Flying or Falling

LEARNING AREA: Scientific Concepts and Applications
EDUCATIONAL LEVEL: High School
CONTENT STANDARD: Concepts in Physics

A student shall:

A. Demonstrate understanding of the basic forces acting on a plane, be able to find the CG (center of gravity), wing area, and the lift to weight ratio by investigating and analyzing the concepts of motion, force, gravity, CG, and the Bernoulli Principle through labs and mathematical formulas.

B. Demonstrate understanding:

1. Of how historical and current scientific concepts and knowledge guide scientific inquiries;
2. Of how scientific inquiries are performed to test ideas and predictions and to learn about the natural world;
3. Of how the use of various technologies influences 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.

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 investigations through a lab-based study. Identify scientific issues based on observations and the corresponding scientific concepts learned, then analyze that data to clarify scientific issues or define scientific questions. Comparing results to current model / aircraft.

NEXT STEP: Large Processes/Concepts

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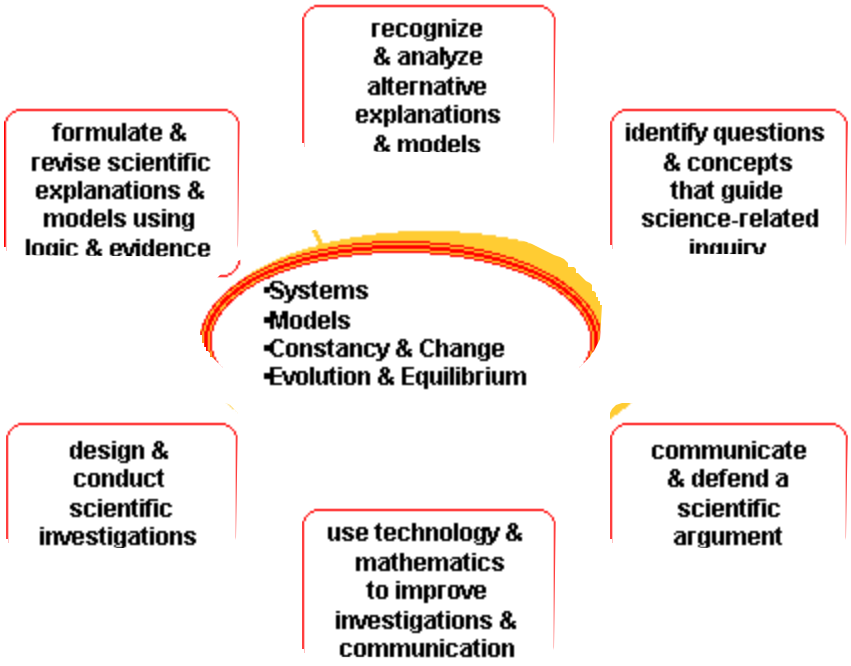
Large Processes / Concepts-----



NEXT STEP: Assessment Task

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Assessment Task------

Description:

Students will learn the basic principles of airplane flight, (lift, thrust, gravity, etc.) through in-class lectures and lab based re-enforcers & worksheets. CG and wing area calculation will be examined through teacher-centered examples along with demonstrations of how to calculate a wing area and the maximum amount of weight it can lift. Finally at the end of the two-week or three-week session students will put their knowledge to use in a final lab activity.

Products/Evidence of Learning:

1. Students must be able to describe at least three basic principles of flight.
2. Students must show how each principle affects a plane in flight.
3. Students must be able to find the center of gravity on a wing.
4. Students must be able to find the center of gravity on a plane.
5. Students should determine the wing area of a wing.
6. Students should be able to calculate a wings maxim load capabilities.
7. Students must define terms.

Overview:

The overall objectives are to have the students be able to understand the weight to lift ratio of an airfoil, along with the added understanding of CG and how it affects an airplane/wing during flight.

This should aid in understanding flight, how wings work, how much they can carry, and understand the importance of an airplanes CG.

This should be spread out over a 2-3 week period. The first half can be spent on basic principles, intro to formulas, and labs backing these areas. The second half should be spent dealing with CG, wing area and load capabilities, using labs or models to show how these details affect a plane. A video describing aviation's basic principles would be highly recommended to start off the activity. The last lab should be a lab set up focusing on each of the products/evidence of learning, as stated above.

NEXT STEP: Checklist

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Checklist-----

STUDENT:

_____**1.** Accurately detailed and recorded facts relating to the issues in lab worksheets.
_____**2.** Showed evidence of initial research by completing the worksheets.
_____**3.** Shared findings with the rest of the group/class during class discussion time.
_____**4.** Analyzed the data and evaluated the hypothesis in the conclusion section of the work sheets.
_____**5.** Demonstrated accurate understanding of the issue.
_____**6.** Student understood recorded data, and could read and apply it during class discussions.
_____**7.** Has stated/written the title, purpose, hypothesis, procedure, data table, and conclusion on each worksheet.

TEACHER:

_____**1.** Clearly explained the forces acting on an aircraft.
_____**2.** Researched the scientific principles behind the forces and a brief history behind each force.
_____**3.** Provided detailed worksheets; the back will detail the procedures.
_____**4.** Included a glossary with definitions to scientific terms.
_____**5.** Provided testing stations for the students to collect data.
_____**6.** Created appropriate model demonstrating Newton's three laws of motion.
_____**7.** Demonstrated accurate understanding of the issues.
_____**8.** Gave material kits to each group, and recorded data.
_____**9.** Provided a forum for discussion of findings, and formed student groups.

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