FUTURE U.

Sit Down Activity

Objectives

Students will:

- **Build** and **test** helicopter models
- **Create** an optimized helicopter design and **compare** it to those of their peers'
- **Collaborate** to name their helicopter, based on U.S. military naming traditions

Latoya Benally, Manufacturing Engineer

Grade Range

5–8

Overview

In this activity, students will be inspired by the work of a manufacturing engineer for Apache helicopters at Boeing as they develop their own model helicopters. After collaborating to construct two different versions, students will determine which one is safer for passengers before creating a third, optimized model. They will also learn about the unique naming process of United States military helicopters in order to name their own. They will then compare their models against their peers in order to determine which model performs best and why.

Timing

45–60 minutes

Materials

- Device with the ability to project video, one for the teacher
- Latoya Benally, Senior Manufacturing Engineer video, to project
- For groups of three students:
  - Helicopter Build handout (two pages)
  - Scissors
  - 3 paper clips
  - Markers or crayons
  - Devices with internet access or printouts of pre-selected excerpts from:
- Native American Tribes: tinyurl.com/2p8rw58d
- Native American Chiefs: tinyurl.com/2afdndbs

FUTURE U.

Procedure

1. **Warm-Up Activity:** Show the Latoya Benally, Senior Manufacturing Engineer video; then do the following:

    *   Encourage students to summarize Latoya Benally's main responsibilities as manufacturing engineer. Be sure students understand that as team lead for the factory supprt collaborating center for the Apache Helicopter, Latoya is responsible for developing helicopters that help make sure soldiers come home safely.

    *   Elaborate and explain that, in general, manufacturing engineers advise on and design the best processes and technologies for manufacturing specific products.

    *   Ask students: As they work to develop the best process for manufacturing products, what do you think manufacturing engineers strive to achieve? Guide students toward understanding that manufacturing engineers want to ensure that the final products are safe, are of high quality, and are economical, among other goals.

2. Divide the class into groups of three and explain that today students will follow in Latoya's footsteps as they experiment with creating their own model helicopters!

3. Prepare students for the activity by completing the following:

    *   Distribute one Helicopter Build handout (two pages) to each group, and review the directions.

    *   Be sure students understand that after using the outlines provided to build two different helicopters, they will then create their own model. Their goal is to create a helicopter that reaches the ground as slowly as possible.

    *   Answer questions as needed and show students where to find the materials.

4. Encourage students to begin. Explain that they will have about 15 minutes to complete each of the steps.

5. After about 15 minutes have passed, regain the class's attention and explain that students will now be responsible for naming their helicopters. Read the following list of military helicopter names (Boeing AH-64 Apache, Boeing CH-47 Chinook, and AH-6 Little Bird) and ask students to consider what they have in common.

6. Then read the following excerpt from the U.S. Department of Defense:

    The U.S. military has a long history with Native Americans. Armed conflicts between the two were commonly known as the American Indian Wars and were fought intermittently from the time the U.S. was first settled by Europeans to early in the 20th century. But Native Americans also served as some of the fiercest fighters for the United States for more than 200 years. In fact, 32 Native Americans have earned the nation's highest military award, the Medal of Honor.

    The tradition of naming helicopters after Native Americans was once an official regulation. That regulation no longer stands, but the tradition continues.

    (www.defense.gov/News/Inside-DOD/Blog/article/2052989/why-army-helicopters-have-native-american-names/)

7. Elaborate on the reading and explain that the official regulation had said that Army aircraft names were required to consist of Native American terms and/or names of Native American tribes and chiefs. Names to choose from had been provided by the Bureau of Indian Affairs.

8. Tell the class that while this official rule no longer exists, today they will follow in the tradition of naming their helicopters after the Native American cultures. Prepare students to do this by doing the following:

   - Record the following two links on the board (or hand out copies of their print-outs):
     - Native American Tribes: tinyurl.com/2p8rw58d
     - Native American Chiefs: tinyurl.com/2afdndbs
   - Encourage groups to use devices to browse the two websites in order to select a name for their helicopter.
   - Explain that they may choose any Native American name as long as they have a reason for selecting it. They should then write the name somewhere on their safest helicopter model.

