

## **Building a Glider Lesson Plan**

### **Michigan Curriculum Connections**

**SCI.I.1.E.1** – Generate questions about the world based on observation.

**SCI.I.1.E.2** – Develop solutions to problems through reasoning, observations, and investigations.

**SCI.I.1.E.3** – Manipulate simple devices to make measurements or scientific investigations.

**SCI.I.1.MS.1** – Generate scientific questions about the world based on observation.

**SCI.I.1.MS.2** – Design and conduct science investigations.

**SCI.I.1.MS.3** – Use tools and equipment appropriate to scientific investigations.

**SCI.I.1.M.5** – Use sources of information in support of scientific investigations.

**SCI.II.1.E.1** – Develop an awareness of the need for evidence in making decisions scientifically.

**SCI.II.1.MS.1** – Evaluate the strengths and weaknesses of claims, arguments, or data.

**SCI.II.1.MS.2** – Describe limitations in personal knowledge.

**SCI.II.1.MS.5** – Develop an awareness of and sensitivity to the natural world.

**SCI.IV.3.E.1** – Describe or compare motions of common objects in terms of speed or direction.

**SCI.IV.3.E.2** – Explain how forces (pushes or pulls) are needed to speed, slow down, stop, or change the direction of a moving object.

**SCI.IV.3.MS.1** – Qualitatively describe and compare motion in two dimensions.

**SCI.IV.3.MS.2** – Relate motion of objects to unbalanced forces in two dimensions.

### **Time required**

Five 45-minute to 1-hour class periods

### **Classroom materials needed**

- Pilot Logs
- Access to the Internet for paper airplane construction plans
- 5 sheets of 8.5 inch x 11 inch 20lb. paper per team
- 1 stopwatch per team
- 1 pair of scissors per team
- 1 meter stick or tape measure per team
- 1 ruler per team
- 1 roll of tape per team

### **Intrigue**

- Prior to visiting the Air Zoo, visit [www.airzoo.org](http://www.airzoo.org) and preview the museum with students. Review what your expectations will be while visiting the Air Zoo.
- Distribute Pilot Logs and pencils, and instruct children to use them for taking notes, creating drawings, and diagrams.
- An airplane moves in three directions; it has three axes of motion. It moves left and right, which is called *yaw*; up and down, which is called *pitch*, and side to side as it tilts and balances, which is called *roll*. Ask the children if they could compare the axes of motion while riding a bicycle to the movements of a plane.
- A bicycle moves right and left (*yaw*) and tips over (*roll*). Sometime a bicycle rider will pull the front wheel of the bicycle up for stunt (*pitch*). Students should be able to relate to the sensations their own bodies go through as they are riding. See if there is a student who does stunts on their bicycle and can demonstrate them. The other students can analyze the stunt as to what axes of motion are being displayed while the stunt is being performed.
- Visit the following websites for demonstrations of pitch, roll, and yaw:  
<http://www.grc.nasa.gov/WWW/Wright/airplane/pitch.html>  
<http://www.grc.nasa.gov/WWW/Wright/airplane/roll.html>  
<http://www.grc.nasa.gov/WWW/Wright/airplane/yaw.html>

## Investigate

- Ask your students to build their own basic paper airplane first and put their name on it. Visit [www.funpaperairplanes.com](http://www.funpaperairplanes.com) or [www.kidsturncentral.com](http://www.kidsturncentral.com) for instructions on building a basic paper airplane. You may wish to make award certificate for different categories of competition and/or ask students to decorate their airplanes.
- Divide your class into teams of four each. Explain to the children that they will be competing as a team, but that each of their individual scores will be combined and averaged for a team score during half of the competition.
- Give each team one stopwatch, a pair of scissors, and a tape measure or yard stick.
- Inform the students that they may modify their planes if needed for different areas of competition like: longest flight time, farthest distance, accuracy with a target, and aeronautical stunts such as loops or turning around a specific item.
- Paper airplanes must be hand launched and everyone is allowed three launches in each category before results are recorded, the average is determined and team scores can then be posted.
- The competition may be easily held in a long hallway, gymnasium, or cafeteria.
- Each category is worth 25 points. Ties are allowed. Scoring instructions follow. The highest possible scoring team for the entire event is 100 points. The actual competition may be accomplished over several days.

### Longest Flight Time

Use a stopwatch to determine the length of time a paper plane stays in the air so that flights can be more amazing. Launches can be made from a high place like the top step of a flight of stairs, stage in the cafeteria, or bleachers in the gym. Expect airplanes to fly five to 10 times farther than the height they are launched from. The team with the longest average of flight time receives 25 points, the second longest receives 20 points, the third longest 15 points, and so on.

### Farthest Distance

Have students measure the straight-line distance from the launch spot to the landing spot. This should be demonstrated to the class prior to the

actual competition. Space should also be provided so that children are not interfering with each other. The team with the longest average flight distance receives 25 points, the next longest receives 20 points, the third longest 15 points, and so on.

- Have students select the one airplane they wish to continue using in the competition.
- Ask each team to select one individual to act as the launcher for each trial.
- Remind the students the next two categories are *Accuracy with a Target* and *Aeronautical Stunts* and to make any modifications to the paper planes at this time.
- Students should only make modifications after explaining what they wish to do and why.  
**Accuracy with a Target**  
Place a chair 15 feet from the launching point. A plane that hits the target automatically receives 25 points for the team. Planes that land within predetermined distances of the target receive lower scores (e.g., planes within 1.5 feet of the target receive 20 points, within 3 feet receive 15 points, and so on).  
**Aeronautical Stunts**  
Only one student should be selected to launch the selected plane. A judge needs to be selected, perhaps another teacher or administrator. Each plane will be launched three times and the judge will award points for the stunt. This category may be run two ways: participants can describe what they plan to do and be judged on whether they accomplish their goal or a judge can instruct students on what stunt the plane must perform.
- After each event, post the team scores so the students can determine a total. If the competition takes place over several days, expect that the children will try to launch their own planes outside of class to discover what needs to be accomplished to meet the requirements for each category. This can also lead to explanations for the modifications that are needed.

## Illustrate

- Students should revisit [www.funpaperairplanes.com](http://www.funpaperairplanes.com) and each team should make a different plane this time. Have the children repeat at least one of the

competition categories. Is success a result of the type of plane used or is it the way the plane is launched? What do flaps cut in the wing (ailerons) do for the flight? What happens if you bend the wing tips up?

- Ask the children to search the Internet for websites such as <http://www.bestpaperairplanes.com> for stunt flyers, the Air Scorpion, or others that have been flown in the International Paper Airplane Competition. Have students construct the paper planes from the provided directions and compare the flight patterns.

### **Finalize**

Each team should be assigned a specific goal (flight of 20 feet, downward loop, straight flight, etc.). Give the teams their equipments and allow them 20 minutes to build their plane and test fly it three times before it is flown for a performance assessment.