CARGO SHIP CHALLENGE

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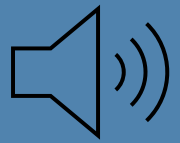
UNLV HOWARD R. HUGHES COLLEGE OF ENGINEERING

Cargo Ship Challenge Overview

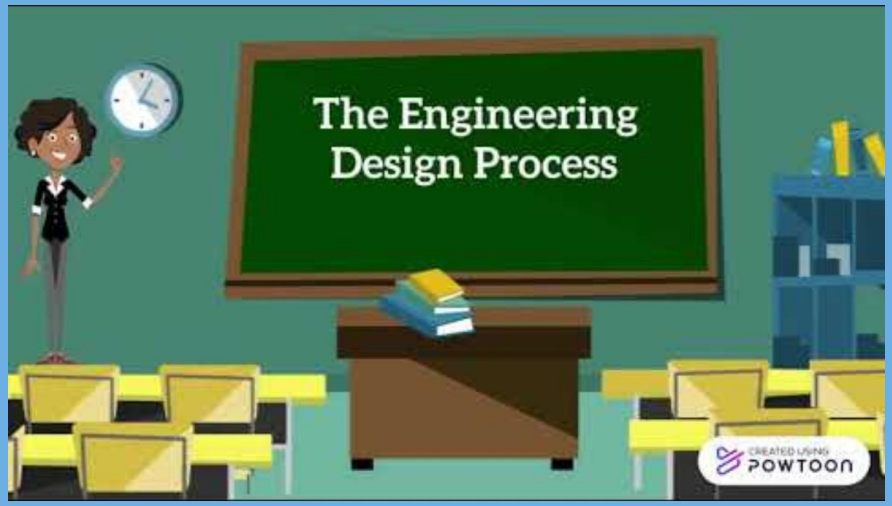
Today you will be following the engineering design process: a process that engineers use to solve real world problems. Follow the path of the pamphlet to create the best design for the Cargo Ship Challenge!

Click the speaker button located at the top right of each slide to hear more information!



Engineering Design Process

Before you start, watch this video about the engineering design process to get familiar with the steps of this experiment.



Materials Needed

- Container/Bucket
- Aluminum foil
- Scissors
- Pennies (or any other small object like washers, marbles, beans, pebbles, etc.)

Step 1: Identify the Problem

Scenario: You are moving to Australia and you need to cross the Pacific Ocean. However, there are no flights to Australia, so you must travel by ship.

Your goal: build a ship that can hold the most weight without sinking.

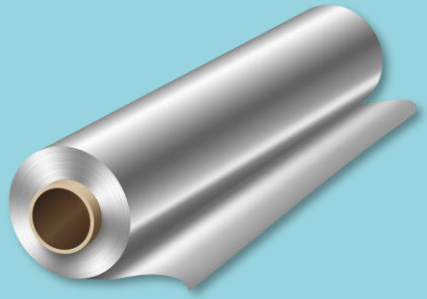
Step 2: Brainstorm

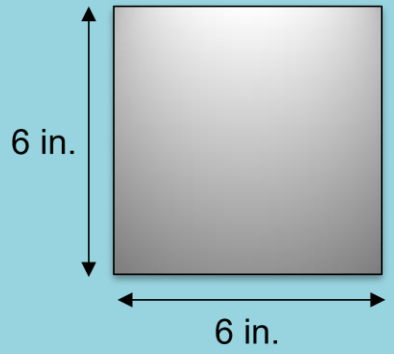
In the "Brainstorm" section, write some ideas on how you can make the ship that can hold the most weight. Your pamphlet has some questions for you to think about.

Step 3: Limitations and Constraints

You just found out that the only metal your supplier can afford is a singular 6 in x 6 in. sheet of aluminum foil!

You will need to consider this material restriction when designing your ship.



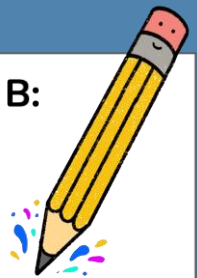


Step 4: Design

In the "Design" section, sketch 3 different designs of the ship you plan to build. Make each design as detailed as possible and remember to keep in mind the limits and constraints.

Design A:

Design B:



Design C:

Set Up

- Fill the container/bucket with water
- Cut the aluminum foil into a square
- Ensure the square is approximately 6 inches tall and 6 inches wide

Step 5: Build

Choose the design you think is the best and build it!

Remember your limitations and constraints!

Step 6: Test and Evaluate

Now you have a ship to test! Test your ship to see how much weight it can hold. Then answer the questions provided in the "Test and Evaluate" section of your pamphlet.

Step 7: Share Your Solution

Share to your solutions with your classmates.

Discuss the following:

Why do you think your own design could or could not hold a lot of weight?

What kind of designs did you see from your classmates?

