

Mission: Building A Bullseye

Mission Briefing

Have you ever wondered how a Spacecraft like the Orion moves through space? Well, it takes precise mathematical calculations and thousands of steps that must be carried out to keep the spacecraft on the right trajectory. NASA uses hi-tech guidance systems to balance and steer rockets during flight so that the spacecraft reaches its destination. Before anything hits the launch pad, NASA plans timing, and tests flight paths through simulations.

Testing is one of the most important parts of preparing for a space mission and ensuring everything will go as planned. NASA does extensive testing so they can think about all the things that could happen in space and ensure all of their tools and resources will work as expected. If something doesn't work in testing, they're able to make any necessary changes before it impacts the mission.

In your engineering design notebook, write down one question you have about how a spacecraft stays on course. Also think about these questions:

- What kind of things do you have to think about when trying to hit a moving target?
- What resources and tools do you think NASA uses to get the timing right and ensure accurate movement through space?
- Why do you think testing is so important?



Learn More

[Launching Orion into Space](#)

[NASA Engineers Analyze Navigation Needs](#)

Career Connection

Meet the LEGO® Space Team Engineer, Avery. As an engineer, she focuses on solving problems. Whether it's developing a rocket powerful enough to bring astronauts to deep space, or creating the systems and instruments used to explore places like the Moon and Mars, engineers like Avery are at the heart of that work.

Avery calculates spacecraft trajectories, identifies the technology needed for the mission, and helps develop tools and equipment that allow Kate and Kyle to do their jobs in space!



Let's meet another NASA Engineer

Andrew Johnson is a Guidance, Navigation, and Control Engineer. He's part of the team that developed the Mars Rover Lander Vision System which helped NASA's Perseverance Mars Rover "see" and avoid large hazards as it prepared to land on Mars.

NASA Engineers like Andrew work to solve difficult problems every day. They represent a variety of jobs at NASA and are responsible for everything from designing and developing, to testing, and maintaining spacecraft hardware.

For more about Andrew Johnson check out this inspiring video:
[Faces of Technology](#)

Your Mission

Now it's your turn! Let's see how precise you can be with your aim. Design and build a free-moving wheeled vehicle or any contraption that you can use to aim a ball towards a target. Think about how you will need the model to move in order to reach your target. Does it need to move fast or slow? How will you keep it steady and straight? How will you make sure you can hit the target consistently?

Brainstorm and sketch out your ideas. Be sure to explain what task you are trying to complete with your tool and build, test, and iterate on your model. Be sure to test your model several times and make changes as needed to ensure it gets to the target. Don't be afraid to try different ideas. If it doesn't work, that's ok, just try something new.

Mission:

The Path To The Pad

Mission Briefing

Can you remember a time that you had to move something really big and heavy? It probably wasn't easy, and you needed help. Maybe you used a wagon or a wheelbarrow? And it most likely still felt pretty heavy! Now imagine if you had to move an entire rocket AND a launchpad. That's what NASA has to do to prepare for launching Artemis I. You had a chance to see how they do it, using something a lot bigger than a wagon – The Crawler!

When transporting the rocket and mobile launcher from the Vehicle Assembly Building (VAB) to the launchpad, the team works to ensure safe and successful transport. They take great care when loading the spacecraft onto the Crawler to ensure it is loaded and balanced properly and remains balanced and steady throughout its journey. The team builds in component redundancies so that if there is a component failure, transport continues smoothly and seamlessly to the launchpad. After the Crawler delivers the rocket and launcher to the launchpad, the team rolls the Crawler to the Mobile Service Structure park site to be protected during launch.

In your engineering design notebook, write down the top three problems NASA must think about when they're moving the rocket. Also think about these questions:

- How could you move a large and heavy object?
- What factors should you consider when transporting a big object? Maybe consider speed or how to make careful turns?



Learn More

[The Crawlers](#)

[Artemis Path to the Pad: Crawler-Transporter 2](#)

Career Connection

Meet the LEGO® Space Team Ground Systems Technician Zach! Ground Systems Technicians represent the ground crew that develops and operates the systems and facilities necessary to process and launch rockets and spacecraft during assembly, transport and launch. These diverse teams design and maintain the infrastructure to support a variety of missions.



Let's meet another member of the NASA Grounds Crew

Jeff Adams is the Logistics, Engineering and Transportation Team Lead at NASA. His team works behind the scenes to move full-scale core stage test hardware from NASA's rocket factory, Michoud Assembly Facility near New Orleans, to test facilities at NASA'S Marshall Space Flight Center in Huntsville, Alabama.

The team spends months planning and developing detailed transportation procedures to ensure the test articles are delivered without a mishap. They also come up with contingency plans – just in case.

Learn more about Jeff Adams:

[I Am Building SLS](#)

Your Mission

Now it's your turn to design a vehicle or device that makes moving large and heavy objects easier. Create something that can lift and move large objects like a rocket safely. Make sure to think about how you'll control the way your device moves and ensure that the objects you're transporting aren't damaged.

What do you need to design to hold the size and weight of the object? How will you keep it from moving or falling? Remember this is a prototype or model so it doesn't actually need to be at full scale to move a large object.

Brainstorm and sketch out your ideas in your engineering design notebook. Identify the object you want to move. Build, test, and rebuild your model to make it better. Don't be afraid to try different ideas. If it doesn't work, that's ok you can try something new just like NASA does.