Drexel-SDP GK-12 ACTIVITY

Science

Weather and Aeronautics

Forces of Flight

Grade Level 5

Lesson # 1 of 1

Lesson Dependency Density Lesson

Time Required 1 Day

Summary

- In this lesson, we continue our discussion of Aeronautics by demonstrating principles of density and force through displacement, and the basic forces of flight.

Keywords

Density, Aeronautics

Educational Standards: 3.5.7, 3.6.7

Engineering Connection

The aeronautics course is intended as a multi-disciplinary course in physics, math and history of aviation. Navigation, forces of flight, principles of flight, history of flight, and environmental factors (including weather and landforms) are specifically investigated. The core curricular items are emphasized, and aviation is considered an underlying theme. The intent is to provide grounding to the curriculum components learned in a typical K-12 school year. Aviation easily generates a lot of excitement among this age group, and as a result, measurable results are expected in these subjects.

Learning Objectives

- Students will take what they learned in the Density lesson and apply those concepts to basic flight. Students will draw a force diagram of the airplane and correctly label/identify lift, drag, thrust and weight. Students will demonstrate understanding of this force diagram such that lift and thrust counter weight and drag, respectively.

Procedure

- In the Density lesson, density is demonstrated using water. We extend this during the aeronautics module to include density and its applications to flight.

  Discuss the paper airplanes from the previous lesson, what were the primary components? Why did they fly? Students will likely say "the wings," but what did they have to do (i.e. offset weight).

  Moving forward with this thinking, why did it move forward through the air? Air moved over the wing, demonstrating Newton's Third Law.

  What made it stop? What makes a ball stop rolling? Friction. This is Newton's Second Law at work. We call it air resistance. Air pushing on the airplane creates drag and opposes thrust!

  Using a slightly more robust model airplane, show headwind and tailwind effects by demonstrating curved flight, stalling flight and simulated landing flight into or with a fan. Into the fan's wind, airspeed increases but groundspeed decreases, providing a precise landing spot and increased airflow over the wing; thus it is preferable to land / take off upwind. Generate discussion on this.

  Given the lift/drag/thrust/weight diagram, how can pilot speed up, slow down, climb, and descend? How do spoilers work? How about the flaps? How do you turn? (bank and "climb" through the turn).

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