Unit 5: Airfoil Design and Forces of Flight

Content Area: **Applied Technology**
Course(s):
Time Period: **Marking Period 1**
Length: **5 Days**
Status: **Published**

Summary

In this unit, students will explore the science and history of flight while learning how humans developed the ability to fly. Through the design, construction, and testing of foam gliders and/or paper airplanes, students will investigate the four forces of flight and discover how airfoil design affects aircraft performance. Students will apply engineering and problem-solving skills as they experiment with different designs, collect data, and refine their models to achieve successful flight.

Revision Date: June 2026

Standards

9.2.8.CAP.1	Identify offerings such as high school and county career and technical school courses, apprenticeships, military programs, and dual enrollment courses that support career or occupational areas of interest.
9.4.8.CT.2	Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).
5.2	Utilize positive communication and social skills to interact effectively with others
8.2.8.ED.1	Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.
8.2.8.ED.2	Identify the steps in the design process that could be used to solve a problem.
8.2.8.ED.3	Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch).
8.2.8.ED.5	Explain the need for optimization in a design process.
8.2.8.ED.6	Analyze how trade-offs can impact the design of a product.
8.2.8.ED.7	Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches).

Essential Questions/Enduring Understanding

Essential Question:

How has flight changed the way people live, work, and connect with one another?

What forces allow an airplane to fly?

How does wing design affect an aircraft's performance?

How can engineers use testing and redesign to improve flight?

Enduring Understanding

Flight is another way that technology has made the world we live in "smaller."

Successful flight depends on the interaction of lift, weight, thrust, and drag.

Objectives

Students will know the history of flight, starting with the Wright Brothers.

Students will know how the principles of flight, such as lift, thrust, drag, and gravity, affect flight performance.

Students will know the basic vocabulary of airplanes and flight design.

Students will be skilled at identifying a technical problem and using the design process to create an appropriate solution.

Students will be skilled at creating, testing, and modifying prototype paper airplanes.

Students will be skilled at identifying which forces are impacting their design types.

Learning Plan

Vocabulary and Terminology: Students will work to complete a short presentation on vocabulary and terminology related to airfoil design and flight. Students will first preview the vocabulary and terminology as a class. Presentations will include definitions, imagery, and real-world examples of the word.

Leaf Glider Challenge: Students will be tasked to use what they have learned from the vocabulary and terminology to complete this challenge. Students will use paper clips of various sizes and shapes to create three different types of leaf gliders with specific variables for each. Students will complete a work portfolio on their testing and their findings, including adding images and completing reflection and conclusion questions.

Paper Airplanes Project: Students will complete a final project for the unit in which they will research, predict, design, test, graph, and complete reflection/conclusion questions. This project will begin with discussion questions for the class, including hypotheticals, such as what would happen if a paper airplane were thrown in the vacuum of space? Each student will design three paper airplanes after researching the best airfoil design. Each paper airplane will be tested a total of three times, and averages will be calculated. Students will organize their flight-distance data into tables and create graphs to compare the performance of their different airplane designs. They will analyze patterns and trends in the data to determine how design features affected flight distance and overall performance. Students will include photos or descriptions of their designs in their work portfolio, along with a graph detailing the distance among the different airplanes.

Assessment

Formative:

Do Nows

Class discussions

Worksheet

Summative:

Work portfolio

Completed data graph

Benchmark:

Exit tickets

Vocabulary and terminology check

Alternative:

Checklists

Verbal discussions

Self assessment

Materials

Chromebook

Projector

YouTube

Google Forms

Google Docs

Google Slides

Paper

Pencil

Rulers

Measuring tape

Meter stick

Paper clips

Various leaves or leaf substitutes (napkins, tissue paper, etc.)

Scissors

Hole puncher

Foam

Integrated Accommodation and Modifications, Spec Ed Students, ELL, At-Risk, G&T, 504's

See attached document:

https://docs.google.com/spreadsheets/d/1elkfGwG4CoxIRxyxZ6eem_INsnuGIXXiG4CkOug9_wg/edit?usp=sharing