Oklahoma Key Business Systems

Lesson 2

Aerospace & Defense: *Wingin' It*

ESSENTIAL QUESTION:
How do engineers test and refine designs?

Engage: What things make birds of prey successful hunters?

Although uncommon, Golden Eagles have been known to carry young mountain goats off of cliffs! Average weight of a Golden Eagle is 10-15 lbs. They can carry prey larger than itself at a full speed dive. **(http://www.adfg.alaska.gov/index.cfm?adfg=wildlifenews.view_article&articles_id=343)**

What features of a Golden Eagle make it possible to lift such large prey?

Explore:

1. Go to **http://bit.ly/NASAhelicopter** to download and print the template and instructions for building a paper helicopter. Build it!
2. Get a stopwatch and time how long it takes your helicopter to reach the ground.
3. Try adding paper clips to the bottom, one at a time, and see how this affects the flight time of your helicopter. Note: Drop it from the same height each time.
4. You should try your helicopter with each set of paper clips a few times and take an average for each number of paper clips trial.
5. Record your data in the table and graph in the online lesson extension.

Explain: What happened to your helicopter flight time as you added more paper clips? Why do you think this happened? What do you think would happen if you changed other things like:

Wing length? Wing shape? Type of paper? Overall helicopter size?

Each one of your answers are what scientist call a **Hypothesis**.

Expand:

1. Choose one of your hypotheses and design an experiment to test it.
2. Be sure to record your data in a table and a graph **(nie.newsok.com/educators curriculum/Oklahoma-key-business-systems/)**.

Application: Scientists run experiments to tests their hypotheses and predictions to add to what is known by other scientists. Engineers run experiments to test the design of a machine or product. In this experiment you were both a scientist and an engineer. Aerospace engineers run thousands of experiments on aircraft to perfect how each type of aircraft behaves in flight. Each part of an airplane or helicopter undergoes extensive testing not only for proper flight but also for safety.

Evaluate:

What did you discover? What is the best helicopter design? How do you know? (Give evidence) What steps did you take to test and refine your helicopter design? Explain and show your findings to an adult.

Full lesson can be found at http://k20alt.ou.edu under the science tab in middle level science

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