

STEM Module Title: Investigating Flight

About This Module	
Overview	In this module, youth will take a “whirl” at being an aerospace engineer as they learn the science and engineering of aviation! Youth will learn about the four forces of flight, design paper airplanes, and at the end of the week have a fun paper airplane competition!
Driving Questions	How does the design of an airplane affect its performance?
Product of the Week	Various paper airplane designs that compete in different “events” in a paper airplane competition.
Session 1	Flight Basics Youth will learn about the properties and forces of flight.
Session 2	Parachute Design Lab Youth will experiment with different materials and designs to create a parachute.
Session 3	Airplane Design Lab Youth will learn about the parts of an airplane and design several types of paper airplanes with different flight capabilities.
Session 4	Airplane Competition Preparation Youth will experience airplane competition elements. Working in teams, they will design, test and improve their airplane designs.
Session 5	Airplane Competition All of the participants’ hard work will be put to the test in a paper airplane competition!

Academic Vocabulary	
Word	Definition
Aerospace	The study of airplanes, helicopters and spacecraft
Aviation	The study of man-made flying machines that are NOT in space, such as airplanes and helicopters
Astronautics	The study of human space travel and exploration
Terrestrial	Objects that are NOT in space, but on the surface or atmosphere of a planet

Academic Vocabulary	
Word	Definition
Gravity	The force that attracts smaller objects toward much bigger ones. For example, a person is attracted to the earth, but the earth is attracted to the sun.
Thrust	A force that pushes or pulls an object forward. For example, if you blow up a balloon and let it go, the thrust makes the balloon “fly.”
Lift	The force that allows an airplane to fly, caused by air moving faster than the air around it. It’s the reason airplane wings have a characteristic shape.
Drag	The aerodynamic force that opposes an aircraft's motion through the air. Drag is generated by every part of the airplane (even the engines!).
Parachute	A cloth canopy that fills with air and allows a person or heavy object attached to it to descend more slowly
Standard	An idea or object used as a model in which to compare other similar objects. For example, everyone knows what a cupcake looks like even if there are many different variations of cupcakes.
Benchmarking	Evaluate or check something by comparing it with a standard
Design engineer	A person who works in a team environment to create solutions to problems
Systems engineer	A person who works with both engineers and non-engineers to make sure the product being created meets design standards
Test engineer	A person who creates tests to make sure the product meets design standards
Graphic designer	A person who puts together images, text or motion graphics to create a piece of design. A graphic designer creates the graphics for published, printed or electronic media, such as brochures and advertising

Supplies		
Facilitator Needs	1	Whiteboard/flipchart paper and markers
	3	Balloons
	1	Scissors
	1	Long stick – either a yard/meter stick or a large dowel
	1	String or yarn
	1	Lotion bottle (unscented)
	1	Package of drinking straws
	1	Paper
	1	Measuring tape
	1	Stopwatch
	5-8	Plastic cups
	2	Hula hoops
	2	Chairs
	1 set	Competition signs
Each Team Needs	2-3	Tape (masking or clear)
	2-3	Scissors
	2-3	Parachute materials: newspaper, paper bags, plastic bags, tissue paper
	2-3	Paper clips
	1	Ruler
	1	Masking or clear tape
	2	Markers or crayons
	1	Clipboards (optional)
Each Child Needs	5+	Index cards or Post-it notes
	1	Pencil
	1	String
	1	Army figurine
	5-10	Paper
	2-3	Rubber bands
	1	Scissors

Note to Facilitators

This module is a highly adaptable design, so you can really adjust the timing and subject matter as needed. For example, although the sessions are written in a 60-minute format, they can easily stretch to multiple days on each session, depending on youth engagement and timing.

The module does have quite a few engineering terms and concepts, but these concepts are needed for understanding of general flight characteristics.

The competition at the end of the week is designed to be a fun way to engage youth in a real engineering challenge. The competition can be as big or as small as needed. The module is written with multiple challenges, so Clubs can select a competition that works best for them.

Handouts are provided for diagrams and reference material during the sessions. If technology is available, this information can be shown on the computer rather than printed as a handout.

Middle and high school children can use this module as well. Just be sure they do multiple challenges at the end of the week, and explore more designs during the airplane design sessions.