

NEXT ENGINEERS

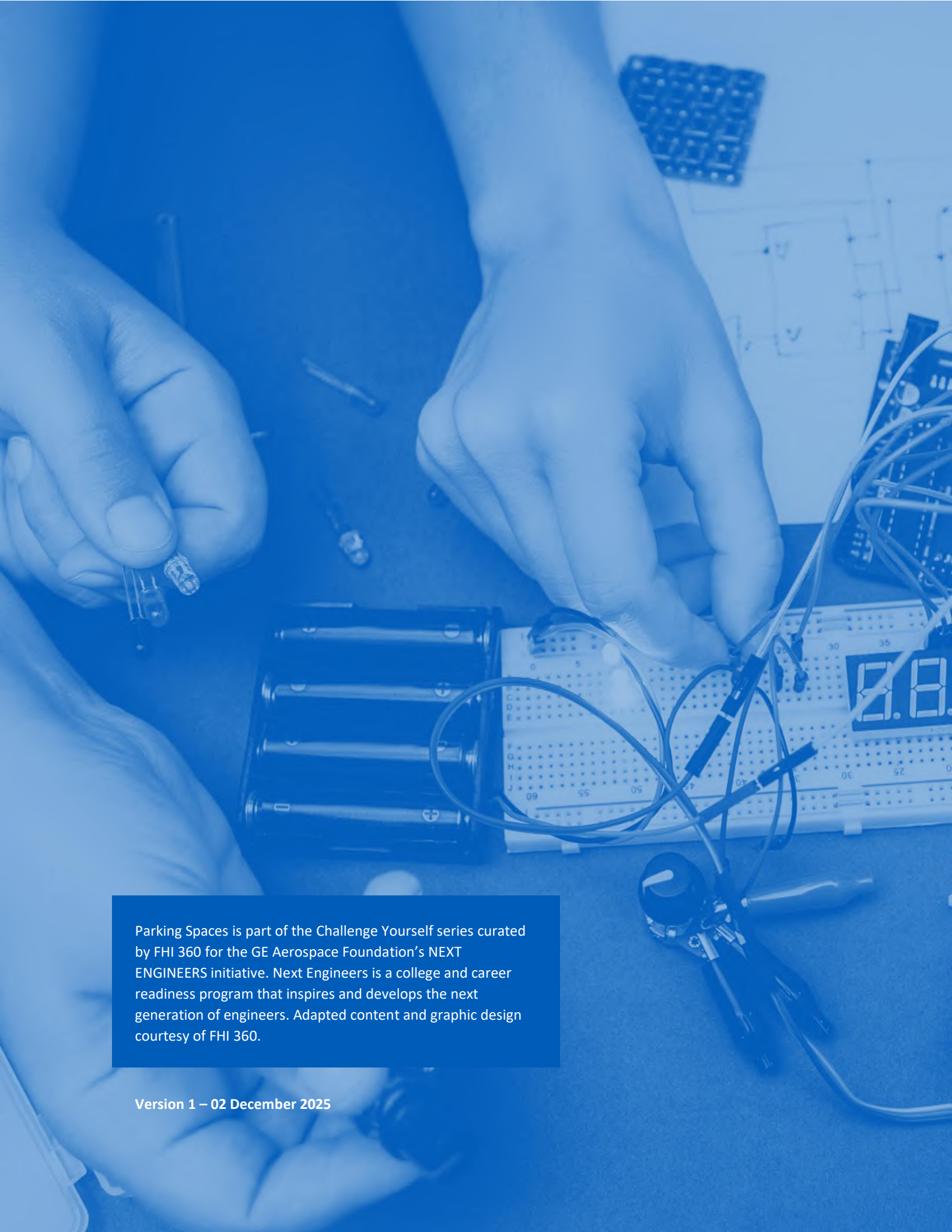


CHALLENGE YOURSELF

JWST Part 6:
Parking Spaces
Aerospace Engineering



NEXT ENGINEERS



Parking Spaces is part of the Challenge Yourself series curated by FHI 360 for the GE Aerospace Foundation's NEXT ENGINEERS initiative. Next Engineers is a college and career readiness program that inspires and develops the next generation of engineers. Adapted content and graphic design courtesy of FHI 360.

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The James Webb Space Telescope Part 6: Parking Space

NERD OUT

How to Park in Space

The James Webb Space Telescope is big. The primary mirror is 6.5 m (24 ft) high and the main heat shield is the size of a tennis court! Launching things into space is expensive. The heavier something is, the more expensive it is because it takes more fuel to escape Earth's gravity.

