

## HOW DO I COLLECT FLIGHT DATA AND REVIEW FOR TRENDS?

### INTRODUCTION

This lesson allows students to launch their glider to collect data on flight distance. Students will create a spreadsheet to document each class member's result and calculate statistical information. Students graph the results to identify trends.

### LEARNING OUTCOMES

- Students will gain an understanding of how to define important characteristics for testing and how to collect and analyze data trends.
- Students will observe each class member's glider and define characteristics that may benefit the gliders flight. Students will gather data on glider weight, wing shape and size and flight distance. Students will calculate wing area and wing loading. Students will input data into a spreadsheet and generate statistical data, graphs and a written analysis of the information and trends observed.

### CURRICULUM ALIGNMENT

#### COMMON CORE STANDARDS - MATH

The Number System 7.NS Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

3. Solve real-world and mathematical problems involving the four operations with rational numbers.1

#### 8108 EXPLORING TECHNOLOGY SYSTEMS BLUEPRINT

005.02 Use computers and other tools of technology in various applications.

#### NORTH CAROLINA COMPUTER / TECHNOLOGY SKILLS

Competency Goal 3: The learner will use a variety of technologies to access, analyze, interpret, synthesize, apply, and communicate information.

- 3.05 Modify/create spreadsheets and graphs/charts to analyze and interpret data for content assignments. (3)

### CLASSROOM TIME REQUIRED

Three 45-minute class periods

## TEACHER PREPARATION

The teacher will need to setup the launch area including launch pad, marking off flight area and distances. Be prepared to measure and mark additional distances if gliders perform better than expected.

Use sidewalk chalk to mark the flight area if launching on a parking area or concrete. Use tape if launching indoors. If the class is launching in a grass area, use spray paint if allowed.

## MATERIALS NEEDED

- Pencil and Paper
- Sidewalk chalk, tape or spray paint (see note under Teacher Preparation)
- Measuring tape (at least 25 ft)
- Digital Scale

## TECHNOLOGY RESOURCES

Each student should have a computer with word processing and spreadsheet software. Students can complete this activity with paper and pencil if computer with WP software is not available.

The teacher should be able to project the use of the spreadsheet program to demonstrate the activity.

## PRE-ACTIVITIES FOR STUDENTS

Students should be able to use a digital scale to determine the weight of an object.

Students will continue keeping a project log. This can be paper and pencil or computer word-processing file. Some work with paper and pencil will be required even if the project log is kept electronically.

Students should record the following data for their plane on a note card and be prepared to share this with the class during the activity: weight, span, chord, wing area, and wing type (round or flat).

## ACTIVITIES

Gliders should be placed on display around the room. Direct students to rotate around the room to each glider and create a system to categorize each glider into groups.

Lead a discussion about what characteristics the students saw that might give a glider chance of being successful. Lead students to discuss this in terms of the categories they created. Students might categorize by wing shape, construction method, or material, etc. Discuss how light materials could cause lower wing loading, and how wing shape might increase lift due to camber, angle, and area.

Have students place the information cards by their glider then move through the classroom to each glider and record the owner name, plane weight, wing-span, wing chord, and wing type (round, flat). Students should also

record the class of the plane based on the categories defined earlier. Students can either enter this data into a spreadsheet directly or record it on paper to be entered later.

Students will launch their gliders and record the distance for the glider on their spreadsheet or paper. After getting the launch data, ensure that students have a spreadsheet listing the builder's name, plane weight, wing-span, wing chord, wing area and foil type (round or flat), class and distance traveled. Modeling the setup of the columns and titles for the students can be helpful. An example is below:

Name	Plane Weight	Wing Span	Wing Chord	Wing Type	Class	Wing Loading	Distance Traveled
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## GUIDED PRACTICE

Have the students develop correct formulas for calculating the wing loading and maximum, minimum and mean of the flight distance data. Wing loading equals the weight of plane divided by the wing area. Show students how to use the =max(cell range), =min(cell range) and =average(cell range) functions to calculate maximum, minimum and mean flight distance.

Direct students to graph the flight distance data and look for trends to see which characteristics led to the best flights. Recommend to students that they sort the data by class, wing type, wing area, wing loading, wing-span, and wing chord to identify trends that can indicate characteristics of gliders with longer flight distances.

Discuss ideas with individuals as they find a trend and then allow that individual to share their thoughts and data with the class. Discuss as a group why this characteristic might lead to longer flight distances.

## ASSESSMENT

Have students document and turn in a list of the ways that they would change their glider to increase flight distances. Students must back up their decisions with data from their spreadsheet and graphs. Look for students to say that the planes with lower wing loading flew best, or trapezoid wings flew best, etc. and to cite examples from the spreadsheet such as John's plane that was a trapezoid flew 10 feet.

## MODIFICATIONS

Pre-prepared notes can be made available for students that have difficulty reading or taking notes.

Save a completed spreadsheet for students who work slowly to ensure they have the proper data.

Students can be paired so that at least one of the students is capable of reading instruct sheet.

## ALTERNATIVE ASSESSMENTS

Arrangement can be made for students with special needs to have the directions read to them and to answer the questions orally.

## CRITICAL VOCABULARY

Trend - a pattern in the data you are studying

Mean – the average of a set of numbers. (Sum the items and divide by the number of items)

Maximum – the largest number in the set

Minimum – the smallest number in the set

## AUTHOR INFORMATION

Russell Sparks teaches Exploring Technology to students in 6<sup>th</sup> – 8<sup>th</sup> grades at East Wilkes Middle School, Wilkes County Schools

Exploring Technology is an entry level CTE course giving an overview of various areas of technology and careers associated with these areas. The externship involved work in the applied engineering school of Wilkes Community College and local aerospace industries. Mr. Sparks was introduced to the tools and concepts used to prepare students for careers in the aerospace industry and given an opportunity to see the industry processes. This will allow him to give his students a better understanding of the steps needed to prepare themselves for the future. Lyndell Duvall, Chair of Applied Engineering Technologies, Industrial and Engineering Technology at Wilkes Community College mentored Mr. Sparks.

## ACKNOWLEDGEMENT

Lesson developed through the Flight Fellowships: STEM in Aerospace Science and Aeronautics, a program of the Kenan Fellows Program and the North Carolina Science, Mathematics and Technology Education Center.

Funding provided for the Flight Fellowships by NASA K-12 Cooperative Agreement #NNX10AU89A.



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