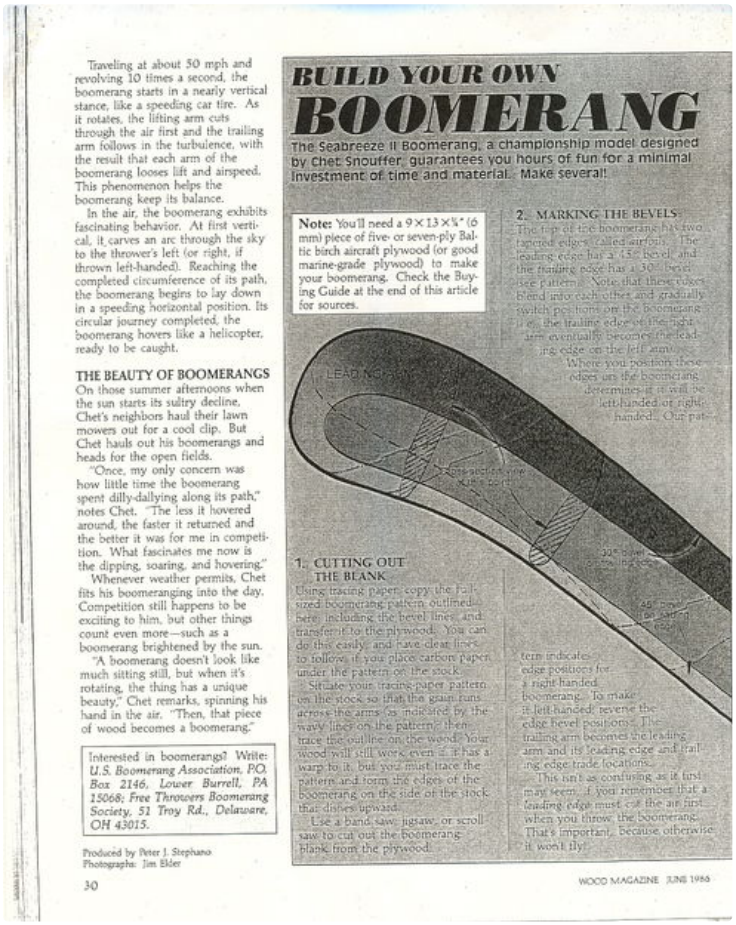
Make a Boomerang That Actually Comes Back!

Make a working boomerang!

Step 1: Does It Actually Work?-Yes!

In order for you to be willing to build your own, you probably want some assurance that it will/can work. I teacher engineering in high school and this is a project I do with my classes. If a ninth grader can build a working boomerang so can you. Still don't believe me, take a look at the video proof. (Note the plans are for a righty, the student in the video is a lefty he reversed the plans so it would work for a lefty.)



Traveling at about 50 mph and revolving 10 times a second, the boomerang starts in a nearly vertical stance, like a speeding car tire. As it rotates, the lifting arm cuts through the air first and the trailing arm follows in the turbulence, with the result that each arm of the boomerang looses lift and airspeed. This phenomenon helps the boomerang keep its balance.

In the air, the boomerang exhibits fascinating behavior. At first vertical, it carves an arc through the sky to the thrower's left (or right, if thrown left-handed). Reaching the completed circumference of its path, the boomerang begins to lay down in a speeding horizontal position. Its circular journey completed, the boomerang hovers like a helicopter, ready to be caught.

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"Once, my only concern was how little time the boomerang spent dilly-dallying along its path," notes Chet. "The less it hovered around, the faster it returned and the better it was for me in competition. What fascinates me now is the dipping, soaring, and hovering."

Whenever weather permits, Chet fits his boomeranging into the day. Competition still happens to be exciting to him, but other things count even more—such as a boomerang brightened by the sun.

"A boomerang doesn't look like much sitting still, but when it's rotating, the thing has a unique beauty," Chet remarks, spinning his hand in the air. "Then, that piece of wood becomes a boomerang."

Interested in boomerangs? Write: *U.S. Boomerang Association, P.O. Box 2146, Lower Burrell, PA 15068; Free Throwers Boomerang Society, 51 Troy Rd., Delaware, OH 43015.*

Produced by Peter J. Stephano
Photographs: Jim Elder

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BUILD YOUR OWN

BOOMERANG

The Seabreeze II Boomerang, a championship model designed by Chet Snouffer, guarantees you hours of fun for a minimal investment of time and material. Make several!

