



“Serving to Serve Again”

A Bit of Understanding about Propellers

Some pilots believe two blade propellers are faster than three or four blade propellers. Some pilots believe short propellers are faster. Other pilots believe the opposite. The Wright brothers airplane had a two blade propeller, while the P-51 of WWII fame had a four blade propeller as does the C-130 Hercules. The Beechcraft Starship has a five-blade propeller.

In designing a propeller for a particular application, several questions should be answered. Torque is what turns the propeller, so we need to know how much torque is available and at what RPM. If for example, maximum torque is developed at 3000 RPM, the tip speed of a very long propeller will be supersonic and probably create more drag than thrust while also having some undesirable effects on the portion of the blade that is just at the speed of sound. If maximum torque is developed at a very low engine RPM, a longer blade may be more desirable, however, ground clearance must be considered and with longer blades there will be more outside noise, but not necessarily more noise in the cockpit. Generally, three and four blade propellers are heavier than a two-blade propeller and will cost more to overhaul.

Another question is what type aircraft is to be propelled through the air? What is the mass of the aircraft? You would not use the same propeller on a 300 HP Mooney or Lancaire that you would use to drive a blimp with a 300 HP engine. At what altitude will the aircraft be traveling? Again, a 300 HP agriculture airplane would not necessarily use the same propeller as a turbocharged aircraft that cruises at a much higher altitude, higher speed, and develops sea level horsepower while doing so.

When selecting a propeller, we should probably start with as few blades as possible to do the job. If we have a lot of horsepower and a tricycle gear airplane, a three-blade propeller would probably be better than a two-blade propeller. Assuming a three-blade propeller is selected, we now look at the airplane to be propelled. Is it a very streamlined airplane with minimum drag or a more bulky design? All three-blade propellers are not the same. Consider long blade, short blade, Q-tip, round tip, Scimitar and conventional. Some propellers pull the airplane some push and others lift, but they all move air.

Vibration is another consideration of the engineer. I am not referring to the vibration felt in the cockpit, although that is very important, but rather the vibration of the propeller blades themselves. Consider a turbocharged 300 HP engine; with maximum RPM and minimum blade angle for take off, the power thrust of the engine is somewhat applied to the edge of the propeller blade. The blade vibration at this angle may be very acceptable.



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As the airplane moves faster, the propeller governor increases the blade angle in order to maintain a constant RPM. When the airplane is leveled off at high altitude in very thin air, the RPM is reduced to cruise power setting, by increasing the blade angle. The power thrust of the engine is then more toward the flat side of the blade. The vibration of the blade may be such that the blade will fail. So, a propeller that is good for a non-turbocharged engine may not be good for a turbocharged engine. That is why each propeller must be vibrationally approved for each engine and airframe application. A propeller blade may be twisted at one point of the blade for an agriculture aircraft and the same blade twisted at another point for a turbocharged high performance aircraft.

Texas Skyways has FAA approval for six different models of three blade propellers. All have different characteristics. They will perform differently on the same aircraft. We recently sold a gentleman an 82-inch propeller to replace his obsolete 88-inch propeller. At cruise power the aircraft was about six miles per hour faster. The more modern design, with the maximum thrust from the blade where it should be, made the difference. Generally speaking, aircraft engines develop maximum torque at about 2400 RPM. Yes, there are many variations. Assuming 2400 RPM to deliver maximum torque, the propeller should be designed to give the maximum thrust at 2400 RPM to achieve the best cruise. Take off performance may not be as good as another propeller with a different twist in the blades. Different strokes for different folks and different blades for different planes.

The engineers at the two major companies that manufacture propellers for general aviation aircraft really know what they are doing. They are continuously designing more propellers to do a better job for the customers.

Texas Skyways sells propellers as well as engines. We recommend the propeller that we believe will be the most beneficial to the customer. However, we often suggest that our customers try various models of propellers before making the final decision. “Fly before you buy.” When asked about propellers by people considering purchasing a new model propeller, we suggest that they go to their favorite propeller shop and ask for a free demonstration. There reason is - there is no “one for all” propeller.

Ask yourself a lot of questions. Then ask the propeller shop. Call the factory. They have sales people with a lot of good advice. Then “fly before you buy.”

Jack Johnson
Texas Skyways, Inc.