



FLATTOP FLYERS!

BACKGROUND:

Aircraft carrier-based flight is considered some of the most challenging flying around. Pilots and their aircraft must handle the stress of launching and landing on an aircraft carrier. Using a hand-catapult launcher, *Flattop Flyers!* features the excitement and challenge of carrier flight.

OBJECTIVE/GOAL:

Flattop Flyers! participants will build sturdy balsa wood airplanes and launch them using a rubber band-powered hand catapult. Participants will gain an understanding of aircraft design and flight dynamics as they build and test their aircraft.

REQUIREMENTS:

Each *Flattop Flyers!* participant will need a place to work. Set up tables or workbenches so that each person can hear and see you as you lead the group through the aircraft building process.

TIME:

1/2 hour to 1-1/2 hours (instructor's discretion)

AGE:

8 years to 16 years

Each Participant Will Need:

- EAA Flattop Flyer Aircraft Kit
- Pitsco HD Bond Adhesive (participants will share)
- Markers or crayons to decorate the aircraft
- Aircraft Diagram

As a Leader You Will Need:

- Your own set of supplies. It is recommended that you build your Flattop Flyer in advance.
- This instruction sheet is for you to read; you do not need to make copies for each person.

DO THIS:

SAY THIS:

1.

Stand in front of the group and speak in a relaxed, conversational tone . . . like you are telling a good story.

Imagine what it would be like to be strapped into an F-18 and shot into the air from an aircraft carrier. You would accelerate from a standstill to hundreds of miles per hour in seconds.

The force of a catapult launch pushes you back into your seat and knocks the air from your lungs. Your aircraft feels it, too.

Modern aircraft are designed and built to withstand enormous stress. Even a basic single-engine airplane is designed to take a lot of stress. In any airplane, turning creates a force on the wings that can exceed the weight of the entire plane. This force is called G-force, or gravitational force.

Standing here, I am under a one-G load. That means that I am experiencing the normal amount of gravitational pull from the Earth.

If I were to sit in an F-18 and experience a catapult launch, I would feel the force of gravity increase dramatically. That's the force that slams me into the seat and takes my breath away. This is called a positive G-force.

2.

Listen to their ideas. Young people often have very interesting ideas about how gravity works.

What do you do in your everyday life that places you in positive-G situations?

If a car that you are in accelerates, you feel the force of gravity increase. If you are driving along fast and hit the brakes, you would feel a negative force of gravity, wouldn't you?

In an aircraft, when you climb, you feel positive-G. When you push the yoke forward and descend, you feel a negative G-force.

Aerobatic pilots can push their tough little planes through maneuvers that create up to 10 times gravity, or 10 Gs. Imagine how that would make you feel!

We are going to build airplanes that can take a lot of Gs.

DO THIS:

SAY THIS:

3. Give each participant a “Flattop Flyers! Aircraft Diagram.” Hold up the pieces as you describe them.

Hold up the main wing (both wing pieces are the same; use either one).

Slide the small rubber nose cone over the end of the balsa stick until the stick is flush with the end of the cone. Refer to Figure 1 on the “Aircraft Diagram” worksheet.

Take your Flattop Flyer kit and open the bag. Refer to your “Flattop Flyers! Aircraft Diagram.”

In the kit you should find several pieces of wood, some rubber bands, and a little black rubber nose cone.

On one of the wings, write your name.

We will begin by building the fuselage, or the body of the airplane.

Take the small black rubber nose cone and place it over the end of the long square stick. Push gently. Do not push the nose cone entirely onto the stick or the stick will break. Make sure the cone, which will be the nose of your plane, is flush with the end of the fuselage stick.

4. Hold up the little balsa block that will become the catapult block.

Be sure the kids glue the block to the end of the fuselage that has the rubber nose. Refer to Figure 1 on the “Aircraft Diagram” worksheet.

Find the smallest rectangular piece of balsa and glue it onto the fuselage directly behind the black rubber nose. This block is called the catapult block. Set the fuselage aside to dry in a safe place.

5. Take some time decorating the wings. The catapult block should be dry in a few minutes.

While we wait for the glue to dry, let’s decorate the wings of our airplanes. Use the markers at your table to give your aircraft a unique look.

