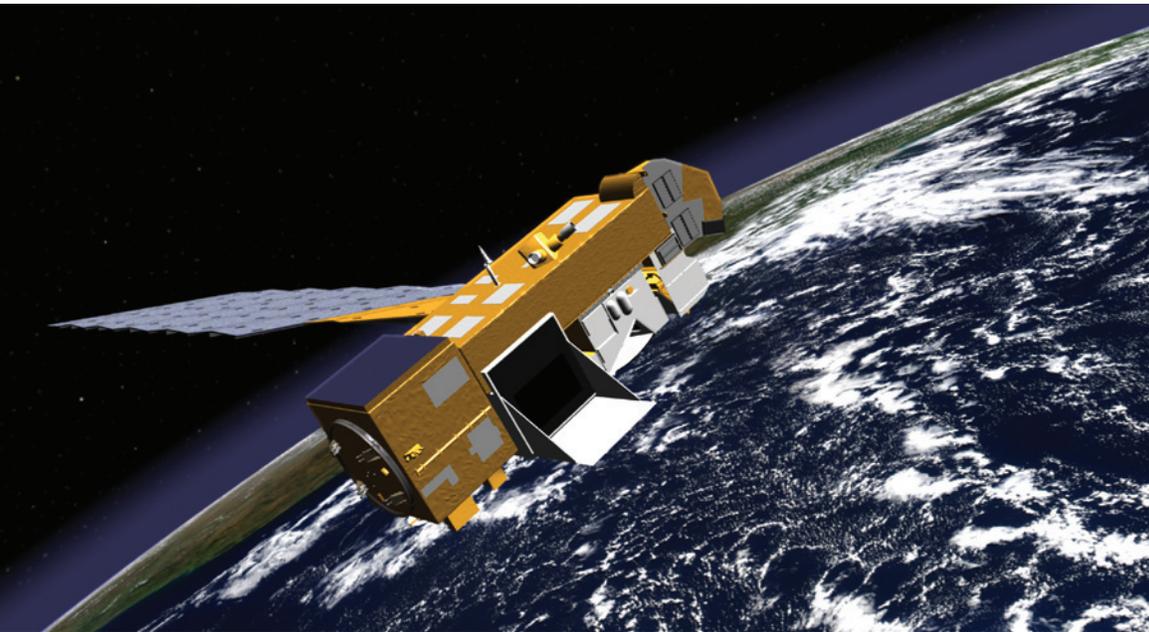


## DESIGN challenge

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

Quality Assurance Form

Fun with Engineering at Home

### 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 most clubs. *Note: Use clips or clothes pins to hold filled balloon shut before launch. If the opening in the balloons tends to stick, try putting a little hand lotion inside the opening.*

## **MOTIVATE**

- Show the video of a recent rocket launch, titled, “Liftoff...To the Moon!”  
<http://lunar.gsfc.nasa.gov/launch.html>

## **SET THE STAGE:**

# **ASKIMAGINE & 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 setup to launch your satellite?” Remind students that one end of the line is the launch pad and the other end is the Moon.
- Have students take the time to imagine a solution for a balloon rocket design and then draw their ideas. All drawings should be approved before building begins.

## **CREATE**

- Challenge the teams to build their rockets based on their plans. In addition, teams will need to design a system to attach their satellites to the launch set up. Remind students to keep within specifications.

## **EXPERIMENT**

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

## **IMPROVE**

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

## CHALLENGE CLOSURE

Engage the students in the following questions:

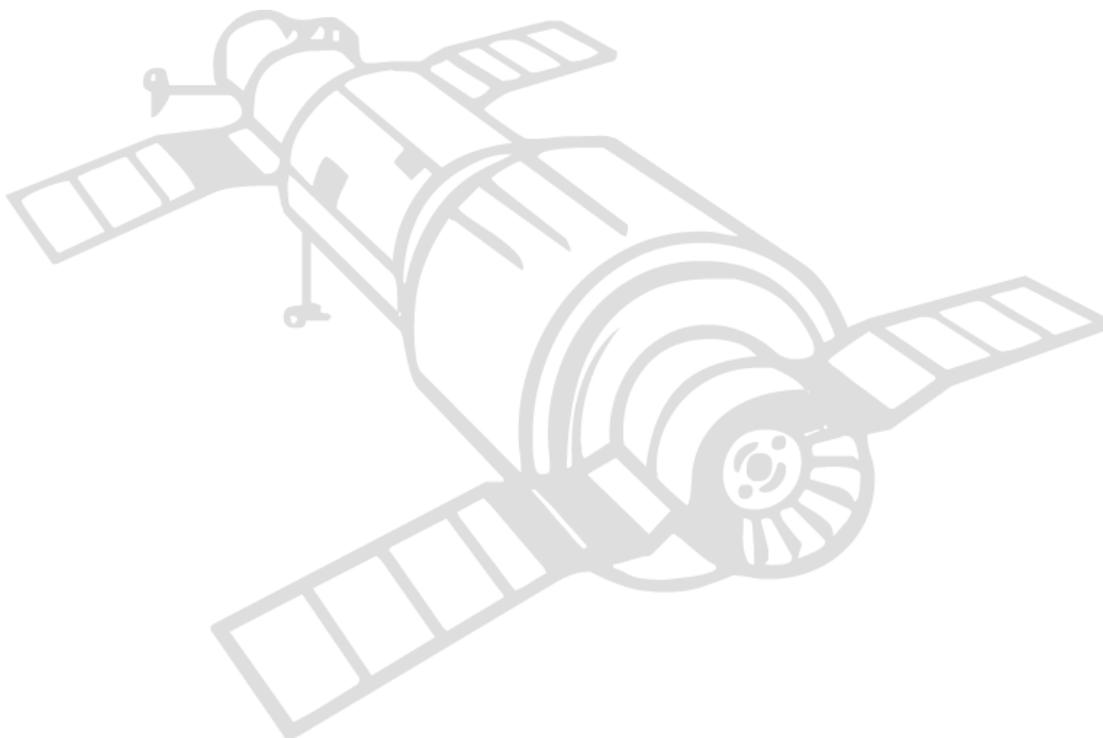
- *What was the greatest challenge for your team today?*
- *Why is the balloon forced along the string?*
- *How did changing the straw length/number of balloons affect how far the rocket travelled on the fishing line?*

## 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?

# 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.*



Launch Your Satellite  
**Teacher page**