Therefore, it was not possible for Webb to take lots of extra fuel with it. This means that it needed to be parked somewhere safe and stable in space that did not need it to burn lots of fuel to stay put.

Thankfully there are five such parking spaces in the Sun-Earth system. They are called **Lagrange points** after the mathematician who calculated the position of the final two (L4 and L5) and are spots where the gravity of the Sun and Earth is perfectly balanced by the orbital motion of a satellite.

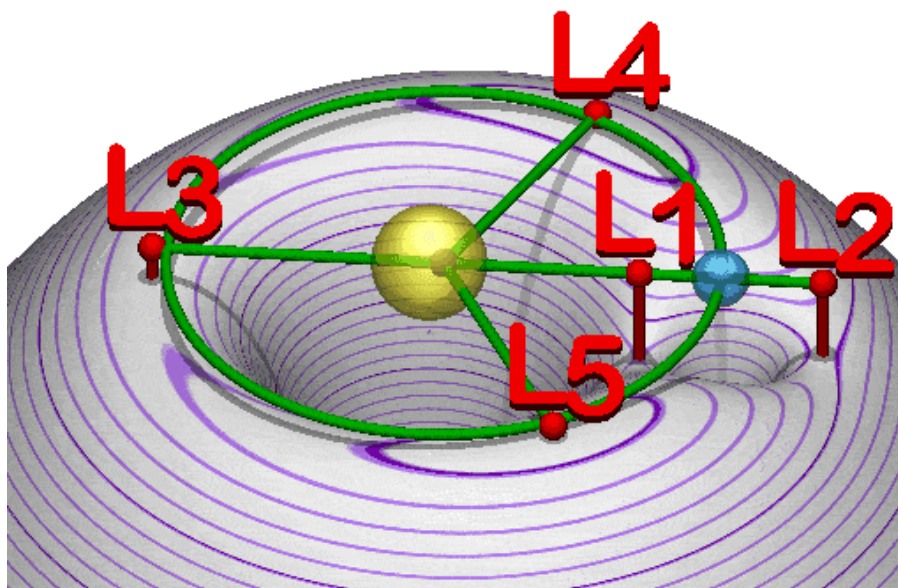


DID YOU KNOW

L1 is used by the Solar and Heliospheric Observatory Satellite (SOHO) because it has an uninterrupted view of the sun.

There are two other satellites currently at L2, the Gaia Probe and Spektr-RG.

Another seven satellites are planned to be parked at L2 in the next few years.



An animation of the five Lagrange points of the Sun-Earth system

Image by cmglee released under a CC-BY-SA 3.0

https://commons.wikimedia.org/wiki/File:Lagrangian_points_equipotential.gif



HAVE A THINK

Why do you think space telescopes are sent to park at L2 rather than L3?



Learn more about these celestial parking spaces by visiting *What is a Lagrange Point?* (<https://science.nasa.gov/resource/what-is-a-lagrange-point/>) or watching the video called *The Parking Spaces of Space: The Lagrange Points* (3:55) (<https://www.youtube.com/watch?v=2LjGgJ4ST60>)

Webb is parked at L2, about 1.5 million km (about 932 057 miles) from Earth, which means that it always has a clear view of the universe without the Earth getting in the way but can still harness the sun's light for power. Watch how the *James Webb Space Telescope Orbits around the Sun* (0:19) (<https://www.youtube.com/watch?v=6cUe4oMk69E>).

It took 3 days for Webb to get about a quarter of the way to L2 and then another 27 days to travel the rest of the way. This is like riding a bicycle hard only at the start of a hill and then coasting the rest of the way up.

On this journey, Webb went through a complex dance to unfold itself and get ready for action. Watch the video called *James Webb Space Telescope Deployment Sequence* (1:47) (https://www.youtube.com/watch?v=RzGLKQ7_KZQ) to see the full sequence of events.

Explore more at *Webb Space Telescope*.



DID YOU KNOW

There are five similar Lagrange points for each of the planets in the solar system. Because L4 and L5 are stable, asteroids called Trojans tend to collect here. Jupiter, for example, has hundreds of them as shown by [these animations](https://www.nasa.gov/content/goddard/lucy-mission-animations-of-jupiters-trojans) (<https://www.nasa.gov/content/goddard/lucy-mission-animations-of-jupiters-trojans>).

