

# TOOLKIT 1

# BEND THAT BAR



OKLAHOMA  
Aeronautics



OKLAHOMA  
CareerTech

**Overview:** Students learn about material properties and that engineers must consider many different material properties when designing. This activity focuses on strength-to-weight ratios and how sometimes the strongest material is not always the best material.

**Source:** TeachEngineering.org

**Grade Levels:** 5-7

**Location:** [https://www.teachengineering.org/activities/view/cub\\_airplanes\\_lesson03\\_activity1](https://www.teachengineering.org/activities/view/cub_airplanes_lesson03_activity1)

| 1<br>Student<br>Activity  | 2<br>Lesson<br>Plan or<br>Procedure | 3<br>Activity<br>Evaluation<br>or Rubric | 4<br>Suggested<br>Activities | 5<br>Glossary | 6<br>Teacher<br>Background<br>or Concepts | 7<br>Student<br>Background<br>or Concepts | 8<br>Standards<br>Alignment |
|---|-------------------------------------|--|------------------------------|---------------|---|---|-----------------------------|
| x   | x                                   | x  | x                            | x             | x   | x   | x                           |
| Notes:<br>• Includes learning objectives.<br>• Includes introduction/motivation text to relate the topic/activity to aerospace careers. |                                     |  |                              |               |   |   |                             |

KEY:

1. Student Activity: This is the focus of the toolkit. It is at least one complete activity or lab for students to complete that relates to a topic relevant to aviation/aerospace. It may include related worksheets.
2. Lesson Plan or Procedure: These are the steps or instructions for the teacher to use to deliver the activity.
3. Activity Evaluation or Rubric: The answers to the activity or a rubric or other tool for evaluating students' results.
4. Suggested Activities: These are additional or extension strategies for the teacher that relate to the topic/activity.
5. Glossary: This is a list of the vocabulary terms and their definitions that relate to the activity and/or associated concepts.
6. Teacher Background or Concepts: This is any background information for the teacher that explains key concepts relating to the topic/activity, provides the aerospace context for the activity or otherwise helps prepare the teacher for the topic/activity.
7. Student Background or Concepts: This is any background information for the student about theory and concepts related to the topic/activity. It may be separate handout files or a text section within the larger topic/activity.
8. Standards Alignment: These are education or industry standards that align with the topic/activity.

## SUPPLEMENTAL RESOURCES

### General Resources

- *Pilot's Handbook of Aeronautical Knowledge*, Federal Aviation Administration, 2016. Free to download at [https://www.faa.gov/regulations\\_policies/handbooks\\_manuals/aviation/](https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/).
- Airport Acronyms and Abbreviations, Federal Aviation Administration, <https://www.faa.gov/airports/resources/acronyms/>
- Find an Airport, Oklahoma Aeronautics Commission, <https://oac.ok.gov/airports>
- Aeronautics Educator Guide, NASA, <https://www.nasa.gov/stem-ed-resources/aeronautics.html>
- K-12 Student/Teacher Resources, NASA, <https://www.nasa.gov/aeroresearch/resources/k-12-resources>

### Instructional Practice Resources

- *60 Formative Assessment Strategies*, Natalie Regier, 2012. Free to download at <https://www.okcareertech.org/educators/resource-center/teacher-trainer-tools>.
- *Student Learning That Works: How brain science informs a student learning model*, McREL International, 2018. Free to download at <https://www.mcrel.org/student-learning-that-works-wp/>.

### Career Planning Resources

- *OK Career Guide*. Free to Oklahoma educators. For more information, see <https://www.okcareertech.org/educators/career-and-academic-connections/ok-career-guide>.
- Aviation Organizations, Oklahoma Aeronautics Commission, <https://oac.ok.gov/media-outreach/aviation-organizations>
- *Careers in Aerospace*, American Institute of Aeronautics and Astronautics. Free to download at <https://www.aiaa.org/get-involved/students-educators/Careers-in-Aerospace>.
- Flying for a Career, AOPA, <https://www.aopa.org/training-and-safety/learn-to-fly/flying-for-a-career>
- Oklahoma Aerospace: Building on a Rich Tradition, Oklahoma Department of Career and Technology Education, <https://www.okcareertech.org/business-and-industry/aerospace-and-aviation>

