

# A CELESTIAL Game Changer

By Omar Torres and Caroline Briselli

For almost a quarter century, some of the brightest minds at Northrop Grumman have been quietly perfecting an engineering marvel that promises to change our understanding of the universe, ushering in the next generation of space exploration. Able to peer 13.5 billion years into the past in its search for alien worlds, the James Webb Space Telescope is gearing up for its home stretch to launch.

## 1. Tale of Two Halves

On August 23, 2019, months of preparation coalesced into a nail-biting day as the teams working on the optical telescope and the spacecraft bus carefully joined them together — lifting the telescope over the spacecraft bus, then slowly, painstakingly lowering it.

The result was the historic full integration of the James Webb Space Telescope (Webb), as well as the integration of the formerly separate optical telescope and spacecraft bus teams.

## 2. Mega Sunshield: A Herculean Effort

As an infrared telescope, Webb must be kept incredibly cold to ensure that its own heat doesn't interfere with its ability to detect small changes in temperature at the edges of the universe. Hence, the monumental importance of the five-layer sunshield, which

helps protect the telescope from the sun's heat.

In October 2019, the sunshield was deployed, layer by layer, into the same position it will take when it is a million miles from Earth.

"If you stand there long enough when the sunshield is fully tensioned and open, it's like the sunshield is breathing, as the layers slowly move up and down together due to small changes to air pressure," said Remy Verdeille, an engineer on Webb.

## 3. A Mirror Like No Other

The world's next great space observatory requires a primary mirror larger than any space telescope in history — its unprecedented size enabled by honeycomb-like sections that, when deployed, will fit together to create one full mirror.

In March, the team deployed the wings of the mirror — the first mirror deployment since the observatory was fully assembled.

## 4. Launch Realness: Inside a Rocket

To launch into space, Webb's tennis court-sized sunshield and primary mirror — six times the size of Hubble's — must be folded inside the Ariane 5 rocket.

To command and test the software systems and hardware components that simulate the

multiple stages of movement and deployment Webb will perform in space, the team got right down to business.

## 5. Choreography on Point

For Webb to deploy its sunshield and activate its cooling systems in space, the deployable tower assembly must extend 48 inches upward, creating a gap between Webb's massive gold-coated beryllium mirror and sunshield. To orchestrate this delicate operation, the team spent months preparing for a test that would only last several hours.

## 6. Systems a Go

When you're working on the largest, most technically complex and powerful space telescope ever built, testing is the name of the game.

For the first time as an integrated and fully assembled observatory, Webb underwent a comprehensive systems evaluation to assess its electronic performance as a fully connected vehicle.

"I've always loved space and how infinite of a frontier it is," said Dillon Wessing, principal systems test engineer on Webb. "As a kid it was all about the Hubble. I now have an opportunity to work on the next generation and see Webb take our discoveries to the next level." **n**



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Engineer



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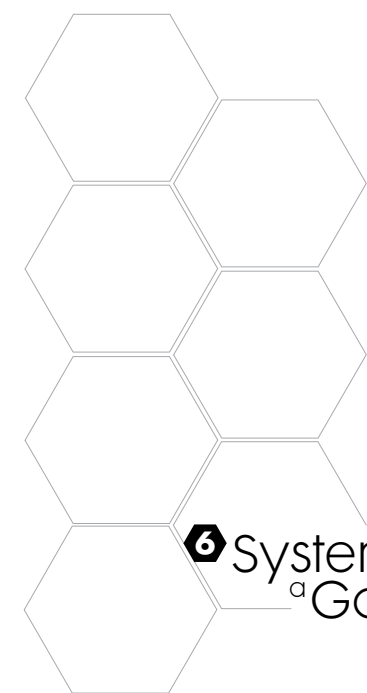
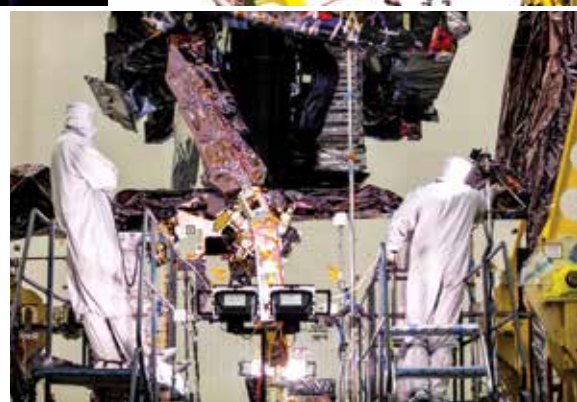
Choreography  
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