OPT TO HOP-UP YOUR PROPS

Compelling propeller thoughts
By Mike Isermann

Propellers…,which type should I use? Have you ever wrestled with this question? I can't tell you how many times I have tried to decide which propeller setup to go with. I like several of the propeller systems used today and can't ever settle on just one. So I go round and round and round…

Propellers are very important because they can turn an average flier into an outstanding performer if you choose wisely. There are four basic types of propellers to choose from. Injection molded plastic, hand-carved balsa, cottage cheese container/plastic cup props or oven baked propeller blades (water soaked and oven baked) made of balsa, basswood or plywood. Any other method is most likely a variation of these four types of propeller configurations.

So which one is the best system you ask? Well, I would have to say all four. Why? Let's take a look at all four methods and reveal their unique benefits and talk about the philosophies that accompany each school of thought. You can see if you fit into one of the categories or perhaps you are just like me. I use at least three of these techniques, or some variation there of, depending on the subject.

Injection Molded Plastic Propellers – You have got to love those prefabricated little wonders that come from Europe and Asia. And they come in so many colors, shapes and sizes, too! Most of the time you just take one out of the package and stick it on your nose block right? Wrong! I always check to see if the prop is balanced before I install it on one of my ships. I also check whether the pitch of the blade is where I want it. Re-pitching a plastic prop is no big deal if you have a little pitch gauge lying around. Just twist and measure a few times until the blades holds your adjustment. There is no guarantee that the adjustment will hold for any length of time, so make sure to readjust it periodically.

Another thing I consider when using plastic props is their weight. Propellers do not need to act as ballast if your plane needs nose weight. That's what clay and lead is for. In fact, I believe a heavy propeller creates more drag than a light weight prop and takes more forward motion to make the prop free-wheel. This robs airspeed causing an increased sink rate. It may not be noticeable at first but in a sport where seconds count, I like to use every advantage I can to maximize my flight times.

Scraping a prop is an extremely time consuming task but it can be very beneficial in terms of prop efficiency. You can scrape anywhere from 1 to 3 grams of weight from a 6 " plastic prop if you work at it. If you have never scraped a propeller before it is very simple. Just install a new number 11 blade into your favorite Xacto handle, hold the propeller in a manner that utilizes your index finger as a support and begin scraping the blade from the hub to the prop tip using perpendicular strokes. I would recommend you wear leather gloves to protect your index finger from the Xacto blade.

You should see little curly shavings begin to fall to the floor. Be sure to move across the blade in a uniform pattern never remaining in one place to long. You don't want a flat spot on the face of your propeller. Understand that you will only be scraping the face of the propeller blade. Scrape both blades evenly so the blade balances after you are finished. That is all there is to it.

Why do some people use plastic propellers over other types of propulsion setups? Fellow modeler Chris Starleaf has explained it this way: Chris likes to use the same motor and propeller setups for all of his planes because it simplifies and standardizes the business end of his models so he has one less thing to worry about when he competes in contests. If he has a problem he just grabs another assembly and installs it. No testing necessary. This simple yet efficient measure makes more sense than anything else I have seen people do in this hobby. And Chris' numbers in the win column prove it. I know there are others who have been doing this for some time now. I guess I am just a slow learner. Old habits die hard.

Hand Carved Balsa Propellers – Often touted as one of the "black arts" of model airplane building, carved propellers do not get the respect they deserve because they are considered to be cumbersome to comprehend and an arduous task to create. I think this could be no further from the truth! Modeling mentor and good friend Bob Isaacks taught me how to carve propellers about five years ago and I can't seem to get enough of carving them these days. Sometimes I carve them with no subject in mind! I guess it's like Jed Clampett used to say: "Ain't nothin' better than a sharp knife, a whittl'n stick and a jug of moonshine to make a man plumb happy." Now I don't know about the moonshine part, but a nice cold hand-crafted brew from St. Arnold's brewery here in Houston, Texas has worked just fine for me. Well Dawgie!! (Or whatever Jed used to say?)

There has been a lot of discussion on what pitch to carve when designing hand carved propellers. Volumes can be written on this topic and we would still have those who disagree. So I will share with you what works for me and we will move on. For most of my planes I use a 1.2 to 1.5 pitch ratio with a few degrees washout on the tips. This gives me great bite during the power phase of the flight and a prop that does not have to work that hard to turn during the glide. I use 5 to 7 pound balsa and I beef up the leading edge of the blade with a piece of 1/16th square basswood. I hate nicks in the blade so I spend the time to lay in some basswood. You may also consider gluing some 30 to 50 pound fishing monofilament to the leading edge of the propeller as an alternative. This also seems to work well.

Why do I prefer hand-carved propellers? Primarily because you can pick the pitch you want and the propeller will hold the selected pitch indefinitely. You can also choose any blade shape you want and you can use just about any type of clutch system known to man without a problem.

Cottage Cheese Container Propellers – I have to admit I have never used this method of construction but I can see the benefits of using the technique. First of all, you don't have to spend much time making the blades. Just find a suitable cottage cheese container or plastic cup, trace your favorite

blade pattern on the container at the desired pitch angle and cut the blade out. It could not be any easier.

