

## How Fast Does Your Plane Fly? 05/27/09

Ever wonder how fast your plane flies? You can estimate the speed of your plane without using a radar gun or computer by using some basic math and a couple of reasonable assumptions.

First, a needed basic definition:

Propeller pitch: The forward distance that a propeller moves in one revolution in an ideal fluid. For a 12 x 6 prop, for example, the prop would pull a plane forward a distance of 6" in one revolution.

Since air is not an ideal fluid, a real prop would move forward somewhat less due to friction, turbulence and vortex formation.

Assumption 1: The efficiency of a well designed prop is about 80% so that the estimated distance moved by a prop in one revolution is about  $.8(\text{Pitch})$ .

Assumption 2: The RPM of a propeller moving through the air is 200-300 RPM faster than that measured statically on the ground due to prop unloading.

Using the definition of pitch and the two assumptions, you can estimate the speed of your plane using the following equation:

$$V = .8(\text{Pitch})(\text{RPM} + 200)/1056$$

where  $V$  = Airplane speed in MPH  
Pitch = Prop pitch in inches  
RPM = Static RPM measured with a tach

If you plug in the appropriate numbers for engines running at 12,000 RPM, you will find that plane speeds vary from about 45 MPH for a trainer flying with a 5" pitch prop to about 74 MPH for a pattern plane flying with an 8" prop.

Note that relatively large changes in engine RPM have minimal effect on plane speed. Take the trainer running a prop with a 5: pitch as an example. Instead of running the engine at 12,000 RPM, put a tuned pipe on it, lean the engine out to the max and fly the plane at 13,000 RPM. Putting these numbers into the equation, you'll find that for all

your efforts, the plane will now have a speed of  $48 \frac{1}{2}$  MPH, a gain of only  $3 \frac{1}{2}$  MPH! Interesting, huh?

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