

Lesson #5 Gliders



Grades K - 4

Duration 45 minutes

Grouping Students can make own glider, but testing will be easier if they work with a partner

Engineering Criteria: Design a glider that descends as slowly as possible to the ground. It needs to land horizontally

Design Constraints: Materials

Synopsis

Students design and build paper gliders and measure their “flight time” while also attempting to have them land in a horizontal fashion.

Ask

We’ve tested using parachutes to help astronauts return to Earth, what other kinds of aircraft could be used?

Possible Answers; balloons, planes, gliders, helicopters, etc.

For many years NASA used the space shuttle to take astronauts into orbit and get them back safely. What does a plane need in order to help it fly, especially if it’s a glider?

Answer; wings, tail, sharp/pointy nose, flaps, fuselage.

What should our engineering criteria (goal) be for a good glider for astronauts to use? [Remind students that friction between a fast moving object and the atmosphere creates enough heat to cause harm to a craft and its occupants. Rubbing ones hands quickly together is a quick and easy example of heat caused by friction. Students can also be told that “shooting stars” they might have seen are actually meteors burning up due their hitting the atmosphere at a high rate of speed]

Answers: Fly gently for a long time in order to reduce friction and heat upon re-entry. Land horizontally so the astronauts are safe and comfortable.

Imagine

Tell students to draw sketches of planes they’d like to make to meet this engineering challenge. Help them label the main parts of a plane by drawing / projecting a diagram for them.

Plan

Ask children how they could test which designs are best. Remind them of their goals; long flight time, horizontal landing.

Create

Have students construct their gliders.

Improve

Remind students that they should only change one variable at a time to test how design changes are affecting their results.

Ask / Reflect

Guide students in reviewing what they discovered and learned.

Materials

Paper - standard 8.5 x 11 copy paper and/or square pieces 8.5 x 8.5

Scissors

Paper airplane templates (if you choose to give students this type of guidance)

Tape

Paperclips

Timers

Step-by-Step

For this lesson one can use the Engineering Notebook worksheet in order for students to organize thoughts and discoveries. There is also a separate Glider Data sheet to help them record flight times and types of landings.

1. Ask

Ask the students what they learned from parachute / wind tube lessons about how things can float / glide on the air. Or, if these lessons weren't done, ask what they know about the shapes and weight of things that float on air. Have them identify objects that float and fly.

Tell them that engineers have found several solutions for helping astronauts return to Earth and today they will try out some of their own ideas. This would be a good point at which to show images/videos of the space shuttle and other re-entry craft being used today (internet links incl. in Resources section)

Tell them that a successful re-entry vehicle must glide as long as possible and land horizontally (for the safety and comfort of the astronauts).

2. Imagine

Have the students talk with a partner about their design ideas. Draw a sample plane (or project its image) and label the main parts. Have students draw their own ideas for their gliders. The students can use the vocabulary from the diagram to label their pictures and share their ideas.

Ask them how they will test their planes and determine which meets the state criteria. As needed, guide them to considering timing their flight times and checking off the type of landing their plane has.

3. Create

Have students construct their gliders.

4. Improve

Students test and record results for their gliders.

5. Ask / Reflect

Have students discuss successes and discoveries.

Assessment

Use the Engineering Rubric to assess students progress at mastering Engineering Practices. If used, reference their Engineering Notebook worksheet as another source of information on a student's engineering skills.

Teacher Tips & Tricks

What's going on scientifically in this lesson?

Gliders use **air resistance** to glide through the air. Gliders operated by people use wind currents and the updraft of warm air to stay aloft for hours at a time, just like hawks and other birds. The shapes of wings force air to travel faster over the tops of the wings which creates **lift**. The **ailerons** and **elevators** on a glider (as well as planes) allow pilots to control their elevation and direction. Paper gliders are basically flying wings. They actually don't need tails like real planes do. The back of a paper gliders wing can be cut to create **elevators** however, which can be folded up or down to create different effects. One way to help a paper plane be more stable and fly longer is to make sure the wing tips the highest point of the wing. If you are looking at the plane from the front, lift each wing tip so they're as high or a little higher than the rest of the plane.

