Experimenting with Flight: Entering the Fray in the Pioneering Age of Flight

Activity Type: Hands-On Activity

Grade Level: 6–8

A RIF Guide for Educators

Objective: Students will assume the role of aviation pioneers as they build and test different glider prototypes.

Content Connections: Literacy, History, Science

Standards:

- **CCSS.ELA-LITERACY.RH.6–8.1:** Cite specific textual evidence to support analysis of primary and secondary sources.
- **CCSS.ELA-LITERACY.RH.6–8.2:** Determine the central ideas or information of a primary or secondary source; provide an accurate summary of the source distinct from prior knowledge or opinions.
- **CCSS.ELA-LITERACY.RH.6–8.3:** Identify key steps in a text's description of a process related to history/social studies (e.g., how a bill becomes law, how interest rates are raised or lowered).

Summary: In this Hands-on Activity, students assume the role of members of a pioneer-era airplane company. They will read typed first-hand descriptions of the Wright brothers' efforts at test flying their Wright Flier in 1903. They will then work as a group (or company) to create their own model glider using one of the designs provided. Finally, they will test their gliders and record their observations in a way that imitates the style used in the report on the Wright brothers' work.

Before the Activity

Explore the Wilbur and Orville Wright Papers Teacher Page:

The Teachers Page to The Wilbur and Orville Wright Papers at the Library of Congress provides standards alignment information, links to the Collection Highlights page, the collection Finding Aid, and a list of additional Related Resources.

Explore the Readings: Students will be using the following readings and documents to complete this project.

Books:

- Bobby Mercer, *The Flying Machine Book: Build and Launch 35 Rockets, Gliders, Helicopters, Boomerangs, and More* (Chicago Review Press, 2012).

Archival Sources:

- Wilbur Wright and Orville Wright papers, 1809-1979: 1904 Pamphlet

This activity was funded by a Library of Congress Teaching with Primary Sources Grant.

During the Activity

Warming Up:

Direct students to complete the Warming Up activity. Consider converting the activity into a classroom discussion and collecting the student responses on the board for students to read. Encourage students to talk about relevant ideas that might not be covered in the list of questions. If students have drafted reports on their discussions with partners, consider having them read or summarize their reports for you or the class.

Getting Started:

Have students read the Getting Started section of the Student Edition. After students read, lead the class in a brief discussion of Otto Lilienthal. Consider preparing to discuss the work of Lilienthal by reading through the following online resources:

- Otto Lilienthal Museum
- To Glide is to Fly

Explain to the students who he was and why he was important. Have them talk about this by prompting them throughout the explanation with questions.

As students get started, direct them to the following LOC tools:

- Searching the Library of Congress: This tutorial will walk students through the process of searching the Library of Congress's many sources.
- Primary Source Analysis Tool: This tutorial will introduce students to primary sources and provide them tools for reading and analyzing them.

Readings:

Students may read the suggested readings on their own or in pairs of small groups. For students who may need support understanding the readings' key ideas, use the suggested comprehension questions below.

Books:

- Bobby Mercer, *The Flying Machine Book: Build and Launch 35 Rockets, Gliders, Helicopters, Boomerangs, and More* (Chicago Review Press, 2012).
    - Who was the first person known to study flight seriously? *Leonardo da Vinci*
    - How is "thrust" provided in a modern airplane? *The engine creates the thrust in a modern airplane.*
    - What is drag? *Drag is friction from the air.*

Archival Sources:

- Wilbur Wright and Orville Wright papers, 1809-1979: 1904 Pamphlet
    - Consider using the discussion questions below as comprehension questions for this source.

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Activity: Testing an Aircraft

Students will be working in groups we will be referring to as companies. These groups can be large or small, depending on the size of the class. Be sure to organize students into groups in a way that best distributes talent and energy around the classroom.

Before the students organize into companies, they will be working independently to read through the Wright brothers 1904 Pamphlet and answer the following questions. These questions are intended to encourage them to read through this document carefully. Time permitting, consider holding a class discussion on the document using the questions to guide the discussion.

