



PROJECT Nº 2

Catapult Slider



AUTHORIZED AMA
STE(A)M PROGRAM

AGE GROUP: 5-13 BEGINNER



PROJECT Nº 2

INFO FOR PARENTS:

Adults should help younger students with measuring and cutting, as well as monitor them while launching the aircraft with the rubber band to prevent eye injuries.

GOALS & OBJECTIVES

Four forces of flight: How can we generate thrust?

Aerodynamics: How do we control an aircraft in flight? What modifications must be made?

MATERIALS

- Pencil or writing utensil
- Paper clips and coins
- Foam board or plate
- Masking tape
- Two bamboo skewers
- Scissors
- Rubber band
- Ruler

BACKGROUND INFORMATION

In the earliest days of building and testing human-carrying flying machines, the two biggest problems that experimenters had to solve were the questions of power and control. Airfoils and how they generate lift were well understood, but keeping a flying machine moving forward quickly enough for them to work always seemed to require an engine that was too heavy for the glider to carry, leading to widespread use of steam-driven catapults, such as those used by Sir Hiram Maxim and Samuel P. Langley. Furthermore, any attempt to control the direction of the flight often ended in disaster. Even the greatest of the early glider builders, Germany's Otto Lilienthal, came to a sad end in a glider crash because he lost control.

It was not until the Wright brothers began their work that aviation pioneers understood that pilots had to be able to adjust the aircraft's flying surfaces in flight themselves. The Wright brothers' approach, in which the entire length of the wing would be warped up or down, meant that aircraft would be unstable and more difficult to fly, but that was the price to pay for greater control. A few years after the Wrights' first successful flight, a rival American aviation pioneer named Glenn Curtiss decided to create separate movable control surfaces—ailerons for roll, elevators for pitch, and rudders for yaw—rather than warp the entire wing. This approach persists on both full-scale and model airplanes to this day.

GO FURTHER

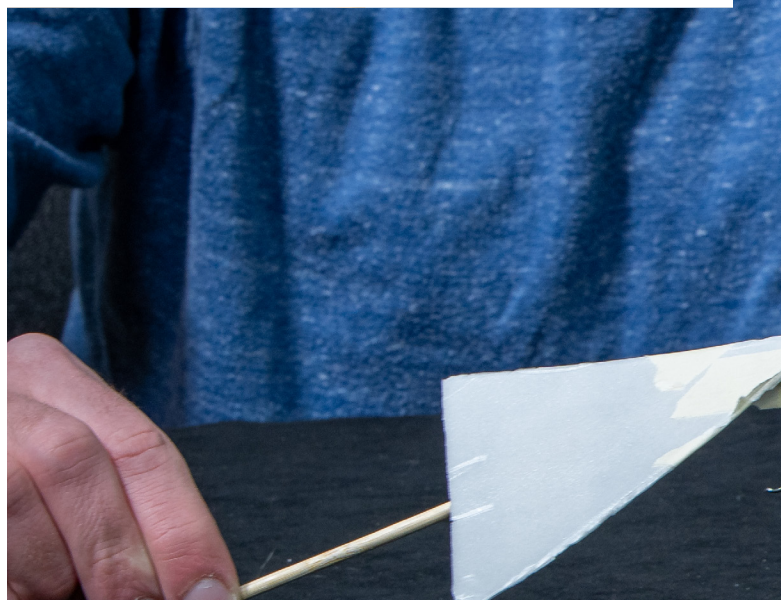
Former students of AMA's Flight School will recognize the glider as quite similar to the FPG-9! If you have made one of those gliders as well, do you think it could be launched the same way? How might it behave differently or similarly? Why?

CREATIVE TIPS

Make sure you never point your glider at another person or anywhere that it could get stuck when launching. It is always best to use a wide-open space outdoors or a large room with a high ceiling, such as a gymnasium

INSTRUCTIONS

1. Loop the rubber band around the blunt end of a skewer and secure it firmly with tape. This will be our launch catapult for the glider.

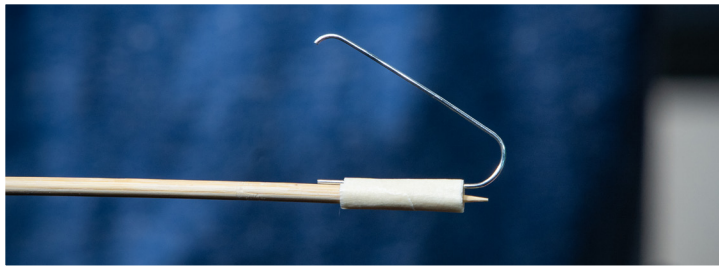


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- 2.** Either by following the template or measuring yourself, cut an equilateral triangle 5 inches in width out of the foam plate.



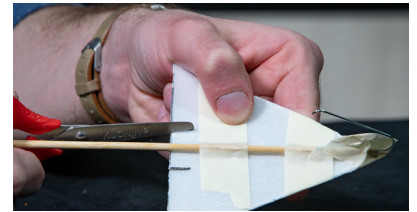
- 3.** Bend half of the paper clip so it forms a 20-degree angle with the other half. Tape one half of the clip to one end of your other skewer to form a hook.



- 4.** Mark $\frac{1}{2}$ an inch from the skewer on both sides along the trailing edge. Using scissors, make small cuts where you marked to form your “elevons.” These control surfaces can function as both ailerons and elevators.

- 5.** Using your ruler, mark 1 centimeter from the skewer on both sides along the trailing edge. Measure 4 centimeters farther and make a second mark.

- 6.** Using scissors, make small cuts where you marked the trailing edge to form your “elevons.” These control surfaces can function as both ailerons and elevators.



- 7.** To launch, loop the rubber band around the hook at the glider’s nose. With your other hand, gently grip the end of the skewer protruding past the trailing edge, pull back until you feel tension, aim upward, and release!

- 8.** What happens when both elevons are tilted upward? What happens when both are tilted downwards? What about one up and one down? Why might this happen?



