in Chamber A

At Northrop Grumman:

- Assemble Spacecraft Element
- Finish Sunshield and Integrate into Spacecraft
- Assembling entire Observatory (Telescope and Instruments and Spacecraft)
- Observatory-level tests
- Transport to French Guiana

The two largest parts of the [observatory](#) are the primary mirror and the tennis-court-sized sunshield. Additionally, there are four scientific instruments—cameras and spectrographs with detectors able to record extremely faint signals—that will fly aboard Webb. All four flight science instruments were integrated into the Integrated Science Instrument Module (ISIM) in March 2014 and since have been undergoing multiple tests. However, the ISIM has not yet been added to the observatory.

Over the next year, teams at Goddard will work to complete the telescope by installing the other optics in addition to the [primary mirror](#) segments. The other optics include installing the aft-optics subsystem or AOS, secondary mirror and both fixed and deployed radiators. Once complete, engineers will connect the Telescope and instruments together when the ISIM is attached to the observatory.

Testing is a continuous part of the assembly process. "After the mating of the ISIM, to the Telescope there will be a room-temperature optical check before a simulated launch environment exposure," Geithner said. That means the observatory will undergo vibration and acoustic testing to ensure it can endure the sound and shaking that occurs during launch. After those tests, there is yet another room-temperature optical check.

Once all of those milestones are accomplished, the observatory will then

be prepared and flown to NASA's Johnson Space Center, Houston, Texas.

Once at Johnson, the observatory will endure end-to-end optical testing in a simulated cryo-temperature and vacuum space environment in Chamber-A. Chamber-A is NASA's giant thermal vacuum chamber where the Webb telescope pathfinder or non-flight replica was tested in April 2015.

After NASA Johnson the Webb telescope will be then transported to Northrop Grumman in Redondo Beach, California where engineers will connect the telescope and instruments together with the spacecraft and sunshield to form the complete Observatory. Once every component is together, more testing is done. That testing is called "Observatory-level testing." It's the last exposure to a simulated launch environment before flight and deployment testing on the whole observatory.

What follows the flight and deployment testing is the shipping of the complete observatory to the launch site in South America where the Webb telescope is slated to launch in 2018.

The James Webb Space Telescope is the scientific successor to NASA's Hubble Space Telescope. It will be the most powerful space [telescope](#) ever built. Webb is an international project led by NASA with its partners, the European Space Agency and the Canadian Space Agency.

Provided by NASA's Goddard Space Flight Center

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