NEW ROADS
MAGAZINE

DIY SCIENCE WITH CHEVY:

Quick-N-Easy Pop Can Flyer

Inspire others to build their own pop can flyer by sharing photos and videos of yours with **#ChevyLove.**

WHAT YOU'LL LEARN:

- Boundary layer separation
- Laminar flow
- Turbulent flow

BUILD TIME:

Under 10 minutes

MATERIALS & SUPPLIES:

- Metal pop can
- Can opener
- Ruler
- Permanent marker
- Utility knife
- Work gloves

This series is designed for children ages 7–13. For outdoor use only. All activities should have adult supervision with proper safety precautions. We recommend always wearing gloves and safety glasses while conducting experiments.

BUILDING YOUR POP CAN FLYER:

STEP 1: REMOVE THE TOP.
Thoroughly wash the can, then use a can opener to remove the top, leaving the rolled aluminum ring intact. Depending on your can opener, the top may come off more easily if you turn the can opener's crank backwards.

STEP 2: MARK THE CAN FOR CUTTING.
Measure 2-1/2 inches down from the can's "shoulder," marking this length at several points around the can's circumference.

STEP 3: CUT THE CAN TO LENGTH.
Use a utility knife to *carefully* cut away the bottom of the can. Work slowly: You want to keep the flyer's body length uniform and *do not want* to slice your fingers. Please ask an adult for help.

TIME FOR TAKEOFF.
That's it! To fly this craft, head outside and make sure your flight path is clear. Now hold your flyer with the can's top forward and throw it like a football, with plenty of spin.

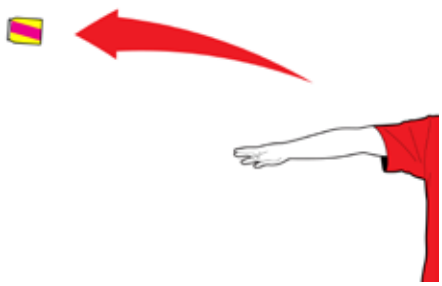
HOW IT WORKS:

Try making a pop can flyer with the full length of the can. Remove the top, as in Step 1. Now cut off just the very bottom of the can. Give it a toss, and you'll see that it flies fine at first, then starts to tumble, as though there is a gob of chewing gum stuck to it. What's going on?

From an engineering perspective, flight is all about *boundary layer separation*. Air is a viscous fluid, not unlike water. When air is flowing around a craft (like our flyer, or your car) it tends to want to "stick" to it. In order for anything to move efficiently through air (and a flying craft must do that in order to stay airborne), you need this layer of air (called the boundary layer) to move smoothly around the vehicle for as long as possible. Ideally, your boundary layer is part of a *laminar flow* of air. A laminar flow occurs when a fluid is moving in many smooth, parallel layers, all in the same direction, with no disturbance between the layers. The opposite of laminar flow is a *turbulent flow*, where various layers of air peel apart and mix, creating many eddies and rough, chaotic lumps.

But nothing lasts forever. Regardless of how smooth your vehicle body, the boundary layer will always eventually pull away from the main laminar flow. This is boundary layer separation. In the worst case, a pocket of stagnant air gets trapped against the body, acting like a lump of chewing gum stuck on the side of the craft. That's what you were seeing when you tossed the too-long flyer and it seemed to knock itself out of the air. It was literally weighed down by a chunk of trapped air.

Sometimes people get the impression that laminar flow is good and turbulence is our enemy. But, like everything in life, it's complicated. We can use turbulence to create the conditions for better, longer laminar flow—and your pop can flyer does just that. The leading lip of the pop can flyer (being thicker than the rest of the can, with a circumference somewhat narrower than the body of the can) creates turbulence at the front end of the vehicle. This mixes the boundary layer with the surrounding air as it is about to pass over the can's length, so that the two layers more quickly form an efficient laminar flow. This more efficient flow delays boundary layer separation. This tends to make turbulence occur behind the can, rather than along its body. This doesn't just prevent gobs of air from getting trapped against the flyer's body; ideally it also dumps air off the trailing edge of the vehicle in back-flowing eddies that push the flyer along, increasing its speed, and thus giving it more momentum for longer flights.



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BUILDING THE BETTER POP CAN FLYER:

All good scientists experiment with changing the variables in their experiments and evaluating the results. The same process can be applied to your pop can flyer. To improve flight distance, try tweaking the follow things:

CAN LENGTH.
If you have lots of cans handy, experiment with different body lengths (2-1/2 inches from shoulder to cut gives good results; you can try going as short as 1-1/2 inches, or as long as the full can). Shorter cans have greater in-flight stability, but less stable overall paths (they tend to weave unpredictably). Cans with different diameters (such as the tallboys some iced tea and energy drinks come in) will have different optimal lengths.

CAN EDGE SHAPE.
Also try different trailing edges—lobes, zigzags, even asymmetrically angled cuts. Or you can add holes and cut-outs to the sides. To add a cut-out, slip the flexible can over the end of a broom handle or mailing tube and always cut slowly and away from yourself, especially the fingers holding the can!

TYPE OF CAN.
Finally, try branching out from drink cans. Soup cans can make effective flyers: Remove both ends, leave the rolled steel edge in place for the front end of your flyer, and then use a hacksaw to cut down the total length of the can. You'll need to experiment, as cans with different diameters, weights, and wall thicknesses will have different optimal lengths.