These blades can either be glued into dowel spares, as will be discussed in the baked propeller blade section of this article, or they can be inserted into a balsa nosecone and/or wooden hub assembly. I have to admit I do not care for the latter. Not because the system seems to be weak or heavy. In fact, I think you can make very light and strong prop assemblies using the technique. And some really scale looking three-blader front ends to boot! To be honest I just don't like the idea of having to fit blades in slots that are cut into the side of a finished balsa spinner. You can not afford to miss your mark. Taking it a bit further, I'm not sure I would be able to match the blade pitches. I'm sure there is a way, but I'm not inclined to figure it out because I don't see a substantial benefit in building this type of assembly. I might be missing the boat here so if someone could enlighten me I may reconsider.

Baked Propeller Blades – Flying buddy Mike Midkiff introduced me to the baked propeller blade back in the early 90's. At the time I thought it was the best thing since sliced bread. I have used them on many airplanes since that time and still consider the technique to be one of the best ways to make custom propellers. You have an infinite number of blade shapes to choose from and they are fun to make. Okay, so the word fun is a bit strong, lets say they're a b**ch to make. Semantics right?

I make them the old fashioned way: about 5 or 6 at a time!!! That way you're bound to get a couple that will hold their shape! Honestly, they're not that bad to make. I'm just a bit of a perfectionist. Iron Mike likes to make his prop blanks out of 1/32" plywood or basswood. Two sheets of 1/32" medium-light balsa with the grain laminated criss-cross on a 10 degree bias is the way I like to go. I have also found that if you use some ammonia (about 30%) in your warm water solution you will improve the likelihood of your blades holding their shape. I usually wrap my blanks on a 4.1/2 inch coffee can at a 13-15 degree angle. I draw a black line tilted to the right and use it as a centerline for my blanks. The best way to hold them in place is to cover them with a piece of thin cardboard. I then wrap the can with an old rubber motor. Don't be afraid to warp a five foot length of rubber on the can. Then stick the whole thing in the oven and bake at 160 degrees for two hours.

Once the blades are baked, covering them with a little Esaki silk or tissue will go a long way towards strengthening the blades and it helps ensure a smooth finish once the blades are painted. But make sure you put it on both sides of the blade! If you put it on the top only, you will see the pitch change! Even the smallest of pieces of tissue and silk will shrink. Now all that is left is a bit of shaping and you are on your way.

I would have to say this part of the baked prop assembly method I am about to describe is my favorite feature of all. If you like prop assemblies that are user-friendly, this technique is for you. I typically prefer dowel spares as the method to attach my baked propellers to my prop hub. Hubs are built out of aluminum tubing, brass tubing, balsa and plywood.

First, on my Dremel, I spin up a piece of 1/32" plywood to the diameter of my vacuformed spinner. Then I glue a balsa wood ring about ?" wide on the plywood disc. This ring will serve as dead wood on the inside of my vacuformed spinner so that I will have something to drive screws into to hold the spinner in place. The next thing I do is select a piece of aluminum tube that will accept the propeller blade dowel I am using. 1/8" ID tube is usually used. I wrap the tubing with sand paper and begin to sand a slot across the centerline of the balsa ring and plywood disc. This slot will be sanded all the way to the surface of the plywood disc. It will act as a "cradle" for the aluminum tube. The next step is to cut the aluminum tube to the same length as the disc diameter, mark the center of the tube lengthwise and drill a 3/32" hole through the center of the tube. This hole will accept a 3/32" OD piece of brass tubing that will act as the hubs bushing. I slide the brass tube through the aluminum tube and then glue it in place with thick CyA. The bushing is then slipped through the center hole of the plywood disc and the aluminum tube is seated and glued into the balsa wood cradle. The brass tubing is cut of flush to the back side of the spinner disc and the front is left about a 1/4" long above the aluminum tube. I will then grab the next size of brass tubing and will file a ramp into the end. I will cut the ramp off leaving about 5/16" of tubing. This small piece of tubing will then be slipped over and glued to the 1/4" stub of 3/32" brass tubing left one the spinner hub. Now, all you do is slip the blade dowels into the hub and voila!

The reason I like to think of this type of propeller system as user-friendly is because the blades are replaceable and adjustable. I like to use tiny 000 wood screws to hold the prop blades in place on the hub. Small "pilot" holes are drilled through the aluminum hub into the dowel spares to simplify pitch setting. Then the wood screws are installed. If a blade breaks, it is super easy to change it out. In addition, this method makes pitching your propeller a snap. You also have the ability to adjust if things are not as you like them. All of a sudden changing propeller pitches can be done on the field. This has huge advantages during competition. It is coming back to me now as to why I have not moved to the same prop same motor approach. Perhaps old habits have their advantages!

Each one of these propeller assemblies offer the modern model builder a number of ways to improve performance on several fronts including ease of adjustment, equipment simplification, reduced effort to fabricate, pleasing aesthetics and serious pulling (or pushing) power. I recommend you try one or all four! I'm sure you will find one or more that will suite a particular application. If you opt to hop up your next prop you may drop when you see your plane mop up the top spots –

Spin with a grin,

OOSMIKE