


# Activity Nine—Controlling the Plane

## Lessons 20–21

**Activity (Lessons 20–21) prep time: 45 minutes–1 hour**
(for gathering materials and following pre-lesson instructions)

**Teaching time:**

Lesson 20: 1½ hours
(Science, Language Arts)

Lesson 21: 1½–2 hours
(Science, Math)

## Objectives—Lessons 20 and 21

1. The students will identify the major parts of an airplane.
2. The students will describe the function of each of the major parts of an airplane.
3. The students will explain how the ailerons, rudder, and elevator control the direction of the airplane.
4. The students will identify the movements of roll, pitch, and yaw.
5. The students will construct an airplane and demonstrate how the ailerons, rudder, and elevator affect the direction of the plane.
6. The students will conduct test flights of their planes to predict and verify information.
7. The students will graph the results of their test flights and calculate the range, mean, and median distances of the flights.
8. The students will design a Super Plane, make a labeled drawing of the plane, and deliver a presentation detailing its capabilities to the class.

# National Standards—Lesson 20 and 21

## Science

- Abilities necessary to do scientific inquiry—S2Ea, S2Ma.
- Understandings about scientific inquiry—S2Eb, S2Mb.
- Properties of objects and materials—S3Ea.
- Position and motion of objects/Motion and forces—S3Eb, S3Mb.
- Objects in the sky—S5Eb.
- Abilities of technological design—S6Ea, S6Ma.
- Understanding about science and technology—S6Eb, S6Mb.
- Risks and benefits—S7Md.
- Science and technology in local challenges/in society—S7Ee, S7Me.
- Science as a human endeavor—S8Ea, S8Ma.

## Mathematics

- Compute fluently and make reasonable estimates—M3.
- Understand patterns, relations, and functions—M4.
- Use mathematical models to represent and understand quantitative relationships—M6.
- Analyze change in various contexts—M7.
- Use visualization, spatial reasoning, and geometric modeling to solve problems—M11.
- Understand measurable attributes of objects and the units, systems, and processes of measurement—M12.
- Apply appropriate techniques, tools, and formulas to determine measurements—M13.
- Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them—M14.
- Select and use appropriate statistical methods to analyze data—M15.
- Develop and evaluate inferences and predictions that are based on data—M16.
- Understand and apply basic concepts of probability—M17.
- Problem solving—M18.
- Reasoning and proof—M19.
- Communication—M20.

## Language Arts

- Standards 1, 3, 4, 5, 6, 7, 8, 11, and 12. (See Language Arts Matrix on page 8.)

## Technology

- Students are proficient in the use of technology– I2.
- Students use productivity tools to collaborate in constructing technology-enhanced models, prepare publications, and produce other creative works—I7.
- Students use technology to locate, evaluate, and collect information from a variety of sources—I10.
- Students employ technology in the development of strategies for solving problems in the real world—I14.
- Relationships among technology and other fields—T3.
- Role of society in the development and use of technology—T6.
- Influence of technology on history—T7.
- Attributes of design—T8.
- Engineering design—T9.
- Role of troubleshooting, research and development, inventions and innovation, and experimentation in problem solving—T10.
- Apply the design process—T11.
- Use and maintain technological products and systems—T12.
- Transportation technologies—T18.

# Lesson 20—It's All About Control

## Materials—Lesson 20

- Student logs.
- A copy of the student text for Lesson 20, "It's All About Control," for each student.
- A copy of "The Parts of an Airplane" diagram for each student.
- A copy of the homework assignment, "Design Your Own Super Plane," for each student.
- A picture of the *Wright Flyer I.*
- Pictures of modern aircraft.
- An empty plastic wrap box or any long slender box.
- Cutaway pictures (cross sections) of planes.
- Imaginary Planes poster to be used at the discretion of the teacher to motivate the Super Plane designs.
- Materials for making a straw plane:
  - A copy of the instructions, "Making a Straw Plane," for each pair of students or group of no more than three students. (Each student will construct a plane, but grouping allows students to help one another.)
  - A 12-inch (30.5-centimeter), strong, plastic straw for each student.
  - A 12- by 18-inch (30.5- by 45.7-centimeter) sheet of heavy card stock or other stiff paper for each student. (If possible, allow students to choose different colors. This helps with identifying their planes.)
  - Clear tape.
  - Paper clips.
  - Scissors.
  - A 12-inch (30.5-centimeter) ruler.

## Pre-lesson Instructions—Lesson 20

1. Duplicate enough copies of the student text for Lesson 20, "It's All About Control," for each student. Punch holes.
2. Duplicate enough copies of the diagram of "The Parts of an Airplane" for each student. (This diagram is included on page 237.) Punch holes.
3. Duplicate enough copies of the homework assignment, "Design Your Own Super Plane," for each student. (This homework assignment is included on page 238.) Punch holes.
4. Duplicate enough copies of the instructions, "Making a Straw Plane," for each pair or group. (These instructions are included on page 235.)
5. Have a teacher assistant or a parent cut the parts for the straw plane ahead of time. This is especially helpful for younger students and even for older students when there are time restraints. Use card stock, tag board, or other stiff paper. For each student, cut a 10- by 5-inch (25.4- by 12.7-centimeter) piece for the wing, and an 8- by 1½-inch (20.3- by 3.8-centimeter) piece for the tail. Prepare several extra parts for students who may make mistakes.
6. Lay the straws, wings, and tail assembly pieces out so students can pick them up cafeteria-style.
7. Assign each student to a partner or a small group (no more than three students in a group) for constructing and flying their planes.
8. Teachers may want to ask a few parents to come in to help with the construction of the straw planes. Be sure they are there to watch you demonstrate how to make one at the beginning of the lesson.
9. Enlarge the diagram, "The Parts of an Airplane," to be used as a chart.
10. Find pictures of the *Wright Flyer I* and modern airplanes. Pictures of these should be available in the books that have been gathered.