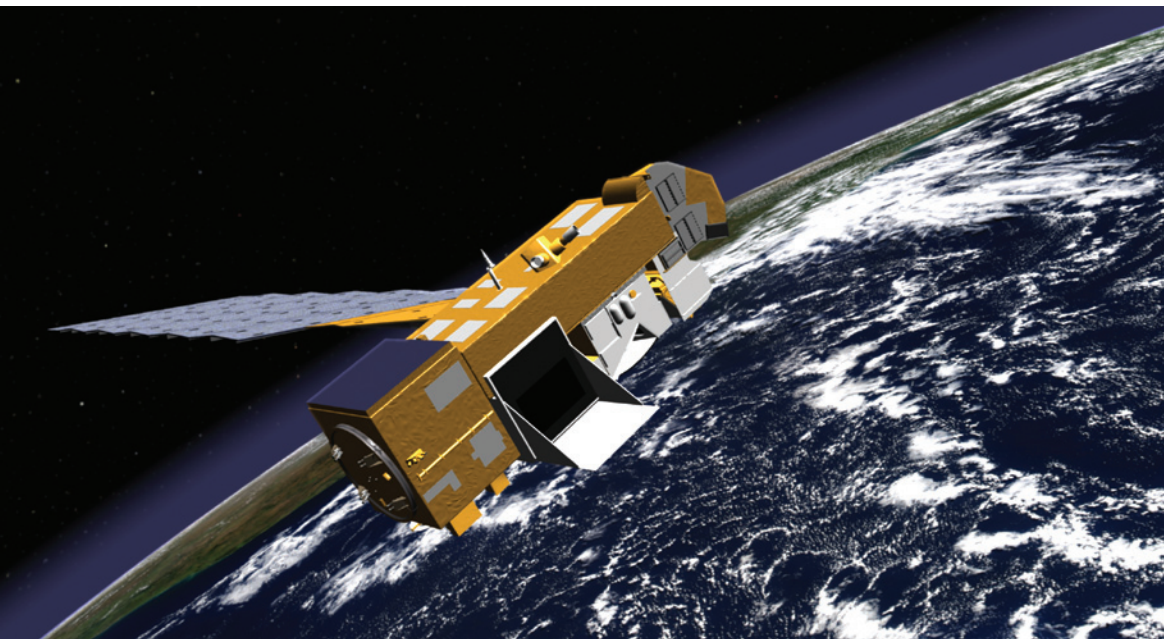
Launch Your Satellite



DESIGN challenge

To design a balloon rocket to launch the satellite that was built in the last activity. The goal is to get the satellite to go as far as possible.

OBJECTIVE

To demonstrate an understanding of the Engineering Design Process while utilizing each stage to successfully complete a team challenge.

PROCESS SKILLS

Observing, communicating, measuring, collecting data, inferring, predicting, making models

MATERIALS

Satellite model from previous activity

General building supplies

Rulers or meter sticks

Binder clips or clothes pins

Balloons (several per group)

Straws

5-meter fishing line set-up strung between two tables

STUDENT PAGES

Design Challenge

Ask, Imagine and Plan

Experiment and Record

PRE-ACTIVITY SET-UP

The fishing line apparatus should be at least 5 meters in length. Clamp or tie one end at table or chair height and stretch the line across the space to another table/ chair at the same level. Holding the free end of the line taut for each trial enables easy restringing of the successive balloon rockets. The line must be very taut for best results. Shoot the rockets toward the tied end. Two fishing line set-ups should be sufficient for a group of 20 students. *Note: If the opening in the balloons tends to stick, try putting a little hand lotion inside the opening.*

launch your satellite

MOTIVATE

- Show the video of a recent rocket launch, titled, "Liftoff…To the Moon!"

  http://lunar.gsfc.nasa.gov/launch.html

SET THE STAGE:

ASK IMAGINE
&PLAN

- Share the *Design Challenge* with the students and ask students to retrieve their satellites from last session.
- Demonstrate how a balloon rocket works by sending a balloon connected to a straw up the fishing line. Do not model how best to attach the satellite or how best to power the rocket, other than releasing the air by using your fingers.
- Ask the students, "How can we use this set up to launch your satellite?" Remind students that one end of the set up is the launch pad and the other end is the Moon.
- Remind students to ask questions and brainstorm, then break into teams to create a drawing. All drawings should be approved before building.

CREATE

- Challenge the teams to build their rockets based on their plans and remind them to keep within specifications. They will also need to attach their satellites from the previous session.

EXPERIMENT

- Send each team to their assigned launch sites to test their rockets, completing the data tables as they conduct each trial launch.

IMPROVE

- After their first set of trials, allow teams to make adjustments to their rockets.
- Teams re-launch satellites and record launch distance.
- Teams should then discuss how far their rocket traveled and which combination of variables gave the best results.

CHALLENGE CLOSURE

Engage the students in the following questions:

- *What was the greatest challenge for your team today?*
- *Which straw length did you choose and why did you choose it?*
- *If you had more time, what other rocket element would you change (ex: balloon shape or size)?*

PREVIEWING NEXT SESSION

Ask teams to think about how humans navigate robotic rovers on a distant planet or moon. How are they programmed? How do the rovers receive messages from a team on Earth?