Note: You'll need a 9×13×¼" (6 mm) piece of five- or seven-ply Baltic birch aircraft plywood (or good marine-grade plywood) to make your boomerang. Check the Buying Guide at the end of this article for sources.

2. MARKING THE BEVELS

The top of the boomerang has two tapered edges (called airfoils). The leading edge has a 15° bevel, and the trailing edge has a 30° bevel (see pattern). Note that these edges blend into each other and gradually switch positions on the boomerang (i.e., the trailing edge of the right arm eventually becomes the leading edge on the left arm).

Where you position these edges on the boomerang determines if it will be left-handed or right-handed. Our pattern indicates edge positions for a right-handed boomerang. To make it left-handed, reverse the edge bevel positions. The trailing arm becomes the leading arm and its leading edge and trailing edge trade locations.

This isn't as confusing as it first may seem, if you remember that a leading edge must cut the air first when you throw the boomerang. That's important, because otherwise it won't fly!

1. CUTTING OUT THE BLANK

Using tracing paper, copy the full-sized boomerang pattern outlined here, including the bevel lines, and transfer it to the plywood. You can do this easily and have clear lines to follow if you place carbon paper under the pattern on the stock.

Situate your tracing-paper pattern on the stock so that the grain runs across the arms (as indicated by the wavy lines on the pattern); then trace the outline on the wood. Your wood will still work, even if it has a warp to it, but you must trace the pattern and form the edges of the boomerang on the side of the stock that dishes upward.

Use a band saw, jigsaw, or scroll saw to cut out the boomerang blank from the plywood.

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Step 2: UPDATE! the Plans and the Material

First step is to download the plans or the pics on this page and print them out full size. Cut out the plans/template on the page, tape the 2 sizes together. Adhere the template to your material using rubber cement.

Material-the plans call for 1/4" 7 layer marine grade plywood, this plywood is hard to find. Baltic birch plywood has 5 layers and it will work great for this project. It can be found at craft stores, lumber yards, or ordered online. My students have had good results with other types of 1/4" plywood but baltic birch works the best.

3. SHAPING THE BOOMERANG

With a drum sander in a drill press, a disk sander in a portable drill, or by hand with a rasp, put a 45° bevel completely around the top side of the blank. Exactness isn't critical, so you can simply eyeball the bevel.

Next, sand back the bevel on the trailing edges as marked on the pattern until you have a 30° taper. Be sure to gradually blend trailing edges into leading edges. Refer to the boomerang arm cross sections for the proper edge taper at both ends and in the center of the boomerang.

Finish sanding the edge contours by rounding off the 45° bevel on the leading edges to a bullnose. Now, turn the boomerang over and sand a slight tapering bevel along the leading edges for about 2½" from the tip of each arm, as indicated by the dashed line on the pattern. This bevel tends to add an even lift. Note the shape of the arm tips as indicated in the cross section views.

4. SANDING AND FINISHING

A smooth surface on your boomerang reduces wind resistance and makes catching much easier, so sand with 80-, then 120-grit paper.

Make your boomerang waterproof by applying sanding sealer. When dry, sand it again with 120-grit to smooth lifted grain fibers.

Let your imagination run when painting your boomerang. Bands of color or other decoration on the arms will create a pattern during the boomerang's flight. Whatever hue (or combination of hues) you choose, spray the color on for an even finish.

For added protection of the paint as well as the boomerang, spray it with one or two coats of polyurethane or lacquer. Some throwers even rub a paste wax over the finished coat. But don't get carried away—too much finish adversely affects the boomerang's flight performance. Refer to the photos on p. 29 for the proper throwing technique.

Chet Snouffer checks the smoothness of the tapering bevel on his boomerang's trailing edges. Note the plies exposed in the aircraft plywood blank.

BUYING GUIDE

Aircraft plywood. You can find aircraft plywood at large hobby stores or by mail order. Here are some suppliers we know about:

- Flounder Bay Boat Lumber, Third and O Avenues, Anacortes, WA 98221.
- Sport Vehicle Supplies, 823 Strain Blvd., Lakeland, FL 33801.
- Timcraft Aero, Inc., P.O. Box 27, Lyons, WI 53148.
- Violette Plywood, P.O. Box 141, Northfield Rd., Lunenburg, MA 01042.

