

# HOW TO MAKE PROPELLERS FROM DAIRY FOOD CONTAINERS

By Dick Howard

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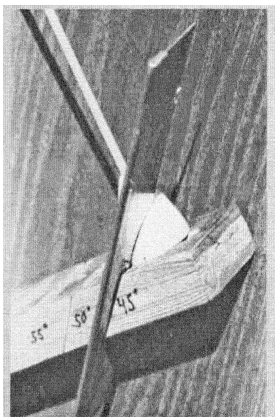
*(Based upon consultation with my sea-daddy Gene Smith,  
who's used Howard's techniques, and my own experience,  
your friendly editor has expanded on some of the  
explanations which were not clear in the original article.)*

If you want to improve your rubber-powered airplane's performance with props that won't break after a hard landing, AND if you happen to like cottage cheese (a lot!), then read on! *(Ed. Note: The plastic in cottage cheese and similar dairy food containers has apparently changed since 1986. They are now too rubbery. A better source of prop material today is the upper 2/3 of a 32oz plastic soft drink cup. Just be sure the plastic is semi-hard — not the mushy stuff that much dairy food now comes in. You can also make peanut size props from 32oz soft drink bottles, but that plastic is a bit thin for anything larger.)*

I've been experimenting with homemade plastic propellers for several years and though they may not be quite as efficient as commercial props, they definitely do have certain advantages: any size is possible, any pitch, any number of blades, desired rotation, they're nearly unbreakable, and fun to make.

Props have been made, using the jig pictured, from 2-3/4 inches for a 6-inch span Fike, to, a 12-inch, 3-bladed prop for my jumbo 36-inch span (Douglas) 046A. Also, I've made a four-bladed prop for an AJ-1 twin and a five-bladed prop for a turbo-prop Meteor twin, both counter-rotating ... all from plastic dairy food containers.

Some builders have thanked me for my efforts, while others are still cursing me for their failures and wasted time. I've included in this article a full-size jig pattern to make the task easier, along with photos to help explain the process. Stick with me—you'll probably be glad you did!



Begin by making your jig from a piece of wood 1x 2-1/2 x 10 inches. The dimensions are not that critical, but

accuracy is. The hardest part will be cutting the angled saw kerfs accurately — I used a Zona saw because of the thin blade. Care must be taken to keep the cut 90 degrees to the edge of the jig while maintaining the correct angle (either 45 or 50 degrees). A table saw could be used but shims would have to be glued in to reduce the width of the cut. Drill one hole 3/32" as shown on the diagram for the prop truing shaft. All other holes are drilled with a 1/8-inch drill bit.

Prop spinners can be made of balsa, pine, or maple, depending on how much or how little weight the model needs up front. They are shaped using a Moto-tool or electric drill with a 1/8-inch drill bit reversed in the chuck as a mandrel.

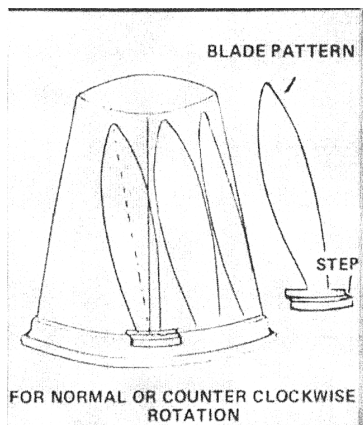
Center drill the spinner blank slightly undersized for a press fit on the mandrel. If the blank is drilled 1/8 inch, a drop of cyano will secure it for shaping, and it can be twisted off later. *(Ed note: Some Duco or Ambroid would be much easier to remove by simply soaking in thinner. If you laminate several thicknesses of wood for the spinner, and use carpenter's or other water based glue, soaking the finished spinner in thinner makes removal of the mandrel easy.)*

After shaping and sanding, remove the spinner from the mandrel and push a length of 1/8-inch brass tubing through the hole so that approximately 1/2-inch protrudes from the base. This, in turn, is placed in the spinner index hole in the jig. Make two pencil marks 180 degrees apart on the base of the spinner for a two-blade prop, or three marks 120 degrees apart for three blades, using the correct lines on the jig.

