Drilling Propellers for Proper Fit on Your Engine

By Pat Roy aka Tired Old Man

Most gas engines have some type of center locator (pilot shaft) for the propeller. It may be a protruding shaft as noted with the 62 or in may be a center bolt hole. Without having a pilot shaft, or hole, the likelihood of installing the prop off center is extremely high. Virtually all glow fuel two strokes have a threaded propeller shaft. That it is threaded is the only real difference between a glow and gas engine propeller shaft.

Engines that are around 35cc or lower typically have an 8mm prop shaft. Engines that are above 35cc have a 10mm prop shaft. Most of the propellers have an 8mm or 10mm center hole. This is not a coincidence. This method of centering has worked quite well for decades, even when the propeller center holes were factory drilled at 3/8". It may still be necessary to ream the pilot hole in the propeller to fit the engine.

How you set your propeller in relation to the engine compression stroke is entirely up to you. For those that hand start their engines, a blade position close to a two o'clock and eight o'clock position works very well. It assists clearing your hand from the propeller arc when hand starting. Again, propeller positioning is completely up to the user. The only time propeller position becomes critical to starting is when a magneto is used for an ignition system. With electronic ignition systems propeller position is not important at all.

Multi bolt hubs are a continuing point of contention. Some feel they are safer, others do not. I'm not going to enter that debate here other than to say that with smaller engines, 75cc or less, there really no point is drilling a bunch of holes in a propeller hub if you have a clear option of using only a center bolt to retain the propeller. If the only mounting option is to drill multiple holes in a propeller then you obviously will need to do so. Bear in mind that the hub design on some propellers makes drilling holes around the circumference of the hub quite difficult. Prop selection can be difficult with smaller gas engine due to this feature.

A drill press is the best means of drilling straight and accurate holes. Always drill a propeller from the backside of the hub, not the front. Starting from the back assures that when the bolts pass through from the front there will not be any misalignment at the hub. That takes a lot of stress off the bolts. Drill the holes one bit size over that of the bolt. There's no reason to size the holes in the propeller bunghole tight to the bolt size. Use of a drill press means that the propeller washer will be an acceptable guide for drilling the propeller. A drill jig is not necessary unless you are using a hand drill to mount your props. Use of a hand drill and drill jig is not a good idea. Using this method frequently results in bolt holes being out of alignment or greatly oversized. If you don't have a drill press find someone that does. Better still, buy one. Once you have the first hole drilled in a propeller, insert a short bolt into the jig and propeller to "key" the propeller to the jig. As each

new hole is drilled, insert another short bolt to maintain hole alignment as you work your way around the hub.

Prop bolts should be an easy slip fit through the prop and into the prop hub. If you have prop bolts that are tight to insert or seem to have a "pre-load" on them you have mis-drilled the holes or you sized the holes too small. Fix this problem before flying. Misaligned prop bolts is one of the causes of sheared prop bolts. Never use Locktite or other thread lock compounds on prop bolts. You might want to take them out someday. Take the time to assure that any prop bolts used will not penetrate so deeply into or through the engine's hub and bind against the engine case. Propellers come with the hubs in various thickenesses and add to that you have spinner backplate differences. You will probably need to obtain several different lengths of prop bolts to meet all the conditions you will be faced with.

Wood props should have the bolts in a multi bolt hub torqed to between 35 and 40 inch pounds. That is judged with a torque wrench, not by feel. Over torquing a the bolts in a wood prop can and do seriously compress the hub on propellers made from softer woods. Unfortunately that covers a lot of the current crop from various manufacturers. If the wood the propeller is made from is light in color consider that it may be softer than ideal. Once you've compressed the propeller hub past a certain point you open the door for the hub to split with the grain of the wood. You don't want to get to that point. Ever. Using a torque wrench in a star tightening pattern helps prevent over compressing the prop hub. Prop bolts should be checked for the correct torque at the beginning of each flying day, and every 6 flights or so in a long day of flying. New propellers should be checked after after three flights. Yes, you have a spinner on there that will need to be removed. Too bad, pull it and check the darn prop bolts. You really do want to keep the propeller attached to the engine. You do not want 4 or 6 sheared prop bolts or a propeller land in your lap in the pits.

Single bolt wood propellers conflict with the 40 inch pound rule. Tighten the center bolt down until the propeller csannot be rotated against the propeller hub or spinner back plate. Yes, you will compress the wood hub. No, a single bolt hub propeller will probably not last as long as a multi bolt one due to hub compression. That did not used to be the case. Props were made of harder woods only a short time ago.

Composite propellers can have the bolts installed tighter, but keep in mind that bolts have a maximum torque value that varies with the size and composition of the bolt. Exceeding that value causes the bolts threads to stretch and/or break the bolt under tension. Prop hubs are a pain to fix so do it right. Consult with your engine manufacturer/distributor to determine what the maximum torque value is for the bolts used on your particular engine.