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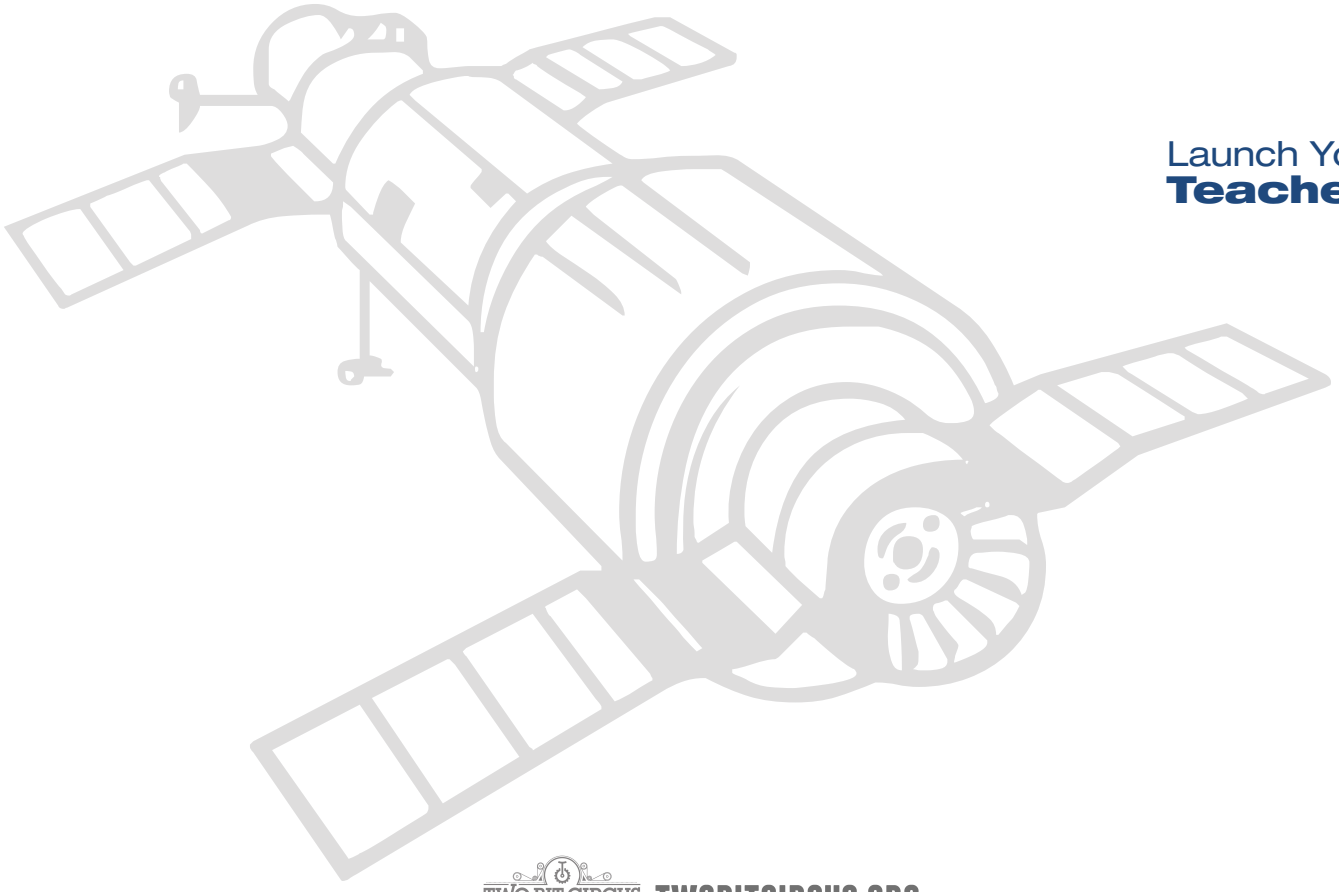

launch your satellite

Launch Your Satellite
Teacher page

3, 2, 1 . . . We have lift-off!

NASA launches several rockets each year. There are actually several launch facilities around the United States. You probably know of the launch pad at Kennedy Space Center in Florida, but did you know there is a launch facility at Vandenberg Air Force Base in California, one at Wallops Flight Facility in Virginia, and another at White Sands Missile Range in New Mexico? A rocket is just the launch vehicle that carries a payload into space. A payload is the load, or package or set of instruments, that needs to be delivered to a destination. When you watched the video for this session, you saw an Atlas V rocket carry a payload, the LRO and LCROSS satellites, to a destination: an orbit around the Moon.

THE CHALLENGE:

*Your mission is to design and build a **launch vehicle** to send a payload to the Moon. The **launch vehicle** is a balloon rocket assembly. Your **payload** is the satellite you built at the last session. Your team must also determine how to attach your satellite to the balloon assembly and then launch it down a fishing wire.*

DESIGN challenge

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launch your satellite!

ASK IMAGINE &PLAN

Draw and label your balloon rocket design that includes the satellite design.

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launch your satellite!

Launch Your Satellite
Student page

Approved by: _____

Experiment & Record

Your challenge is to launch your balloon rocket the farthest distance! Build your rocket with ONE balloon attached to a drinking straw. Test three different lengths of straw.

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launch your satellite!

Balloon Rocket Data Table 1

	Trial 1	Trial 2	Trial 3
Straw Length	**Short _____ cm**	**Medium _____ cm**	**Long _____ cm**
Distance traveled (cm)			

Now that you tried three different lengths of straw, build your final rocket – the one your team expects to go the farthest.

Balloon Rocket Data Table 2

Rocket Elements	New Trial after re-design
Balloon length (cm)	
Straw Length (cm)	
Distance traveled (cm)	

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