9. When there are about 15 minutes remaining in the class session, bring the class back together. Then:

   - Call five or six groups at a time up to the front of the room and have each group share their helicopter name.
   - Guide the groups through dropping their helicopters from the same height at the same time to see which one is able to fall to the ground most slowly.
   - Once a winner is determined, instruct this group to stay at the front of the room, and call up five more groups. Then repeat the same steps until all groups have competed and the class's "Safest Helicopter" has been selected.
   - Encourage the class to reflect on why this helicopter had the most success. Then ask the winning group to share the design decisions behind their helicopter.

10. **Wrap-Up:** Before class comes to a close, tie the activity back to Latoya Benally's role of manufacturing engineer of the Apache helicopter at Boeing. Remind students of the collaboration and collective thought process that Latoya said she relies on to solve problems, and ask students:

    - How could your group apply what you've learned from the rest of your peers to improve your own helicopter design?
    - If you were to redo the construction of your third helicopter, what could you do differently to ensure that a collective thought process (i.e., hearing from as many different people as possible) guided its build as much as possible?

FUTURE U.

National School Standards

Next Generation Science Standards
Engineering Design

- Disciplinary Core Idea:
    - ETS1.B: Developing Possible Solutions
        - A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4)
        - Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3)
        - Models of all kinds are important for testing solutions. (MS-ETS1-4)

ITEEA Standards
Standard 9: Engineering Design

- In order to comprehend engineering design, students should learn that:
    - G. Brainstorming is a group problem-solving design process in which each person in the group presents his or her ideas in an open forum.

Helicopter Build

Materials Needed

- Helicopter Diagrams sheet
- 3 paperclips
- 1 pair of scissors
- 1 piece of scrap paper

Image 1

Step 1: Build

1. Cut out the border of both helicopter outlines.

2. Once your outlines are cut out, cut along the remaining solid lines. (NOT the dotted lines!)

3. Fold back Sections A and B (which both say "Fold Back") along the dotted lines. Fold back Section A first and then Section B on top of Section A. Then press down along both folds to make sure they are tight. Do this for both helicopters.

4. Fold Section C to the back on both helicopters as well.

5. Fasten a paperclip to the bottom of each helicopter. Your helicopters should now look like Image 1!

6. Lastly, for each helicopter: Fold Blade 1 along the dotted line. Then fold Blade 2 in the opposite direction. Your helicopters should now look like Image 2!

Image 2
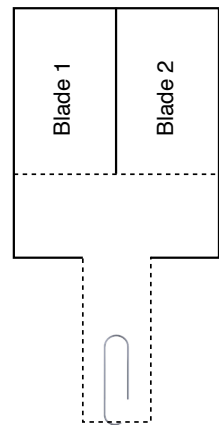
Step 2: Test

Now that your helicopters are complete, it's testing time. Your goal is to get the passengers in your helicopter to the ground as safely as possible. In this situation, the safer helicopter is the one that reaches the ground more slowly.

1. To launch your helicopters, place one in each hand and hold them between two fingers where it says "hold here."

2. Place your arms out in front of you and above your head at the same height.

3. Drop them at the same time and see how they fall!

4. Observe which one drops more slowly, and discuss why they may fall at different rates.

Step 3: Optimize

You will now be challenged to use the materials available to design and build a third helicopter. It should be similar to the first two, but modified so that it drops even more slowly. Note: It must still have a paperclip at the bottom!

Brainstorm ideas for your third helicopter together and listen to all group members' ideas fully before you collectively decide on a new helicopter design.

Then test it against your other helicopters to see how it performs, and continue to make tweaks as needed until your group is satisfied with the results!

FUTURE U.

Helicopter Build

Helicopter Diagrams

HOLD HERE

Blade 1

Blade 2

A

FOLD BACK

B

FOLD BACK

C

HOLD HERE

Blade 1

Blade 2

A

FOLD BACK

B

FOLD BACK

C