

Edward Sterba Aircraft Propellers
513 68th Holmes Beach, FL 34217
941-778-3103

Propeller Installation and Maintenance

Installation -- Please treat the Urethane Leading Edge carefully, it takes a few weeks to fully cure. Because of the slight differences in prop hubs and spinner bulkheads, it may be necessary to lightly file out one or more bolt holes in the propeller. It may also be necessary to radius the large prop hub hole to get a proper fit on the engine. This can be accomplished with a small round file and abrasive paper. Some spinner bulkheads are designed to "crush" against the rear of the propeller upon the first installation of prop, bulkhead and hub. At this time it is also imperative to make sure that your bolt drive bushings are not able to "climb" into the propeller because the bushings are loose and the holes in the prop for the bushings are too deep. This has caused a problem in the past. It may be necessary to have spacers in the bushing holes so that this can't happen. This is important. Propeller bolts should always be tightened evenly in a cross pattern gradually tightening all to an even torque. The standard value on 5/16 nuts is 10 to 12 ft/lbs, 3/8 is 15 to 18 ft/lbs, 7/16" is 20 to 22 ft/lbs, 1/2" bolts to 25 ft/lbs. Even if torqued to an even value with a torque wrench, the actual value will change through the year as the wood continues to change thickness according to the weather and the season. It should be checked several times a year for tightness, especially if the aircraft sits for any length of time. That's how wood is.

The propeller should always be "tracked" upon each installation and whenever unusual vibration is noticed. This can be accomplished with a tape measure held to a fixed part of the aircraft and measurements made to each blade tip, or by positioning an object near the sweep of the blades. Track should be within 1/8th " between the two blades. If not, try loosening all the prop bolts then retorquing again giving first preference to one side or the other in order to correct to 1/8th". All screws and washers used on the spinner should be the same length to maintain the balance of the spinner and prop. Any repair made to one side of the spinner must be matched by a similar patch on the other side. Front spinner bulkheads tend to crack so it may be necessary to reinforce them during initial assembly. The spinner itself must not wobble too much and can be tracked with the use of a grease pencil and a yardstick while the engine is at idle. Be careful! Elongating the front bulkhead boltholes and shifting the bulkhead will put the spinner into correct alignment. Aerodynamically, it doesn't seem necessary to have a real close fit between the prop and the spinner so it is better to have a little too much room than not enough to avoid damage to the prop finish.

Maintenance -- The amount of maintenance required depends on the condition of your run-up area and how much weather the propeller is exposed to. If the aircraft is tied down outside in the weather it is necessary to have a propeller cover installed to prevent sunlight from deteriorating the finish. The cover should be made of a breathable material and cover all the prop right up to the spinner. The urethane leading edge should prove very durable, however, high power run-ups over dirt or gravel will definitely pull debris up into the blade. It is best to pull the power back a bit when flying in rain to reduce the tip speed and erosion forces on the blade. Repairs to the urethane can be made with epoxy resin although it will not be as strong as the original material. Any wood prop needs to be left in a horizontal position so that moisture does not collect in one blade. Should it be stored off the aircraft for an extended period of time, it is better off not in a heated house for the winter where the humidity gets very low. Please do not use any wax or cleaning material with silicone since any refinishing will be almost impossible to accomplish. Painting of the tips or side towards the pilot can be accomplished with enamel paint after light steel wooling of the finish. Please use an even amount of paint on each blade since the balance is very sensitive.

GENERAL RULES ON PROPELLER MAKING

Tip speed --- $RPM \times Dia." \times .00436 = \text{tip speed (Ft/sec)}$

-- the normal maximum for a wood prop is 900 Ft/Sec

$2700 \times 68 \times .00436 = 800 \text{ ft/sec}$

Geometric Pitch --- $RPM \times Pitch" \times .000947 = \text{speed (MPH)}$

-- this approximates the aircraft forward speed

$2700 \times 60 \times .000947 = 153 \text{ mph}$

Blade Angle --- $Pitch / Circ. = \text{then arc.tang.} = \text{angle (degrees)}$

-- to find the angle needed at any blade station for a desired pitch.

Example - 60 pitch, 68 dia. (214" circ.) $60 / 214 = .2804$, then $\text{arc.tan. of } .2804 = 15.70 \text{ degrees}$

Prop \$395⁰⁰
 OPS + 25⁰⁰

 Total 420⁰⁰
 - 210⁰⁰

 Balance \$210⁰⁰

OTHER RULES OF THUMB -- PROPS AND OTHERWISE

It is not unusual for a small, slippery homebuilt to exceed the Geometric Pitch by 10 to 15 %, this is not being more than 100% efficient, it has to do with how the blade angles are measured and the fact that this formula doesn't take into account the lift of the blade airfoil. Once you establish the max. level RPM possible, reducing that RPM by 10% will approximate a 75% power setting.

ALSO --- When handling large snakes, always use one adult for every 4 feet of snake. This is one of the most important rules of all.