Light But **Strong**

A Lesson in Engineering

The Challenge

Design and build a mobile launcher platform that is light enough to be moved to the launch pad, but strong enough to hold the weight of the rocket.

You have been challenged by a NASA materials engineer (a materials engineer selects the materials to build rockets, spacecrafts, and launch pads) to use a lightweight material to build a mobile launcher platform that can be light enough to move, but also strong enough to hold the weight of the rocket.

Brainstorm ideas, design the launcher platform, and evaluate how well the launch pad held the weight of the astronauts (pennies).

Materials:

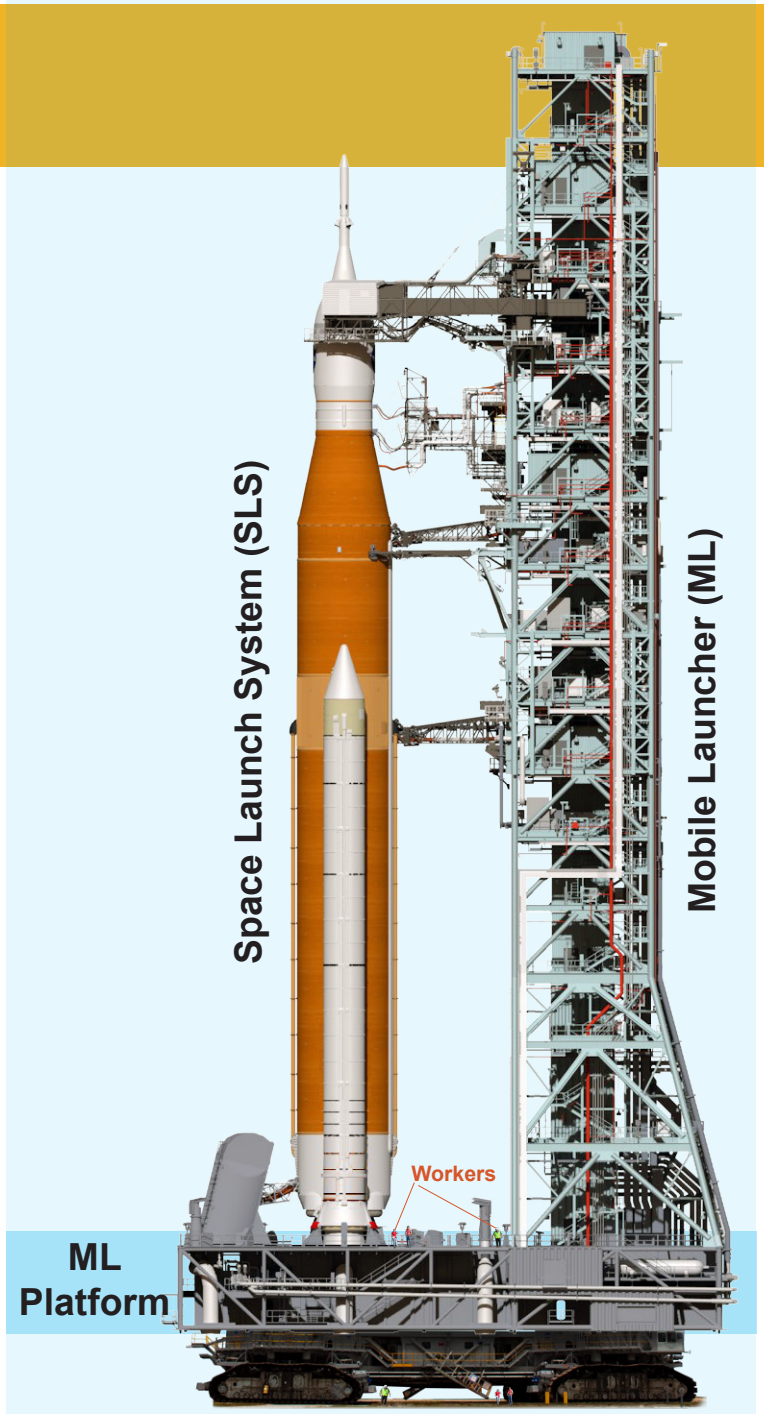
- Drinking straws (30)
- Scissors (1 pair)
- Pennies (20)
- One small paper or lightweight cup
- One 3” by 3” piece of cardboard
- Various materials such as clay, tape (recommended for younger students), or playdough to connect the straws together
- Ruler
- Balance scale (optional)