DO THIS:

SAY THIS:

6. Refer to Figure 2 on the "Aircraft Diagram" worksheet to be sure the main wing is placed properly on the fuselage.

The wing is held on with the rubber band only. Make sure the kids are not gluing the wings to the fuselage.

It's time to install our wings. Slide one of the small rubber bands over the fuselage and move it up to the front by the nose. Place one of the wing pieces on the fuselage just behind the catapult block and on the opposite side (so that the catapult block is on the bottom of the fuselage and the wing is on top).

Take the rubber band that is on the fuselage and stretch it up and over the wing and the nose of the plane. Position the rubber band so it secures the wing in place.

7. Do the same for the horizontal stabilizer. It should fit onto the fuselage three inches from the end of the tail. Refer to Figure 3 on the "Aircraft Diagram" worksheet.

The wings and horizontal stabilizer must be centered for the aircraft to fly properly.

Find the other small rubber band and slide it over the fuselage up to the main wing.

Place the other wing piece onto the fuselage three inches from the tail. This wing is called the horizontal stabilizer. Stretch the rubber band up and over the horizontal stabilizer and the end of the fuselage. This should secure the horizontal stabilizer just like the main wing is secured.

Make sure the wing and the horizontal stabilizer are centered on the fuselage.

8. Refer to Figure 3 on the "Aircraft Diagram" worksheet to be sure the vertical stabilizer is attached in the proper place. The bottom of the vertical stabilizer and the bottom of the catapult block should be even.

Take the last piece of flat balsa. Carefully press the tail panel out of the balsa cutout. Glue it onto the tail of the fuselage. This is the vertical stabilizer. Be sure to glue it on the side of the fuselage so that one-fourth inch of the vertical stabilizer extends below the fuselage.

Set the aircraft aside to dry.

DO THIS:

SAY THIS:

9. Refer to Figure 4 on the “Aircraft Diagram” worksheet to be sure the catapult is properly rigged with the large rubber band.

We will need a catapult to launch our aircraft. Find the last rectangular balsa stick and the large rubber band.

Loop the rubber band around the stick and slip one end of the rubber band through the other end. Tighten the band around the end of the stick and write your name on the stick. This is your catapult.

10. When administering the Flattop Flyer’s Oath, pause frequently to give the kids time to repeat the oath.

If the glue is dry on the aircraft, prepare to launch by moving to an appropriate area. You should fly these gliders in a large, open area. They will fly very high, so be sure the airplanes don’t fly higher than any buildings at an active airport.

Let’s launch our aircraft!

Before we begin, you will all have to take the Flattop Flyer’s Oath.

Raise your right hand and repeat after me.

“I promise to fly my craft with precision and professionalism. (pause) I promise to abide by all Federal Aviation Administration Regulations. (pause) I promise to operate my airplane in a safe manner at all times, (pause) even when no one is looking.”

Congratulations! You are official Flattop Flyer pilots!

11. Encourage the kids to experiment with their aircraft. The wings slide back and forth to adjust balance, and the balsa can be shaped by breathing on it and softly bending. Try it!

If time permits, hold competitions for distance and sustained flight.

Happy Flying!

Place the end of the rubber band on your catapult over the end of the catapult block.

Gently pull your aircraft back and aim toward the sky.

On the count of three, we will launch.

1, 2, 3 – Launch!

Great job!

Now see if you can alter your aircraft to make it fly better. Aeronautical engineers call this research and development.

Happy Flying!

FLATTOP FLYERS!

Aircraft Diagram

Figure 1

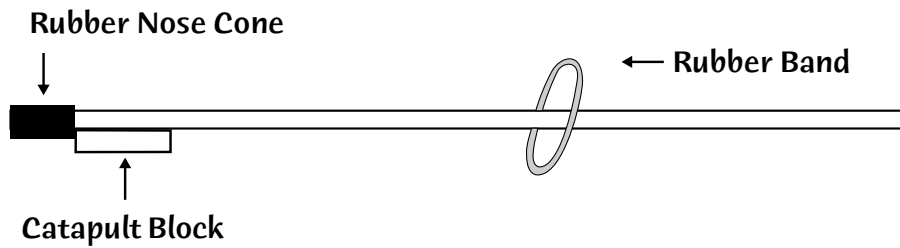
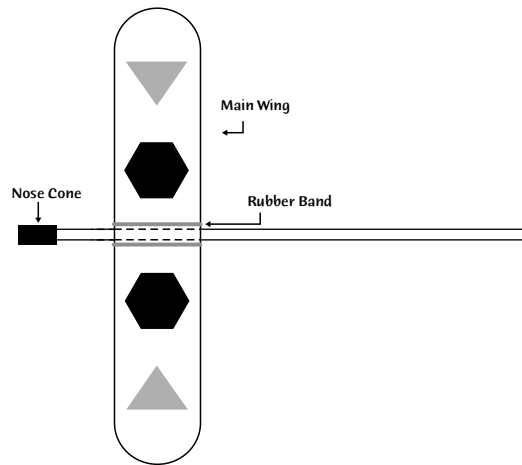
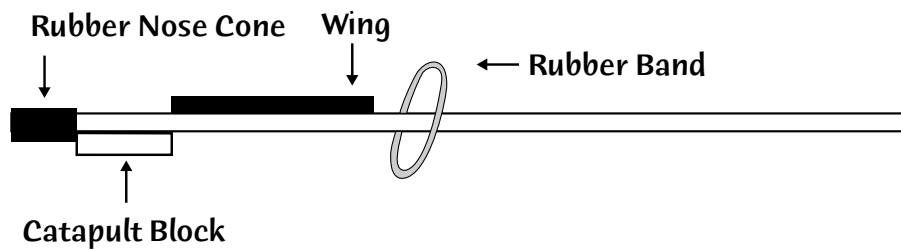


Figure 2



Top view

FLATTOP FLYERS!

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Figure 3

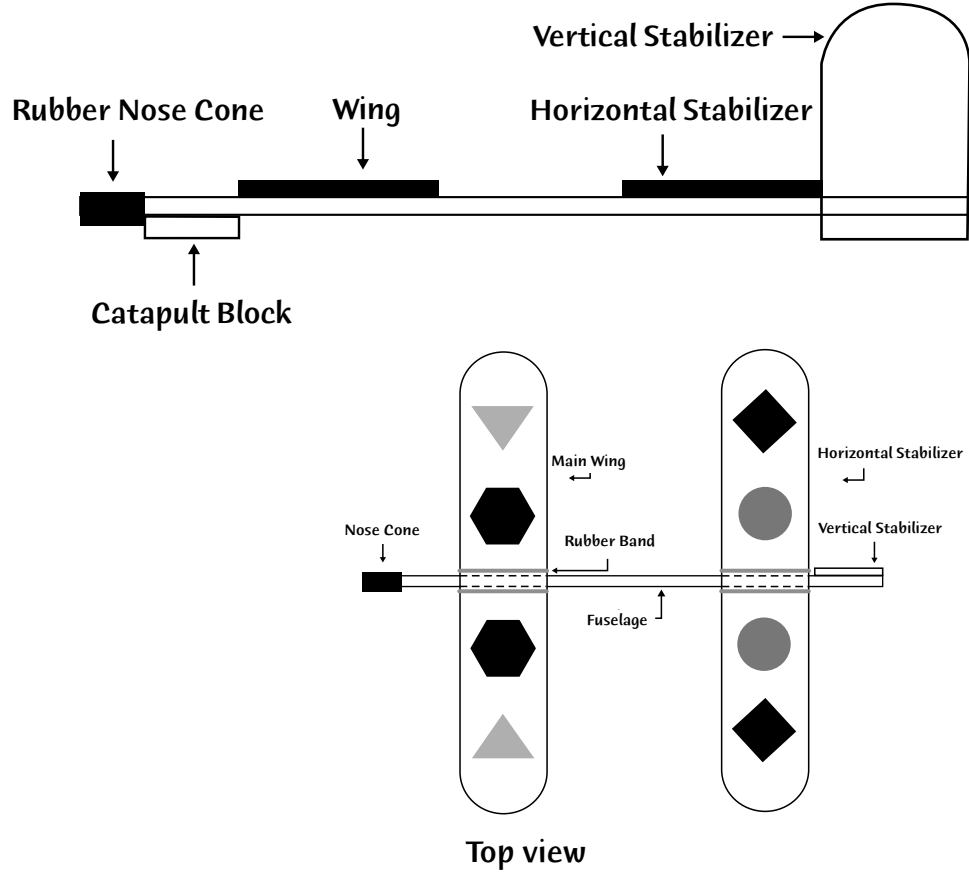


Figure 4

