## Atmospheric Flying Machines Activity

**LEARNING AREA:** Scientific Applications
**EDUCATIONAL LEVEL:** High School
**CONTENT STANDARD**: Earth and Space Systems

**STANDARD: A student shall:**

**A.** demonstrate understanding of the four forces that act on any aircraft by investigating and analyzing the scientific principles behind each force in a written report. Students will design, fly, and evaluate a paper aircraft and write a lab report of their design.

**B.** demonstrate understanding:

**(1)** of how historical and current scientific concepts and knowledge guide scientific inquiries;
**(2)** that scientific inquiries are performed to test ideas and predictions and to learn about the natural world;
**(3)** of how the use of various technologies influence the quality of data and the investigation;
**(4)** of the essential role of mathematical tools and models and how they are essential to scientific inquiry;
**(5)** of how explanations based on evidence adhere to established criteria including empirical standards, logic, openness to criticism, and reporting of methods and procedures; and
**(6)** of how traditions govern the conduct of science, including ethics, peer review, and consensus;

**C.** design and conduct an experiment to investigate a question and test a hypothesis by:

**(1)** formulating a question and hypothesis;
**(2)** designing and conducting an investigation;
**(3)** recording relevant data;
**(4)** analyzing data using mathematical methods;
**(5)** constructing reasonable explanations to answer the question and supporting or refuting the hypothesis;
**(6)** identifying and considering alternative interpretations of results; and
**(7)** specifying implications for further investigation;

**D.** design and conduct one experiment to measure one of the forces by identifying scientific issues based on observations and the corresponding scientific concepts; analyzing data to clarify scientific issues or define scientific questions, and comparing results to current aircraft or future aircraft.

**NEXT STEP: LARGE PROCESSES/CONCEPTS---**



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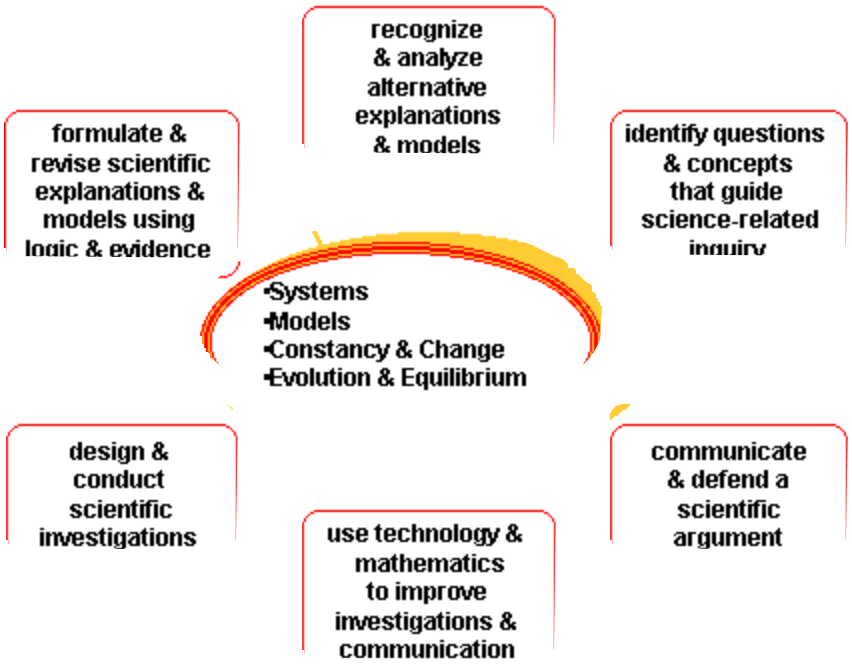
## Atmospheric Flying Machines Activity continued---

**LARGE PROCESSES/CONCEPTS:**




**NEXT STEP: ASSESSMENT TASK---**



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**ASSESSMENT TASK:**

**DESCRIPTION:** Students will research the four forces that affect all aircraft and the scientific principles behind each and write a formal report. Students will construct a paper airplane and evaluate it for the 4 forces in a formal lab report.

**PRODUCTS/EVIDENCE OF LEARNING:**
**1.)** Write a formal report of aircraft forces and scientific principles.
**2.)** Construct a model airplane out of 8½ X 11 typing paper.
**3.)** Write a formal lab report of flight characteristics of your model airplane.
**4.)** Possible Enrichment Activity: Compete with other model designs for longest timed flight or some other parameter.

**OVERVIEW:**
***Overall objectives:*** Students will create a formal written report of the four forces that act on all aircraft and the scientific principles behind each force. They will design a paper airplane, fly it, and evaluate on the four forces in a formal lab report.
***Problem:*** What factors make atmospheric flight possible and what principles are they based upon?

**DESIGN A MODEL AIRPLANE**
**Procedure:**
**1.)** Each student will research the four forces acting on all aircraft.
**2.)** Each student will explain the scientific principles and history behind each of these forces.
**3.)** Each student will write a formal written report.
**4.)** Each student will include at least one picture/drawing explaining the forces and principles.
**5.)** Each student will include a bibliography with a minimum of 3 references.
**6.)** Each student will design a paper airplane, test it for the four forces, and write a formal laboratory report with their results.
**7.)** The lab report will state the individuals name, title of lab, purpose, hypothesis, procedure, data, and conclusion.
**8.)** Possible Enrichment: Consider a contest between airplane designs.

**NEXT STEP: CHECKLIST---**



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**CHECK LIST:**

| STUDENT | TEACHER | |
|---|---|---|
| | | **THE FORMAL REPORT** |
| _____ | _____ | **1.** Clearly explains the four forces acting on all aircraft. |
| _____ | _____ | **2.** Includes the scientific principles behind the forces and a history behind each. |
| _____ | _____ | **3.** Compares the forces to each other. |
| _____ | _____ | **4.** Includes at least one drawing/picture. |
| _____ | _____ | **5.** Includes a glossary with definitions to scientific terms. |
| _____ | _____ | **6.** Has bibliography with a minimum of three references written in proper reference format. |
| | | **THE LABORATORY REPORT** |
| _____ | _____ | **1.** Includes a model airplane made of one (1) 8 1/2 x 11 piece of paper. |
| _____ | _____ | **2.** States the title, purpose, hypothesis, procedure, data table and conclusion. |
| _____ | _____ | **3.** The student will analyze the data and evaluate the hypothesis in the conclusion section of the report. |
| | | **ENRICHMENT ACTIVITY** |
| _____ | _____ | **1.** Competed with other students designs and planed_____. |



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