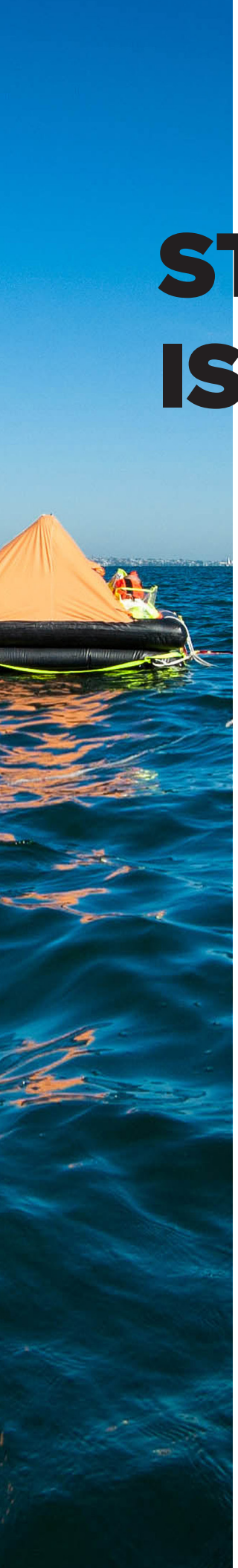
Grades 3–5

30–45 minutes



STRANDED ISLAND CHALLENGE

DESIGN CHALLENGE

Using only the items provided, participants work in teams to create a device that can deliver a cell phone to a raft floating in the water.

SUPPLIES AND EQUIPMENT

Per whole group:

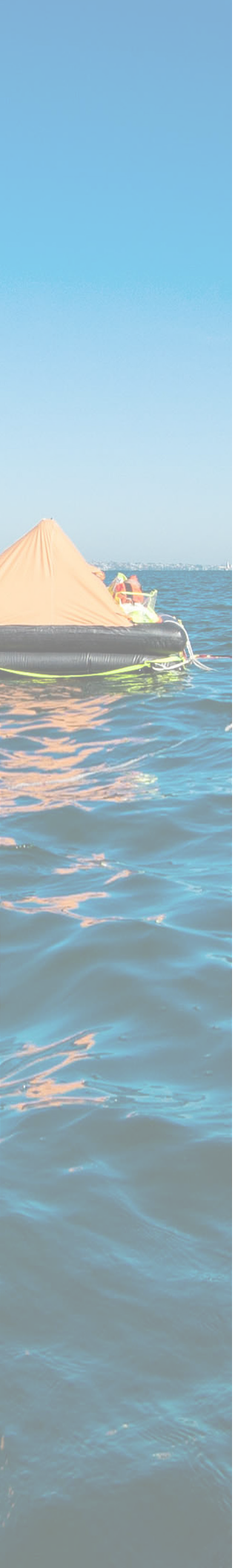
- ☐ Small pool of water
- ☐ Towels

Per team:

A bag of supplies containing:

- ☐ 1 sheet of newspaper
- ☐ 1 large rubber band
- ☐ Dental floss
- ☐ 1 roll of tape
- ☐ 1 pencil
- ☐ 1 pair of scissors
- ☐ 1 ruler
- ☐ 1 small inflatable pool float
- ☐ 2 tennis balls
- ☐ 3' of rope
- ☐ Mock mobile phone

MacGillivray Freeman's DREAM BIG



GETTING READY

Choose an open space to set up the pool of water, or use a water exhibit in a museum. This is a great activity to run outdoors during the summer.

You will need something to represent the cell phone in this activity. You can use a nonfunctioning or broken phone, or something with similar dimensions and weight. A plastic travel soap dish with some weight inside will work well, as will a deck of cards wrapped in plastic and duct tape.

The activity revolves around sending a phone to a person stranded on a raft. You may choose to fabricate a narrative to engage your participants. Consider incorporating local legends or waterways into your story.

INTRODUCTION

Introduce the activity to participants by saying the following, adapted for your audience and locale:

Imagine that you are stranded on a deserted island. You would have to build anything you need to survive using only materials that you can find. While many people might see this as a no-win scenario, an engineer might see this as a thrilling challenge. He or she might build shelter, devise a water filter, or create a way to signal for help.

INSTRUCTIONS

Introduce the design challenge. Divide the participants into teams of four at most. Each team will build a contraption that can deliver a cell phone to a person stranded on a raft. Note the constraints of this activity:

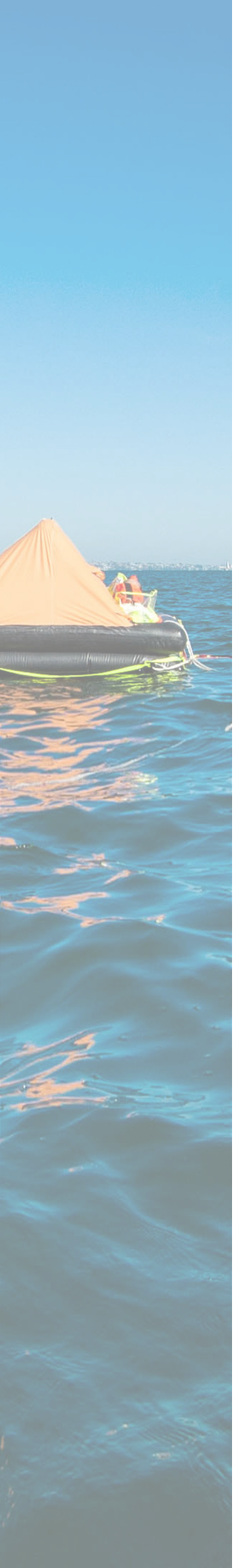
- The device should be able to float while carrying the phone and should keep the phone dry.
- You may use only the materials supplied in your bag, as well as anything else you are carrying on your person.

Give each team a few minutes to sort through their materials and create a plan. The question they should ask themselves is:

- How might each material be used to succeed in this design challenge?

Give the teams 20 minutes to build their device. They may find it necessary to make changes that they didn't anticipate in the planning phase.

Test each design to make sure it floats and to check for leaks. Each design may look different, but it will be easy to tell which creations are successful.



ACTIVITY VARIATIONS

For older participants, incorporate a way to propel the device across the water. Additional materials might be required.

Conduct the activity at a school with a swimming pool. Have a teacher or activity leader “stranded” on a raft in the middle of the pool. The first team that gets their phone to the stranded person wins.

TROUBLESHOOTING

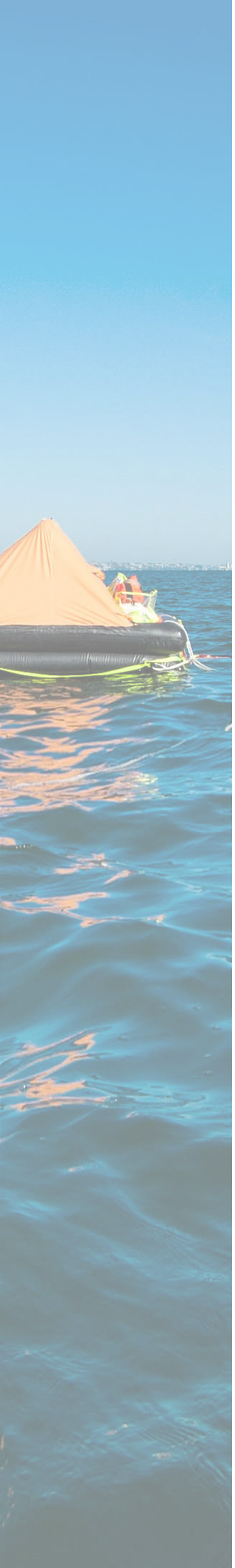
- If your device doesn’t float, consider increasing the buoyancy by adding pockets of air or by distributing the weight over a larger area.
- Some participants might point out that it would be quicker to call for help yourself than to build a device to send a phone to a person stranded on a raft. Applaud their rationale and ask them to think of a reason why they would send a phone to the raft, and incorporate it into the fictional scenario.

RELEVANT TERMINOLOGY

Buoyancy: An object’s ability to float in water or other fluid.

Density: How much something weighs compared to how big it is—or, an object’s mass per unit volume. Something big and light, like a balloon, has low density. Something small and heavy, like a rock, has high density.

Two girls paddle a homemade boat made in an anything-that-floats race. Credit: Linda Reddington, Asbury Park Press.



GUIDANCE FOR YOUNGER CHILDREN

QUESTIONS TO ASK AFTER THE ACTIVITY

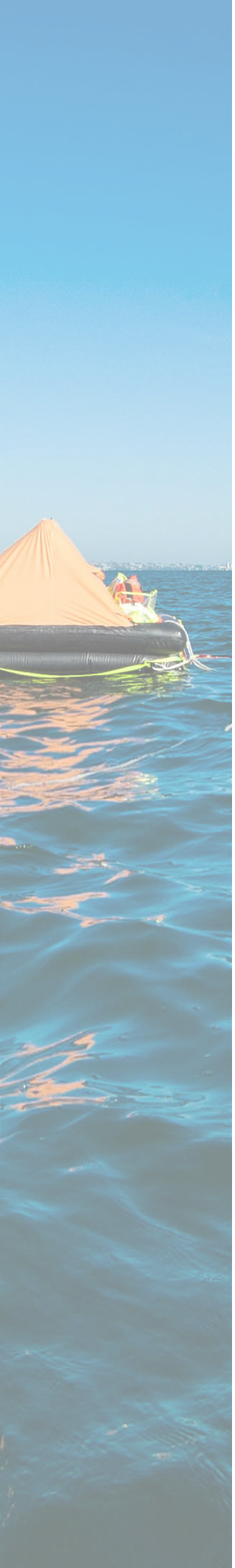
- How long do you think your raft could float? How can you make it float longer?
- Do you think your raft would still work if it had to carry something heavier than a cell phone? If you had to change it, what would you do so it could carry a bottle of water?
- If you made your raft bigger, do you think it would float longer? Why or why not? What if you made waves in the pool and tried to make the raft capsize—would the size of your raft matter?
- What if the water in the pool were salty ocean water? Do you think your raft would perform better or worse? Why?