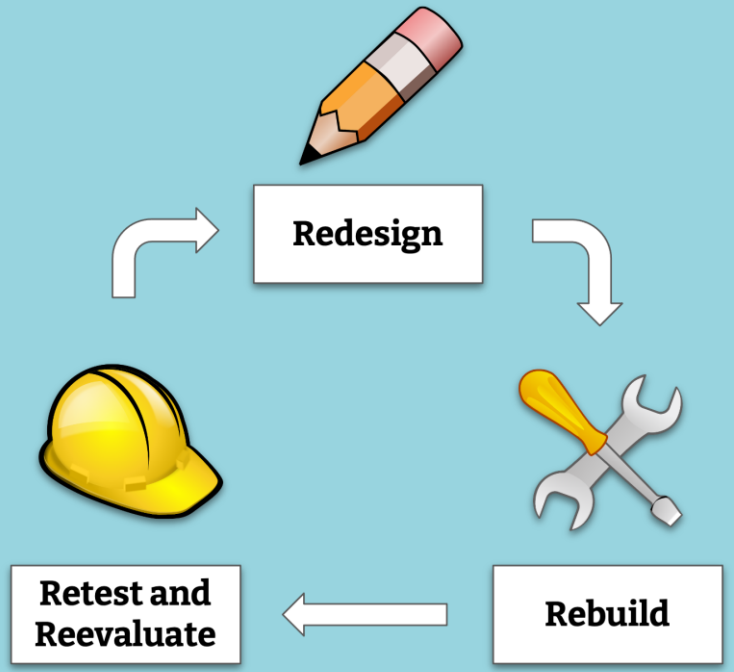
How can you improve your design?

Step 8: Redesign, Rebuild and Retest/Re-evaluate

Repeat the last 3 steps using a new sheet of aluminum foil:

(1) Design
(2) Build
(3) Test and Evaluate

This is your chance to improve your design!



Redesign

In the "Redesign" section of your pamphlet, sketch a design for a new and improved ship. How can you improve your previous ship? Make each design as detailed as possible and keep in mind the limits and constraints.

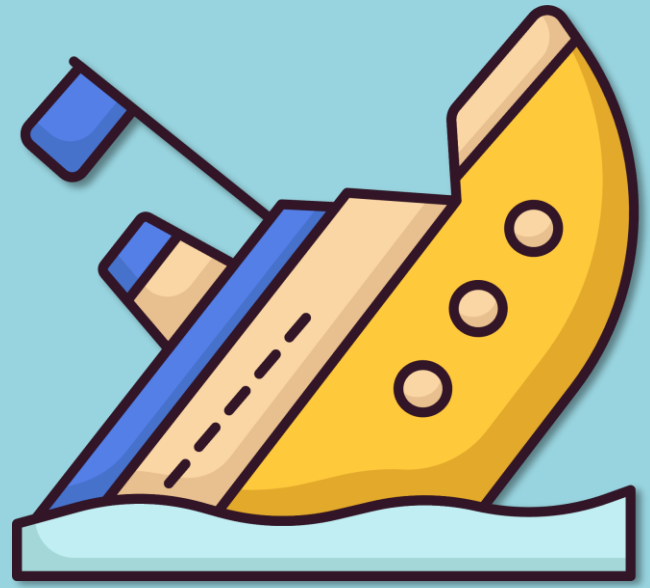
New and Improved Tower Design:

Rebuild

It's time to build your new ship! Using the same size aluminum foil sheet as before, build your new ship based off your redesign. Remember that you can only use 1 sheet of foil!

Retest and Reevaluate

Using the same steps as before, test your new ship to see how much weight it can hold. Then answer the questions provided in the "Retest and Reevaluate" section of your pamphlet.



Step 9: Share Your New Solution

Share to your solutions with your classmates.

Discuss the following:

Why do you think your own design could or could not hold a lot of weight?

What did you do differently than before? What did your classmates do differently?

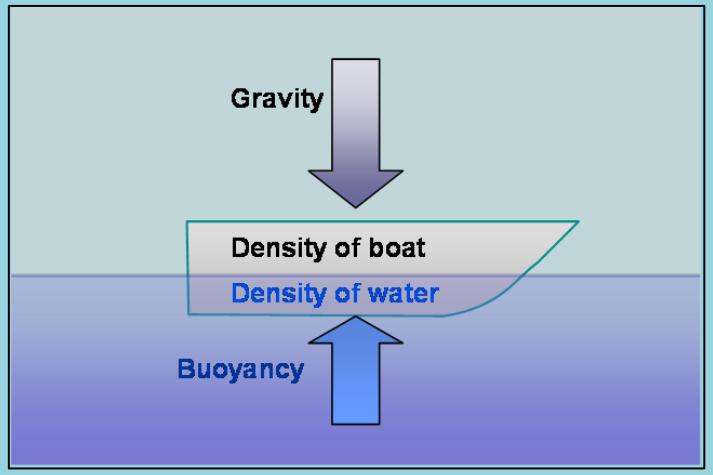
How can you improve your design?

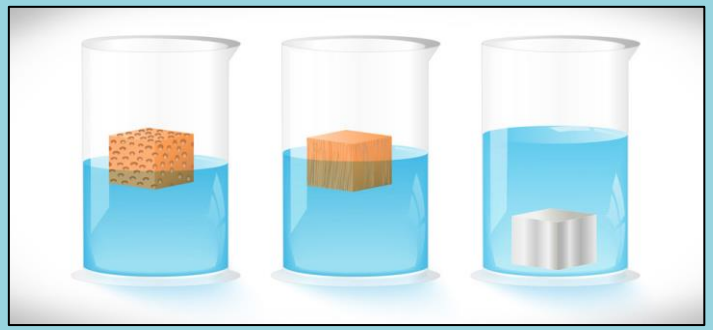
WARNING!

The next slide will provide the explanation (solution) on what makes the best ship for this experiment. Make sure you have completed the previous steps before moving on.

Explanation

- Gravity pushes down while buoyant force pushes up
- Having a greater surface area (more boat touching the water surface) means that the boat can hold more weight
- Engineers need to keep density in mind to ensure that larger objects can float





Cargo Ships in Real Life

Solution Build and Test

Build

Test and Evaluate

Thank You!

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