- What was the motivation for the Wrights to explain their efforts to document their work in this way? *The Wrights claim that their efforts and accomplishments had not been accurately described in the media reports.*
- How many attempts at flight were made on December 17, 1903, by the Wrights? *Four attempts; two by Orville and two by Wilbur*
- What were the wind conditions like on that day? *Their own measurements indicated that the velocity was 22 miles per hour when the first flight was made and 20–22 miles per hour at the time of the last flight.*
- In what way was the aircraft launched from the ground into the air? *The Flyer was launched along a rail into the wind.*
- How fast was the Flyer able to travel through the air? *It flew 30 to 35 miles per hour through the air.*
- What reasons do the Wrights give for why the first flights were much shorter than the final flight? *They learned to better handle the airplane with each new attempt.*
- Why did the Wrights decide to discontinue any further efforts at flight until the next season? *The winter was already setting in, and they wanted to wait for better conditions.*

Use the following to help students progress through the steps described on the Student Edition.

Step One: In this step, students have been encouraged to create their airplane companies and create a name for their company. Here are some sample names to help students come up with their own: Flight Ventures, Accuracy Aeronautics, Up-Up-and-Away, Inc.

Step Two: In this step, students will research their airplane design in the book *The Flying Machine Book: Build and Launch 35 Rockets, Gliders, Helicopters, Boomerangs, and More* by Bobby Mercer. Students should select from the designs available in part three starting on page 37. The materials required for these gliders include:

- Paper
- Scissors
- Empty plastic water bottle
- Sharp knife
- Duct tape
- Paper plates
- Glue
- Tape
- Plastic straws
- Pennies
- Phonebook page
- Piece of cardboard

Note: If *The Flying Machine Book* is unavailable, consider directing students to one or more of these paper airplane designs. Additionally, if some or all of the resources above are unavailable, these paper airplanes (which require only the paper) are suitable replacements:

Fold-N-Fly Paper Airplane Designs

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Step Three: In this step, students will be building their aircrafts by following the instructions in the book. Some suggested materials may not be available. Attempt to help the students make adequate substitutes with supplies that are available. Remind them to refrain from testing the aircraft until the testing phase.

Step Four: In this step, students will need to bring their aircraft to the testing ground. You will need to have identified a suitable location for the testing. A school gymnasium would be best, but any large enclosed area would work. If permitted, use masking tape to mark off and measure areas for testing.

Step Five: In this step, students will be identifying roles for each person in their companies. Help students with this process the best you can. There should be roles for fliers, roles for measuring, roles for note-taking, etc.

Step Six: Students will be making 10 attempts to fly their aircraft. Each attempt should be deliberate and should incorporate anything learned from previous attempts. Remind students that they should be carefully documenting these attempts. They should record notes about what worked, what did not work, and how they adjusted their approach on the next attempts.

Note: If you decide to have students complete the elaborate activity below, make sure they are collecting images of their testing attempts.

Step Seven: The final step is to produce two reports:

- The first report is a complete version of the flight table located at this link.
- The second is to draft a report on the experiments modeled on the Wright brothers 1904 Pamphlet.

After the Activity

Elaborate: Consider having students create slideshow presentations using Google Slides that document their efforts. These can be shown to the class in presentations led by the individual companies. You might consider having them create these slideshows as possible proposals for government officials looking to provide grants for additional aviation research. Students can make an argument about why they should be selected to receive these grants.

Reflect: Consider the following reflection prompts to use for a class discussion or short essay:

- What have your efforts at building and testing a glider taught you about the pioneering efforts of aviators?
- What new appreciation for this trial-and-error process have you gained by conducting your own efforts?
- In what way did the data collection efforts you used during the testing process help your efforts? How were these data most useful?
- Can you think of any other noble efforts where careful data collection during the trial-and-error process might prove useful?

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