ML Fun Fact:

Total height above ground: **380 feet**
Appox weight: **10.5 million pounds**

SLS Fun Fact:

The Block 1 SLS will weigh almost as much as 8 fully-loaded 747 jumbo jets, and it produces as much thrust at launch as 139 jet engines.



As the most powerful rocket ever built, the Space Launch System will offer five times more volume for larger payloads, telescopes and experiments not previously possible by other launch vehicles.

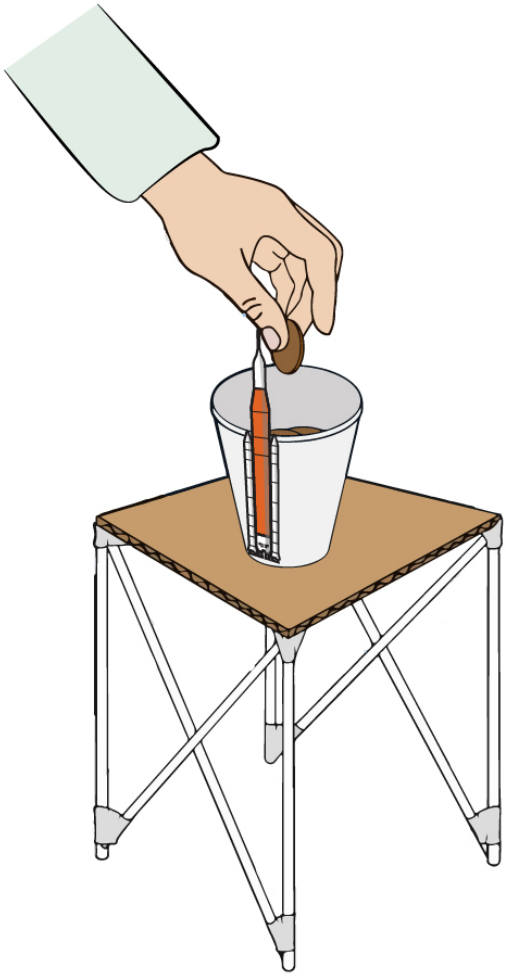
The mobile launcher is the ground structure that will be used to assemble, process and launch NASA’s SLS rocket and Orion spacecraft from Launch Pad 39B for Artemis missions to deep space destinations, such as the Moon, Mars and beyond.

Jacobs

Your Challenge

Build a mobile launcher platform that will be light, but also strong enough to hold the weight of the astronauts (pennies) in the cup (rocket) that sits on top of the launcher platform. The platforms should be built with straws and a material such as tape or clay to hold the platform together.

After the group completes their mobile launcher platform, set a 3” by 3” piece of cardboard on top of the launcher platform with a cup sitting on top and drop one penny at a time into the cup (rocket) to test the strength of the platform until the platform collapses.

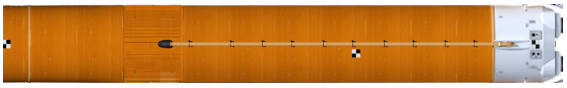


Think it over

Your platform must be both light and strong.

Discuss with your group:

- What does it mean for something to be light weight?
- What does it mean for something to be strong?



The **core stage** of the SLS will be made from aluminum which is a light and strong material.

Name one thing that you know is made of aluminum.

_____

Name two items that are light but also strong.