ENGINEERING CONNECTIONS

Engineers are creative problem solvers. Their work involves creating solutions to problems in order to make us safer and healthier. Even when they aren't stranded on a deserted island, engineers use the materials and conditions provided to solve problems. Examples include finding solutions for moving people from home to school, or making a computer work faster. To complete this activity, engineers would first seek out materials that can float and keep stuff dry! Their next step would be to build something that might work and then test it before trusting the valuable phone on it. After the first test, engineers might make improvements (especially if what they built sank!) and try again until they had a design they thought would work.

SCIENCE CONNECTIONS

Scientists investigate facts, conducting experiments that always have the same answer. On a deserted island, a scientist might start by identifying materials that always float, or that could be made to float. Figuring out how to use this information moves a science experiment to an engineering problem. Scientists and engineers often share information back and forth in their work.



GUIDANCE FOR OLDER YOUTH AND ADULTS

QUESTIONS TO ASK AFTER THE ACTIVITY

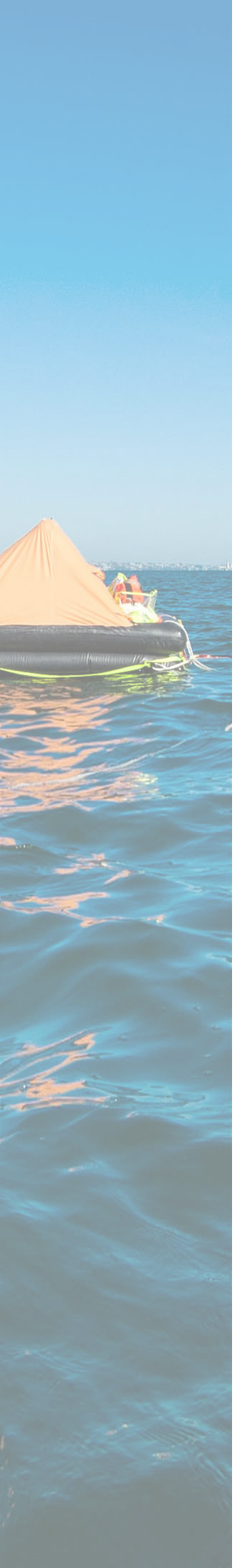
- How could the addition of electricity change your raft design?
- Did your design keep your phone dry? If not, how could you improve your design?
- Imagine there is a coral reef that surrounds the deserted island. What would you add to your design to help get the raft over the reef?

ENGINEERING CONNECTIONS

Engineers are creative problem solvers. In this activity, you were limited by the materials available on your deserted island. Engineers also have to deal with limitations, called constraints, as they solve problems in the real world. Constraints can include materials available, time, and even money. Engineers must come up with the best solution within those constraints. With different materials, more time, and sometimes with more money, the best solution may change.

SCIENCE CONNECTIONS

Why does a rock sink in water, while a giant cruise ship floats? It all has to do with density and buoyant force. Density is a measure of the amount of matter packed into a given volume. Density is closely linked to weight, but it is not the same thing. If an object is very dense, a small amount of it will still weigh a lot! A less dense object of the same size will weigh less than the very dense one. Whenever you place an object in a fluid, two forces act upon the object: a downward force and an upward force. The upward force on objects in a fluid is called buoyant force. The downward force is the force of gravity caused by the object's weight. If the downward force is less than the upward force, the object will float. By decreasing an object's density, we increase the buoyant force. This is why a giant cruise ship with a low average density will float, while a rock, with a high density, will sink.



MacGillivray Freeman's DREAM BIG

ENGINEERING OUR WORLD

dreambigfilm.com

ACKNOWLEDGMENTS

"Stranded Island Challenge" was adapted by the Cincinnati Museum Center and is based on an activity created by Science Enhancement for Science Advancement (SESA). All rights reserved.

allencountyesc.org/files/4714/0975/6744/SESA_Survivor_Tech_Challenge_2014.pdf

Supplemental content adapted for *Dream Big* Activities by Carnegie Science Center.

Find more great activities at DiscoverE.org