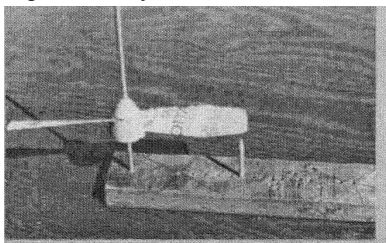
The spinner is then placed in the appropriate hole, at the pitch angle chosen, with one of the pencil marks on the index line of that hole. *(Ed Note: Dick left out much explanation here. Which of the four holes you place the spinner in will be determined by the size of your spinner; You'll need to try putting the spinner in various holes so that the middle of the cut will intersect the midline of the prop as closely as possible. On a larger spinner the cut will need to start farther from the prop centerline and the middle of the cut will need to be higher on the spinner so that the shaft in the spinner will need to be in a hole farther from the angled cut in the jig. As to whether to use the 45° angle cut or the 50° angle cut, I can only speculate that the larger the prop, the more likelihood you'll need to use the 50° angle.)* Hold it securely in that position while a blade slot is cut using the Zona saw. After the first slot is cut, the spinner is rotated so the next mark is on the same index line and another slot is cut. When all the slots are cut they can be widened slightly and radiused to match the curve of the blades using a strip of sandpaper.

Blades are cut from a plastic container, like the kind that contains cottage cheese, yogurt or similar products (see above). My particular preference is cottage cheese cartons. A blade pattern is cut from the container at approximately 15 degrees *(There's a more scientific approach to determining this angle in an article on the PFFT website entitled "Prop From Plastic Bottle")* to the left of perpendicular. As you can see in the diagrams, when cutting out the first blade leave a one inch (wide "T") at the base of the blade including the step but minus the lip to aid in making the subsequent blades. The first blade is then placed on the step of the container and consecutive blades are drawn by tracing around the first one and then repeating the pattern around the container, keeping the step of the pattern blade on the step of the container. This should ensure uniformity. Blades for reverse or

clockwise rotation must be cut 15 degrees to the right of perpendicular.



The finished blades (minus the "T" base) are pushed into the spinner slots. With the 1/8" brass tube still in the spinner, insert a piece of 3/32" brass tubing in it and place the 3/32" tube in the 3/32" "Truing" hole at the far end of the jig. The 1/2" length of 1/8" tubing extending below the bottom of the spinner will keep the spinner at a reasonable height above the jig. Use a short piece of dowel in one of the other holes as a guide as you see in the photo to make sure the prop blades are rotating in the same plane. You may need to use slivers of wood in the spinner slots to form wedges to raise or lower the blade tips. When you're satisfied, use thick CA to glue the blades in place and use accelerator to prevent any further movement.



If prop weight is critical, remove the brass tubing and replace with 1/8-inch aluminum tubing, secured with regular cyano. (*Brass is always preferable for use with prop shafts due to its resistance to wear. Otherwise, leave the brass tubing in the spinner and bush the tubing down with 3/32 o.d. tubing for a 1/16- inch prop shaft or again with 1/16" Special Shapes thin walled brass tubing for a .047 shaft, or a standard 1/16-inch o.d. tubing for an .032 shaft. Cut the combined tubing off to the correct length so that the tubing just reaches the front of the spinner. For a free wheel ramp, cut a very short piece of 5/32 brass tubing and CA it on the very front of the tubing, and use a dremel to cut a free wheel ramp in the 5/32 tube.*)

The finished propeller is balanced by scraping the heavy blade with a single edge razor blade. Blades for props larger than six inches will have to be reinforced or laminated using cyano as an adhesive. Acetone, M.E.K., or even lacquer thinner can be used, but they tend to leave the plastic a little soft.

