SELECTING A PROPELLER

The chart below is intended to give the beginner a starting point for best performance. Modelers who have some experience develop a feel for the best size propeller for different model/engine combinations. In general, engines want to operate at a particular RPM where they can reach max power. Using too large a diameter and/or too high a pitch may cause the engine to not rev up to the best power band. With too small a diameter and/or pitch, the engine will over-rev and not deliver the best thrust. Often, heavy and slow airplanes use a large diameter and moderate pitch, while a fast plane will have a smaller diameter and a higher pitch. Hovering and lifting applications use an over-sized, low-pitch propeller. Use the chart below to select a propeller. Check the RPM with a tachometer – RPM will increase from 1500 to 3000 in flight, depending on the weight and speed of the plane. **BE SURE TO FOLLOW ALL SAFETY AND WARNING INSTRUCTIONS. . . GOOD FLYIING!**

1. RPM Operating Limits: One of the differences between wood and glass-filled nylon propellers is that glass-filled nylon props have suggested RPM limits for mechanical considerations. This will vary according to diameter. For Master Airscrew props, we suggest the following formula:

RPM Operating Limit = 165,000 divided by Diameter in Inches. For example, a 10" diameter prop has an operating limit of 16,500 RPM, well above the requirement of a .40 engine.

2. Propellers for 2-Stroke Engines

.049 to .051: 5.5x4, 5.5x4.5, 6x3, 6x3.5, 6x4
.09 to .10: 7x3, 7x4, 7x5, 7x6
.15: 7x6, 8x3, 8x4, 8x5, 8x6, 8x7
.20 to .25: 8x6, 8x7, 9x4, 9x5
.29 to .35: 9x6, 9x7, 9x8, 9.5x6, 10x4, 10x5, 10x6
.40: 9.5x6, 10x4, 10x5, 10x6, 10x7, 10x8, 10x9
.45 to .50: 10x7, 10x8, 10x9, 11x4, 11x5, 11x6, 11x7, 11x7.5
.60: 11x4, 11x5, 11x6, 11x7, 11x7.5, 11x8, 11x9, 11x10
.71 to .80: 12x4, 12x5, 12x6, 12x8, 13x5, 13x6, 13x8, 13x10, 14x8
1.08: 14x6, 14x8, 14x10, 15x6, 15x8, 16x6
1.20: 14x8, 14x10, 15x8, 15x10, 16x6, 16x8, 16x10
1.5: 16x8, 16x10, 18x6, 18x8, 18x10
1.8: 18x8, 18x10, 20x6, 20x8
2.1: 20x6, 20x8, 20x10
2.7 to 3.5: 22x8, 22x10, 22x12, 24x8, 24x10, 24x12

3. Propellers for 4-Stroke Engines

.20 to .25: 9x4, 9x5, 9x7, 9x8
.40: 11x5, 11x6, 11x7, 11x8, 12x4 12x5, 12x6, 12x8
.60: 11x8, 11x9, 11x10, 12x5, 12x6, 12x8
.90: 12x8, 13x8, 14x6, 14x8, 14x10
1.20: 14x8, 14x10, 15x8, 15x10, 16x6, 16x8

4. Converting from a 2-Blade to a 3-Blade Propeller

To convert form 2 blades to 3 blades you want to decrease the total blade area and increase the angle of attack (or pitch) to overcome the increased drag of the third blade. The general rule is to DECREASE propeller diameter by 1-2", and INCREASE by 1-2" the propeller pitch. It is all right to keep the same pitch when going from 2 blade to 3, however you will not want to decrease pitch.

5. Propellers for Electric Motors

Motor Size	Prop
400 – Direct Drive	6x3, 6.5x4, 7x4
400 – Geared	7x5.5, 8x4, 8x5, 8.5x6
550/600 Direct Drive	8x4, 8x5, 8.5x6, 9x6
550/600 Geared:	
2.5:1 Ratio	10x6, 10x7, 11x6, 11x7, 12x6, 12x7
3.0:1 Ratio	11x6, 11x7, 12x6, 12x7, 12x8
3.5:1 Ratio	12x7, 12x8, 13.8.5

6. Propeller Hole Sizes

Most Master Airscrew Propellers have two hole sizes because they are piloted in the back of the propeller to facilitate reaming should you need to englarge the hole. The first number is the hole size; second number is the pilot size.

2-Blade Propellers (glass-filled nylon)

5.5" through 6": 1/8" and 3/16" 7" through 8": 3/16" and ¼"
9" through 13": ¼" and 5/16" 14" through 20": 5/16" and 3/8"

3-Blade Propellers

6" through 7": 1/8" and 3/16" 8": 3/16 and ¼"
9" thorugh 13": ¼" and 5/16" 14" through 16": 5/16 and 3/8"

Wood Series and Wood Scimitar Series propellers all have a uniform ¼" hole.
All Electric Series propeller have a set of 5 bushing inserts for mounting to various prop adapters.

7. Balancing a Propeller

Because of slight differences in wood grain and density, and due to variances in the molding process, it may be necessary to balance a propeller – either wood or glass-filled nylon – before use. Balancing a prop is a simple operation and requires the following materials:

1. Balance Stand (we recommend the Master Airscrew Balance Stand, part no. MA604222)2.
2. Masking Tape – 1" or under in width
3. Silver solder, modeling clay, enamel or nail polish
4. Pocket knife
5. Sanding paper, medium to fine grade

Note: If you need to ream the center hole, do this **before** you balance youe prop. If you ream even slightly off center, balance will be changed considerably and you have to balance all over again.

When you place the prop on the balance stand, make sure the cones are placed fairly snug next to the prop hub. Hold an end of the prop so it hangs vertically, and let go. The heavy blade will fall and the prop may even rotate once until it finds horizontal balance. As a test, turn the cones 180 degrees and see if the balance changes. If it does, the cones are out of balance.

To Balance: Take a 1" piece of masking tape and place it on the light blade – on the tip is fine. Test for balance and add or subtract tape as needed. The amount of masking tape on the blade will tell you how much material you will need to add or remove for final balance.

In most cases, the weight of the tape is so slight it won't show up on a gram scale – say 1" or less of tape. If this is the case, the prop is within spec and can be flown without adding or removing material.

To Add Material: For g/f nylon props, place modeling clay or silver solder in the holes in the back of the prop hub, on the side of the light blade, until it balances. For wood props, try adding paint or nail polish to the back of the light blade. Industrial enamel or nail polish can also be used on g/f nylon props.

To Remove Material: For g/f nylon props, use a pocket knife to trim the edges of the heavy blade. For both wood and g/f nylon, use sanding paper to remove material from the heavy blade and bring into balance.