

How To Convert the Size of a Two-Blade Prop to a Three-Blade or Four-Blade Equivalent

By Paul Geders

Normally, you go down 1 inch in diameter and keep the same pitch. For example: you have a 2-blade, 10 X 6 prop, and you would go to a 9 X 6, 3-blade to achieve almost the same performance.

There is a very complicated formula for determining the load factor of a propeller. In its most simplistic form, for a 2-bladed prop, the load that a prop places on a motor is equal to the diameter cubed, times the pitch, or $D \times D \times D \times P$. For a 2 bladed 10x6 prop, the load factor would be $10 \times 10 \times 10 \times 6$ or 6,000. For a 12x8 prop it would be $12 \times 12 \times 12 \times 8$ or 13,824.

The more complete formula, which takes the number of prop blades into account is $D \times D \times D \times P \times \text{Square root } (N-1)$, where N = the number of prop blades. For a 2 bladed prop, the square root of $2-1$ is the square root of 1 which is 1, so the term just drops out of the equation. For a 3-bladed prop, the correction factor is the square root of $3-1$ or the square root of 2, which is 1.414. For a 4 bladed prop, the correction factor is the square root of 3, which is equal to 1.732. So if you have a 3-bladed 9x7 prop, then the load factor is $9 \times 9 \times 9 \times 7 \times 1.414$, which is 7,216, and this would be roughly equivalent to a 2-bladed 10x7 prop, which has a load factor of 7,000. If you had a 4-bladed 12x7 prop, then the load factor would be $12 \times 12 \times 12 \times 7 \times 1.732$ or 20,950. This would be roughly equivalent to a 2-bladed 14x8 prop, which has a load factor of 21,952.

In the end, if the load factor of 2 props is the same, you will get similar RPMs from the two props, and similar performance.