### Activity-Specific Resources

- "Aerospace materials—past, present, and future," *Aerospace Manufacturing and Design*, <https://www.aerospacemanufacturinganddesign.com/article/amd0814-materials-aerospace-manufacturing/>
- "Basics of Aerospace Materials: Aluminum and Composites," MachineDesign <https://www.machinedesign.com/materials/article/21831769/basics-of-aerospace-materials-aluminum-and-composites>
- Materials, Smithsonian National Air and Space Museum, <https://howthingsfly.si.edu/structures-materials/materials>
- "The History of Aviation Materials," AIP Precision Machining, <https://aipprecision.com/the-history-of-aviation-materials/>
- "What Materials Are Aircraft Made Of (& Why), AeroCorner.com, <https://aerocorner.com/blog/what-are-planes-made-of/>

## TEACHER ACTIVITY REFLECTION WORKSHEET

- What instructional objectives were met? How do I know?
- Were students actively engaged? How do I know?
- Did I alter my instructional plan? How and why?
- What formative assessment(s) did I use?
- What would I do differently the next time?
- What additional resources and/or support would enhance this activity?

# A-Z REVIEW

## Student Reflection Worksheet

Your Name: \_\_\_\_\_

Date: \_\_\_\_\_

### Instructions

- Think about what you have learned today.
- Write a word about what you have learned in each letter box. The word does not need to begin with that letter. Try to think of words others haven't used.
- At the end of the time given, you will get points for each word that applies. You will also get points for words no one else has written down.

**Note:** This activity can be done in groups or individually; your instructor will decide. Your instructor will decide the bonus for the winning individual or team.

|          |  |          |  |
|----------|--|----------|--|
| <b>A</b> |  | <b>N</b> |  |
| <b>B</b> |  | <b>O</b> |  |
| <b>C</b> |  | <b>P</b> |  |
| <b>D</b> |  | <b>Q</b> |  |
| <b>E</b> |  | <b>R</b> |  |
| <b>F</b> |  | <b>S</b> |  |
| <b>G</b> |  | <b>T</b> |  |
| <b>H</b> |  | <b>U</b> |  |
| <b>I</b> |  | <b>V</b> |  |
| <b>J</b> |  | <b>W</b> |  |
| <b>K</b> |  | <b>X</b> |  |
| <b>L</b> |  | <b>Y</b> |  |
| <b>M</b> |  | <b>Z</b> |  |

# EXIT TICKET

 **OKLAHOMA** AVIATION

Name \_\_\_\_\_ Date \_\_\_\_\_

Three things I learned today: \_\_\_\_\_

Two ways I contributed to class today are: \_\_\_\_\_

Two Important facts/details: \_\_\_\_\_

1 question I have for tomorrow: \_\_\_\_\_

**EXIT TICKET**

 **OKLAHOMA** AVIATION

Name \_\_\_\_\_ Date \_\_\_\_\_

Three things I learned today: \_\_\_\_\_

Two ways I contributed to class today are: \_\_\_\_\_

Two Important facts/details: \_\_\_\_\_

1 question I have for tomorrow: \_\_\_\_\_

**EXIT TICKET**

# CAREER REFLECTION WORKSHEET

Your Name: \_\_\_\_\_

Date: \_\_\_\_\_

## Instructions

- Many factors go into deciding what career might be a good fit for you. You can be proactive and start researching careers to help you decide a career path.
- Choose one to three careers in Aviation & Aerospace Pathways that interest you. Use the career pathways videos and other resources that your instructor provides. Answer the questions below for each career.

1. List the career. Why does this career interest you?

2. What tools and technology does this career use? How would they make the job easier?

3. What knowledge is important to have for this career? Why is it important?

4. What skills and abilities are important to have for this career? Why are they important?

5. What work activities in this career might relate to things you already do at school, at home or at a job?

6. What about the work environment for this career would interest you?

7. Where can you develop the skills and abilities for this career?