

# EARN YOUR WINGS

## INTRODUCTION

This is a basic design-process activity with DIY airplanes. You can use simple paper airplanes or use foam plates to construct planes. Students make and test planes, then make modifications and retest. They should take notes and record data about their modifications and results. Using science notebooks to draw diagrams of the planes, record data, and modify their designs would be a great way to show how STEM professionals use notebooks. The design of the investigation is open-ended—students could choose to focus on the fastest plane (and so measure speed), or longest distance traveled (and so measure distance), or time in the air (and so measure time.) Their notebooks should include what problem they are trying to solve and why they chose that problem. They should use good investigation skills, making data tables, using metric units, and changing only one variable at a time.

## MATERIALS

+ Several blank sheets of letter-sized paper or foam plates

## STANDARDS

### NGSS 3-PS2-1

Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

### NGSS 5-PS2-1

Support an argument that the gravitational force exerted by Earth on objects is directed down.

### NGSS MS-PS2-2

Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

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*This series of performance expectations will require students to engage in many experiences trying to explain the behavior of objects due to forces acting upon them. This activity also engages students in the Science and Engineering Practices of Defining Problems, Designing Solutions, and Planning and Carrying Out Investigations. It provides the opportunity to examine the Crosscutting Concepts of Cause and Effect, and Form and Function.*

NAME:

DATE:

## EARN YOUR WINGS

You are going to test, retest, and design a model of a plane to see how you can change its performance. Decide whether you want to make your plane fly faster, further, or stay longer in the air. Explain what you are testing for, and why you chose that variable. Record your results below, conducting at least three redesign cycles. Be sure to use metric units, good measuring tools, and change only one variable at a time.

## DESIGN 1

Draw Diagram:	Data:
How will you modify your design based on the evidence?	Expected outcome:

## DESIGN 2

Draw Diagram:	Data:
What are you going to modify?	Expected outcome:

DESIGN 3

Draw Diagram:	Data:
What are you going to modify?	Expected outcome:

**Summarize your results. How did you improve your plane through cycles of the design and testing process?**