_____

_____

Plan and design

Your platform must hold the rocket (a cup) six inches above the ground. The platform must also be able to be moved to the testing site and hold a 3” by 3” piece of cardboard.

Discuss with your group how you will build your mobile launcher platform.

- Which materials will you use?
- What will your platform look like?
- What type of material will you use to hold the platform together?

Jacobs

Draw a picture of your proposed platform:

Build

Collect all of the materials to begin building your platform.

Did you use all of your materials? Yes ____No____

Did you change your original design as you were building? Yes ____No____

Why?_____

_____

_____

Testing and results

Now that you have finished building your mobile launcher platform, it is time to test how much weight your platform can hold.

Move your platform to the testing area.

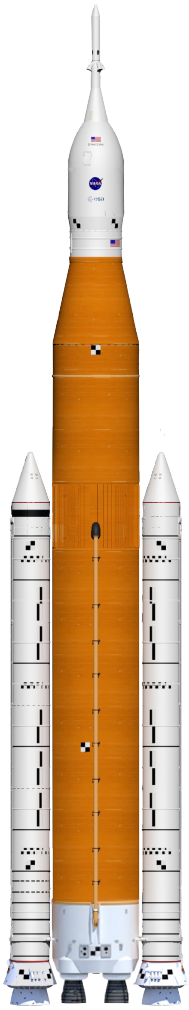
Estimate how many pennies your platform will hold.	How many pennies did your platform hold?

