# STEM ACTIVITY: Introduction to the Scientific Method
# *O-Wing Experiment*

Teacher: Martin Building: FMS
Course: 7th Grade Science
Unit: General Science/Intro to Scientific Method
Date: Beginning of the Year

| STEM_ Standards_ (CCSS/NGSS | Student Language | How Demonstrated (Assessment) | Real World Connection |
|---|---|---|---|
| **MS-ETS 1-1**<br>**MS-ETS 1-2**<br>**MS-ETS 1-3**<br>**MS-ETS 1-4**<br>**MS-PS 2-1**<br>**MS-PS 2-2**<br>**MS-ESS 3-3**<br>**MS-ESS 3-5 *air pollution*** | **I CAN:**<br>*design a futuristic aircraft prototype<br>*work cooperatively in a group to design and build an prototype of an aircraft | Formative assessment through student performance of activity.<br>Analysis questions and graph | *air pollution/global warming and airplanes<br>*natural resource depletion (oil)<br>*finite resources<br>*cost savings for business |

| V | A | K | T |
|---|---|---|---|
| X | X | X | X |

**Lesson:**
*Given the following materials:

I. **Background Information: See Real World Connection (above)**

Provide students with essential knowledge/information or activate prior knowledge that will help them address the challenge. Introduce the project by discussing the question posed in the Real World Connection box. Students will continue to work together for the duration of the project.
*Airlines are looking for ways to conserve fuel costs. One way they do this is to reduce the amount of weight they carry on each flight. Additionally, aircraft design using current state-of-the-art technology and materials mitigates the forces acting on an aircraft in flight thus saving the company a lot of money.

## II. Technology/Engineering Standards: See Standards (above)

State each learning standard subtopic, central concept, and individual learning standard that the lesson/activity will address along with the appropriate grade level span.

## III. Critical Key Vocabulary Term:

Critical vocabulary includes words and terms that students need to know in order to meet the learning outcomes for the lesson plan.

*scientific method
*carbon dioxide
*lift
*drag
*aerodynamics
*mass
*gravity
*process
*hypothesis
*Bernoulli Effect
*fluid dynamics
*conclusion
*fuselage
*troposphere
*pollution
*atmosphere
*finite vs. infinite resources

**IV. State the Challenge/Problem:**

a. Identify the need or problem that students must solve.

Your job as an aircraft engineer is to develop the prototype for a new design.
Your goal is to create an aircraft that flies the furthest distance possible.

b. List criteria and constraints.

Your aircraft design MUST use all of the following materials: straws, cardstock, tape and paperclips.

**V. Materials**

plastic drinking straws tape cardstock scissors ruler pencils paperclips.

**VI. Procedure:**

Detailed step by step instructions for completing the stages up until the actual design process and subsequent design testing /evaluation.

**VII. Design Process Steps:**

1. **Brainstorm possible designs**
2. **Design your prototype(s)-discuss pros and cons, select a design to build, draw a diagram of your prototype**
3. **Create your prototype(s) using the materials provided**
4. **TEST your design! Each prototype should be "flown" five times, measured, and an average distance taken.**
5. **Evaluate and rEfine (re-engineer) your design as needed.**

**VIII. Extension(s)**

A structured way to delve deeper into content after a student has demonstrated proficiency in a lesson.
Evaluate various design options (ex: the 'O-Wing'Experiment)

**IX. Scaling the Lesson Up and/or Down**

How can the lesson be adapted to accommodate different grade span students (elementary, middle, high school)?

## S.T.E.M. Connections include:

Science- Force and Motion, Molecular motion, *Weather, *Temperature differential, Atmospheric pressure, scientific method (Refer back to vocab list)

Technology- Design process, Modeling, Historical perspectives

Engineering- Problem solving, Prototyping, Technological design

Math- Measuring mass, measurement, graphing, averages, metric system

# REFLECTIONS: