



# 4-H Club GO TO Resources



August 2021

## Lesson Objectives:

Club members will have fun creating paper airplanes and the testing their skills in launching them.

## Time:

15-20 minutes

## Equipment and supplies:

- Paper
- Pencils
- Rubber bands
- Paperclips
- Stapler

## Preparations:

- Review Lesson
- Gather equipment and supplies

## Paper Airplane Launcher

In order to take off, an airplane has to generate enough lift (upward force due to air pushing on the plane) to overcome its weight (downward force due to gravity). The faster an airplane goes, the more lift it generates. This is one of the reasons why airport runways are usually very long. In this project you will build an air plane launcher using a rubber band. It stores potential energy, which gives extra kinetic energy (motion energy) to the paper airplane - even over a short distance.

### Activity

- To do this project you will need to build a basic paper airplane. Have the members bring paper airplanes they all ready made at home or make some with them before the activity.
- Staple a paperclip to the nose of the paper airplane. The outer straight part of the paper clip should point backwards parallel to the bottom of the plane so it can serve as a hook to attach to the rubber band. There will be some pull on the hook, so make sure it's secure.
- Practice throwing your paper airplane using your entire arm. How far can you throw your plane? How much do you move your arm when you throw it?
- Now try to throw your airplane only using your wrist. Keep your shoulder and elbow still. How far can you throw the plane now?
- Next try launching your airplane using a very simple "catapult." Hook one end of a rubber band around the end of a pencil. Hook the paper clip on the nose of a plane around the other end of the rubber band, and pull it back to stretch the rubber band. Aim the plane forward and release. How far does the plane go now? How far did you have to stretch the rubber band compared to how far you moved your arm or wrist?

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- Checkout this YouTube video for visual directions: <https://youtu.be/9Fv0-50Imsc>
- How does the angle at which you launch the plane affect its flight distance?
- Try using different lengths and thicknesses of rubber bands. Do some work better than others? Why do you think that is?

### Observations and Results

You probably found that it was very difficult to throw your paper airplane very far when using only your wrist. Your wrist has a much smaller range of motion than your entire arm, and it's difficult to get the airplane going fast enough for a long flight. A rubber band, however, can store quite a bit of energy in a relatively small distance when it is stretched. A launcher built with a rubber band can get the airplane going fast over a much shorter distance, allowing you to launch it much farther than you can with just your wrist - possibly even farther than you could with your entire arm!

### Going Beyond

Aircraft carriers are large ships with runways on them that allow aircraft to take off and land in the open ocean. Although aircraft carriers are huge, they are very small compared with land-based airports and runways. Airplanes can't gain enough speed to take off on their own over such a short distance, so they get an extra boost from a type of catapult. This catapult provides extra energy from a source such as compressed air or electromagnets to help the plane gain extra speed. The catapult hooks on to the plane and helps it accelerate over a much shorter distance so that it can get enough speed and lift to take off.

- What difficulties did you have using the launcher?
- How would you change your design of your launcher? What additional supplies would you use? Why?
- Did you try different designs of paper airplanes? How about different types of paper?

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## Sources & Additional Lesson info:

4-H Club GO TO Resources is being offered to 4-H clubs in Boone, DeKalb and Ogle Counties as a way to enrich and enhance 4-H experiences and programming at the club level. It is the goal of the Extension staff to assist 4-H leaders and officers in providing simple hands-on activities on a monthly basis that can broaden the 4-H club experience and as a result heighten positive youth development.

### Resources:

**Scientific American Website:** <https://www.scientificamerican.com/article/build-a-paper-airplane-launcher/>

**Science Buddies YouTube Channel:** <https://youtu.be/9Fv0-501msc>

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