Project Design: Chet Snouffer
Illustrations: Kim Downing
Photographs: Jim Elder

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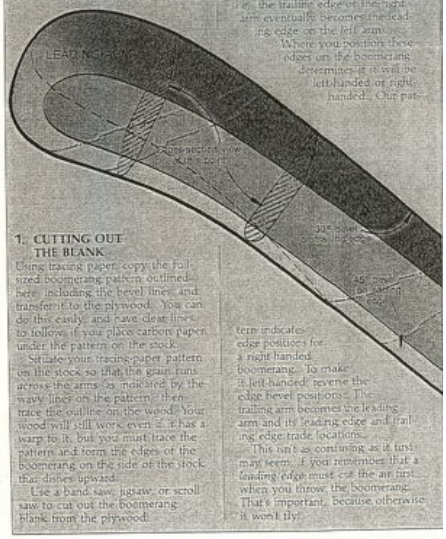

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Step 3: What Tools Will I Need?

I recommend a jigsaw and anything that can be used for sanding. Hand sander, palm sander, orbital sander, disk and belt sander, drum or pad sander mounted on a drill, etc.
You could also carve your boomerang, but I do not have the patience for that.

Step 4: Cutting Out the Blank

Carefully make relief cuts around your pattern and cut it out. I used a jig saw for this but a scroll saw and band saw work well also. If you are skill with any of these tools you can cut some of the bevels for the edges.

Step 5: Sanding the Edges and Contours

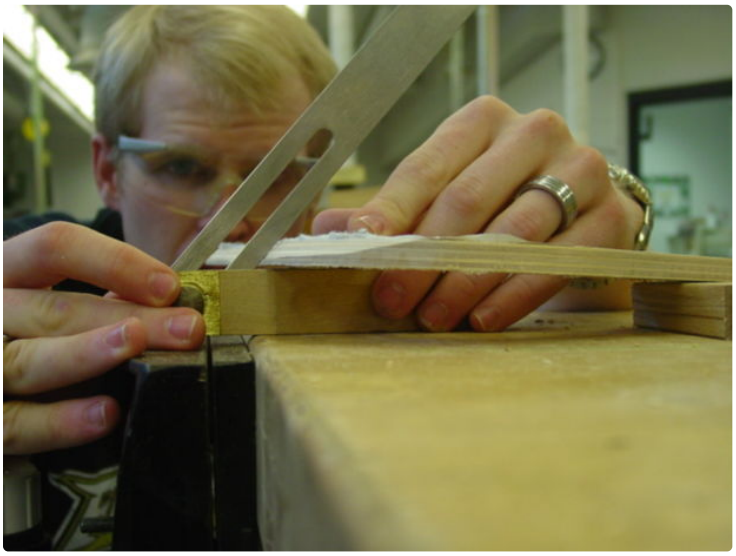
After cutting the edges will be rough, you will want to sand these smooth.
The leading/trailing edges are what makes the boomerang return. However the template gives you an easy guide to follow. The template directly shows you where to sand the 45 and 30 degree angles.
On the ends and middle you will have to blend the two edges together. No special technique for doing this just sand everything smooth.

Step 6: How Do I Shape the Edges?

You will shape the edges with lots of sanding. Palm sanders and orbital sanders work well for this, however it can take some time. A belt/disk sander makes sanding easier and faster. The machine in the picture is my favorite machine to use for this. It has a gage for the angles and takes material of quickly but not so fast that you take off to much.
Follow any power sanding with hand sanding.
Round the front edge just slightly, it will make it easier to throw.

Step 7: Check Your Work Frequently

Check your work using a t-bevel, square, or triangle.



Step 8: Almost Ready to Fly

After sanding your edges to the proper angles your are ready to throw your boomerang. In the picture you can see several boomerangs in various stats of completion.
It is not necessary to paint or stain your boomerang. However I have had students that create great looking boomerangs for display.
Do not paint, stain, or seal your boomerang until you have thrown/tested it. It needs to be unfinished so you can make adjustments. Also paint and stain may decrease your boomerangs performance.

Step 9: Throwing Your Boomerang

Find a wide open area like a soccer or football field. I recommend stand at the corner of the field. If there is wind you want to be throwing into it.

Hold the boomerang in the palm of your hand, flat side on your palm. Thumb on top fingers wrapped on the front edge. See the picture.

Throw it like a baseball with a little side arm. Aim the boomerang up and down the sideline of the field. Practice and repetition help you find the proper throw to improve performance.

Step 10: Watch Out When It Comes Back!

Heads up! Hopefully yours will fly nicely and come back. If not you have a really cool flying stick.