RUBBER BAND RACER
APOLLO 13 CHALLENGE

TeacherGeek

A SUCCESSFUL FAILURE?

In 1970, three astronauts launched for the moon in a tiny Apollo CSM capsule. They never landed. An oxygen tank exploded, crippling the craft's **(command module)** electricity, light and water as poisonous **CO^2** filled the cabin. **Apollo 13** was 200,000 miles from Earth and running out of time.

* Find more information on space engineering, visit nasa.gov/mission_pages

SQUARE PEG, ROUND HOLE

NASA engineers had a problem – keeping the crew alive for over 36 hours prior to safe re-entry. They were limited by time, the minimal supplies onboard the spacecraft, and increasing CO^2.

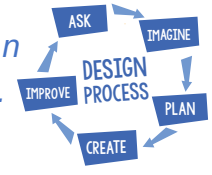
Astronaut **John Swigert** had to somehow adapt a square scrubber cartridge to fit a round lunar CO^2 scrubber – square pegs, in round holes, in *space*!

NASA's "Mailbox Rig"

DESIGN PROCESS

The **Engineering & Design Process** was key to saving the day in the Apollo 13 mission. Using a mix of found and recycled materials (including socks!), the "**mailbox rig**" came from the minds of ground control engineers, *brainstorming*, *testing* and *improving* a design.

The crew returned safely to Earth on April 17, 1970, six days after launch.



"Challenge Supplies"

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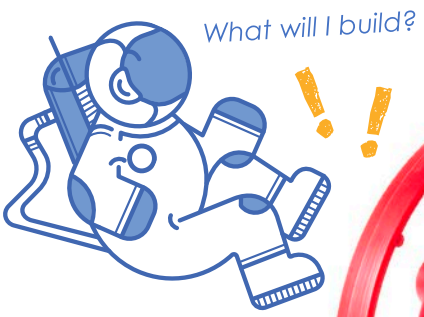
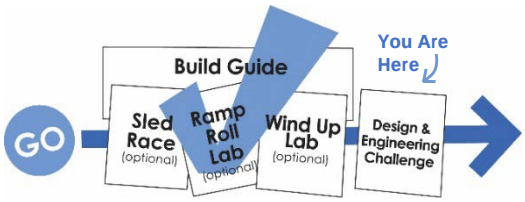
THE CHALLENGE

Create your own **"mailbox rig racer"** from limited supplies, to compete in a target challenge.

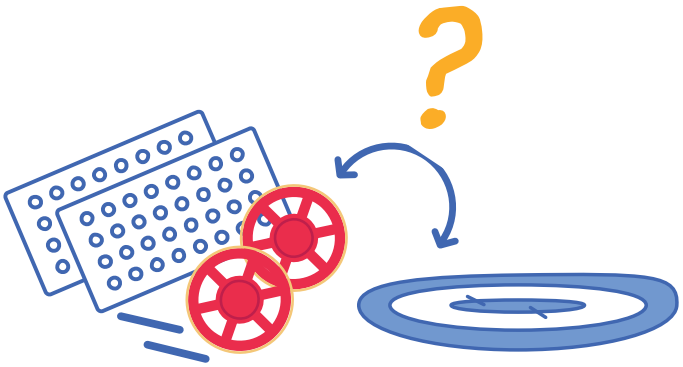




Before you start... Make sure you have built a **Rubber Band Racer** for use on this challenge.
Documents & Supplies at: **teachergeek.com/learn**

THE DESIGN

Using ONLY the supplies on the table, construct a racer that can hit a target.
This racer will not be like your example – it's unique, your own "mailbox rig racer!"
Use an **engineering notebook page** to brainstorm, test and improve your design.



CONSTRAINTS

(rules & limits for your design)

Teacher's Note:
Find more information on setting up and running this challenge in the Racer Classroom Overview.

Difficulty: Medium - Hard

Time Limit: _____
Fill in how much time you have to complete this challenge

Are you faster than a NASA engineer?

Only use the tools provided, if any.

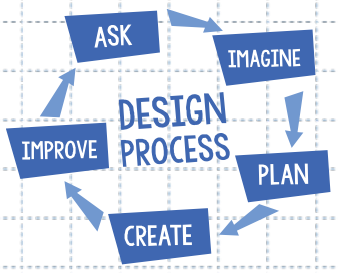
Your Challenge Supplies

- 3 Connector Strips
- 2 Hole Plates
- 4 Dowels • 1 Stop Clip
- 2 Wheels • Tape
- 2 Tires
- 4 Rubber Bands

Latex changes the traction (friction)

Design #: _____ Date: _____

Name: _____



ASK

What is the problem your racer needs to solve or make better?

Research. How did the engineers of Apollo 13 think about and solve this problem? What are the constraints (things your design cannot, or must, do or be)?

IMAGINE

Brainstorm. Sketch and describe possible solutions or different ideas that might solve the problem. Use extra paper, if needed.

Choose the best solution. Circle it. *Why do you think it's the best?*

RUBBER BAND RACER ENGINEERING NOTEBOOK

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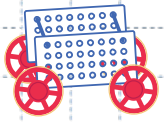
PLAN

Draw the solution you chose. Include the details you will need to create it.
Use extra paper, if necessary.

CREATE



Build it. Build the racer you planned.
Test it. Make observations. Record results below, or on another paper.

IMPROVE

Did you solve the problem?
Yes? Great! Identify a new problem (a way to make your design even better).
No? That's okay. What did you learn that can help solve it in a new/different way.

There is no perfect design, or true failure. Successful failures show you how to improve!
Make it faster, go farther, stronger, more accurate, easier to use, more efficient, better looking, etc.
Fill out a new Engineering Notebook page each time you redesign your rubber band racer.