If you did this activity again, would you change your design? Yes ____No____

Why?_____

_____

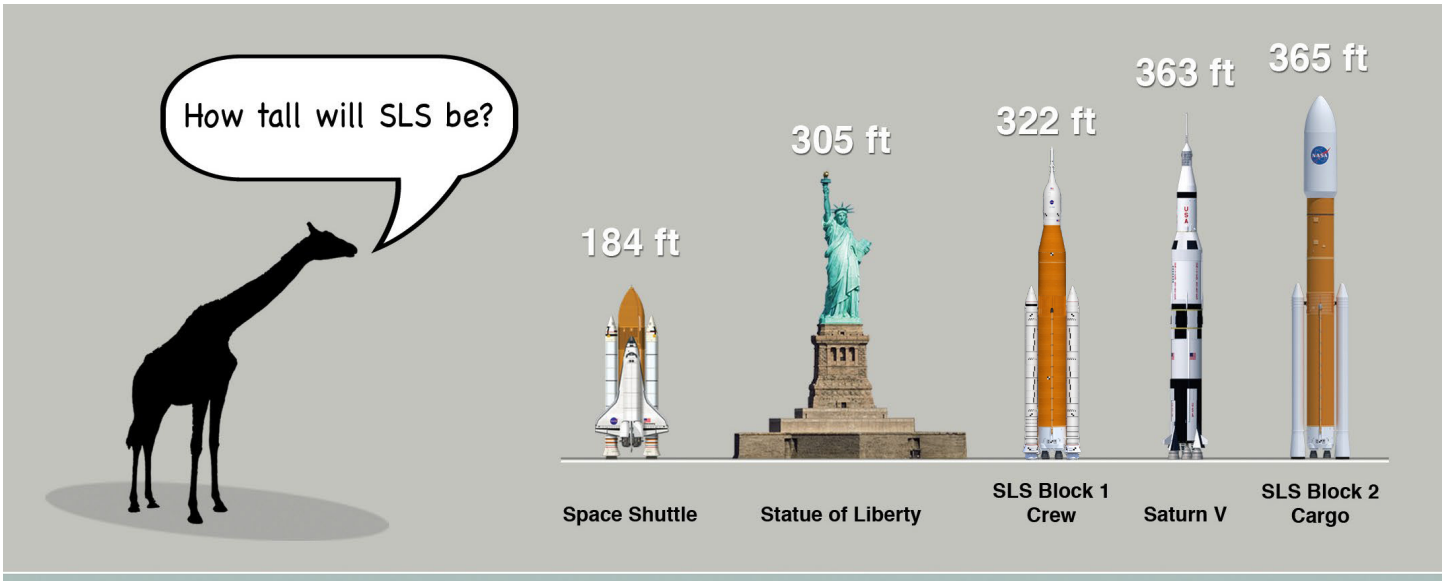
_____

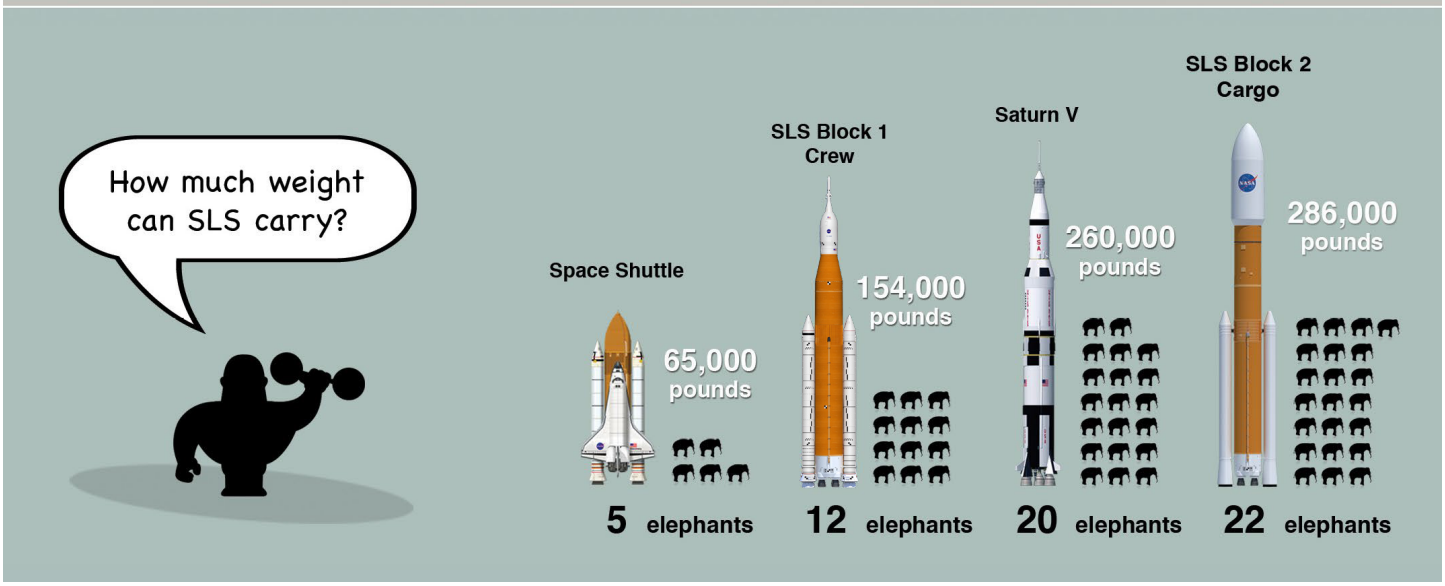


Cutout SLS rocket and attach to paper cup

Jacobs

SLS fun Facts





CT-2 Fun Facts:

- The crawler-transporter is more than 50 years old
- It is 131 feet long by 114 feet wide, about the size of a baseball infield
- It has traveled nearly 2,236 miles along the crawler way at a top speed of one mile per hour to deliver rockets and spacecraft to the launch pad
- CT-2 will transport the SLS and ML to Launch Pad 39B

Change it up!

- There are many ways to enhance the activity!
- Choose a height or weight goal for the platform.
- Have different groups use different materials to build the platform and compare.
- Require a hole in the center of the launch pad for the rocket "flame."
- Have the students make their own material using a recipe for homemade playdough. Recipes can be found online.

ML Fun Fact:

The base of the mobile launcher is 20,600 square feet of floor space, equivalent to 10 3-bedroom houses!

Jacobs