

FROM GROUND TO AIR

TRADE LINK: ENGINEERING TECHNOLOGY & AIRCRAFT MAINTENANCE TECHNOLOGY

TEACHER BACKGROUND

Duration: Two-three 45-minute classes.

Group Size: Groups of four.

Setting: Indoors (Classroom).

Grade level: 6-12.

RATIONALE

Paper airplanes have a main body, and generally two wings. Some are more complex, with tails, rudders and flaps. The wings compress the air below the paper airplane, creating high pressure, and thus the airplane is able to "sit" and glide on the air. Moving the rudders, ailerons, or flaps up or down can change the flight path of an airplane. Working collaboratively as a team, you must start from the design process and build an airplane that can successfully fly, while problem solving any potential issues that may arise as you build and test your airplane.

METHOD

In this activity, teams of four student are to design and build a glider plane made out of paper products and toothpicks or wood skewer sticks. Students must decide which two members will be engineer technicians, responsible for the design of the aircraft, and which two members of their group will be the aircraft maintenance technicians, responsible for the construction and troubleshooting of the aircraft.

CURRICULUM OUTCOMES

Students will use scientific inquiry and technological design skills to solve practical problems, communicate scientific ideas and results, and make informed decisions while working collaboratively. (Science, 6-8)

MATERIALS

- Paper (printer paper, wrapping paper, newspaper, tissue paper, toilet paper or paper towel, or cardboard.)
- Sticks (30 cm wood/bamboo skewer sticks, toothpicks, or Popsicle sticks.)
- Adhesive/connector products (3M scotch tape, 3M masking tape, painters tape, duct tape, super glue, glue stick, glue gun, white glue or carpenter's glue, or zip ties.)
- Safety pin

GETTING STARTED

Engineers start with designing and testing several different models of an airplane before they get the approval to build a real one. They typically must work under specific constraints or limits, including the purpose of the airplane. By testing different models of planes, engineers can determine which one is best for distance, speed and other factors. (Problem Solving) The role of the Aircraft Maintenance Technician is to research and troubleshoot problems with the aircraft and write technical reports. As the Aircraft Maintenance Technician, you must be able to problem solve and troubleshoot potential issues as they arise. (Problem Solving, Writing)

THE ACTIVITY

1. Students must first decide their roles as a group; 2 students will take the role of engineering technician, and 2 students will take the role of aircraft maintenance technician. (Collaboration)
2. As a group, decide upon the materials you wish to use to construct your airplane. You must consider specific parts of your airplane, such as main body, wings, tails, rudders, flaps, etc. Create a materials list. (Communication, Writing)
3. Complete mandatory safety checklist provided by the teacher. (Writing)
4. Research various design options. (Digital)

5. Begin designing the airplane, with the engineering technicians leading the process. (Creativity & Innovation)
6. Once the students have completed their mandatory safety checklist, materials list and design plan, they are then to begin constructing their projects according to their design plans. (Communication, Problem Solving)
7. Optional: students may use the worksheet "Design an Airplane" to keep them on track.

BRANCHING OUT (EXTENSIONS AND VARIATIONS)

1. Class discussion: have students discuss in their groups factors that they noticed affected their airplane model test flights. Have them record their answers. Ask students how they would change their designs if they had a do over. Have students list variables that affect flight (such as weight, wing length, rudders, etc.)
2. For extra math practice, have students create a line or bar graph of their planes. Encourage more complex models and manipulate them more.
3. Have students complete other challenges with their planes. Set up a mock landing pad, a target or a hoop to measure plane flight accuracy.
4. If students develop an interest in inventions that relate to flight, or inventions in general, have them dig deeper and conduct further research.
5. For younger students, complete a bar graph as a class or in small groups.

SKILLS FOR SUCCESS

1. What are the factors that affect flight? How will you adjust your design keeping these factors in mind? (Digital, Problem Solving)
2. How will you measure flight distance and flight time? (Numeracy)

INFORMATION BITE

Successful engineering brings together science knowledge, creativity and innovation, productive brainstorming, design/test/build cycles and scientific testing. When all these elements come together, engineers are likely to come up with successful designs. So, even though engineers need to know a lot about airplanes to design new ones, collaboration, communication and problem solving are required for new aircraft designs to be successful.



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