The Flightline

Volume 40, Issue 11 Newsletter of the Propstoppers RC Club AMA 1042 November 2010

President's Message

The elections are over and the current board was voted in for another year The Board would like to thank the Members for their trust and we will work hard to give you great flying fields.

Well Saturday night Brookhaven Indoor was a great success we started off with a bang. There were many planes and helicopters flying together no problem a great night.

Don't forget more indoor flying Nov. 5th 6:30 till 9:300 at Tinicum school and Nov. 13th at Brookhaven 6:00 till 10:00.

If there is any news about our fields we will we will discuss at the meeting.

As always bring in some show and tells . By the way, Wednesday nights are Night flying Till 8:30 see you at the meeting

Dick Seiwell

Agenda for November 9th Meeting
At the Middletown Library;
Doors open at 6 pm meeting at 6:30

1. Membership Report
2. Finance Report
3. Show and Tell

INSIDE THIS ISSUE

Minutes of the Propstoppers Model Airplane Club

October 12, 2010 , 2010 at the Middletown Library.

The doors were opened at 6:00pm and attendees began assembling around 6:10 to prepare the room. Our meeting was called to order at the 6:30 starting time.

Ray Wopatek recorded the roll call with 16 members present at that time(others came later).Pete Otinger announced the value of funds in the treasury, and the report was accepted by the members.

Copies of the newsletter were evident, and the minutes of the prior meeting were approved by all as appeared in the newsletter.

Old Business

The practicality of night flying was again discussed, especially as to minimize the potential of any noise interfering with neighbors' homework or bedtimes.

A measurement earlier in the week showed a large gas helicopter to have met the AMA requirement of 96 dB at 3 meters. Al Busualdo ventured that an Align 450 doesn't make much noise, with the usual muffler, but the 500's are noisier. It was agreed that we should permit flying with lights on, as a trial basis, on Wednesdays until 8:30 pm.

We then discussed indoor flying from 6 to 10pm at Brookhaven. The first night is Oct 23, which is free, just a tip. The next nights are Nov 13, Dec 11, and Jan 8. Mike Black has arranged for us to fly in the Tinicum school gym for Fridays in the winter months. Nov. 5 Dec. 10 Jan. 7 Feb. 4, Mar. 4

New Business

Mike Williams agreed to take on the club Yahoo Group calendar to relieve Dave Harding of some of the many duties he performs regularly for the club.

It was mentioned that the Widener students might be able to measure propeller thrust in forward airflow, using the diffuser exit of their little wind tunnel, but their OS 61 FX could not be used, as it would deposit oil in the room. Members discussed the amount of power required of an electric set up to drive a 14-6 prop, and it seemed that Chuck Kime might find a 32A arrangement, with other possibilities from Al Busualdo and Eric Hofberg.

For the usual discussion of flying sites, it was reported that we must patiently await word from Garrett-Williamson after they have their board meeting. We have heard nothing yet from our appeal to Elwyn Institute.

Following the By-laws directions, at this meeting there was a call for nominations for officers. After discussion from the floor, the current officers were asked to become nominees. There being no others submitted, Article VIII biii was invoked, and the current slate was voted into office by the majority in attendance.

Show and Tell

At 7:30 we had show and tell an coffee and donuts. Mick Harris showed another beautiful model, this time the resurrected Revolt, nicely done.

Bill Tomasco , who likes rubber scale, presented a Dumas Staggerwing Beechcraft D-17 in orange tissue. He reported that some of the wood in the kit was not suitable and had to be replaced, and the burn marks from laser cutting should be sanded off so as not to show through the tissue. We barely beat the library -enforced closing time at 7:48pm

Calendar of Events

Club Meetings

Monthly Meetings
Second Tuesday of the month.
Middletown Library
Doors open at 6:00, meeting at 6:30 pm.

9th November

Tuesday Breakfast Meeting
Tom Jones Restaurant on Edgemont Avenue in Brookhaven. 9 till 10 am. Just show up.
Flying after at Chester Park 10 am.

Regular Club Flying

At Christian Academy; Electric Only
Monday through Friday after school till dusk
Saturday 10 am till dusk
Sunday, after Church; 12 pm till dusk

Indoor Flying

Tinicum School, Friday nights 6:30-9:30
Nov. 5 Dec. 10 Jan. 7 Feb. 4 Mar. 4
Brookhaven Boro Gym, Saturday 6 – 10 pm
Oct. 23 Nov. 13 Dec. 11 Jan. 8

Special Club Flying

Saturday mornings 10 am
Wednesday Helicopter evening in summer
Thursday evenings in the Summer
Tuesday mornings 10 am weather permitting after breakfast at Chester Park.
Check our Yahoo Group for announcements;
http://groups.yahoo.com/group/propstoppers/

Beginners

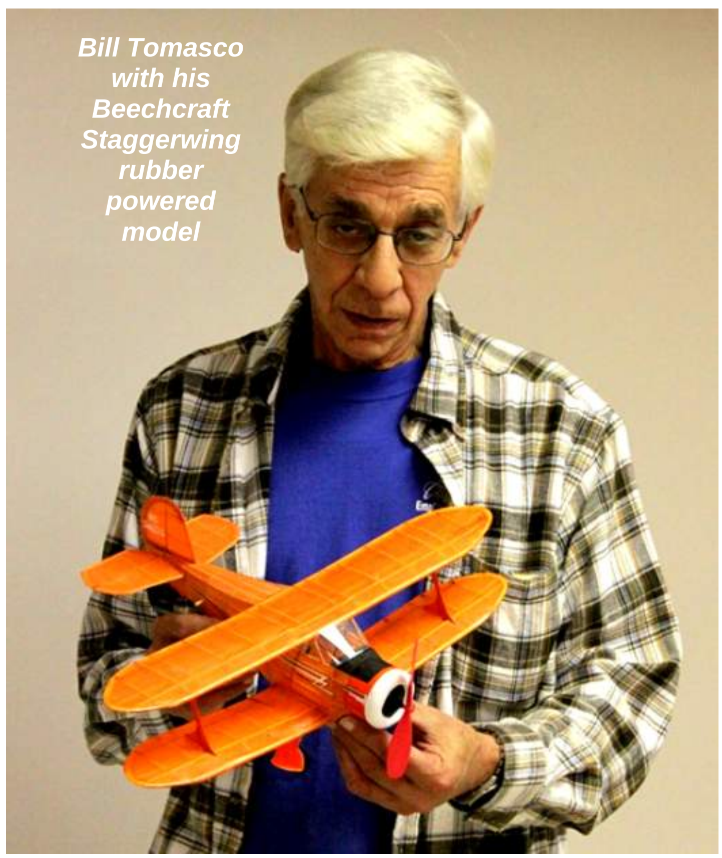
Beginners using due caution and respecting club rules may fly GWS Slow Stick or similar models without instructors.
The club also provides the AMA Introductory Pilot Program for beginners without AMA insurance.

Propstoppers RC Club of
Delaware County, Pennsylvania.
Club Officers

President Dick Seiwell
(610) 566-2698 reslawns@verizon.net
Vice President Dave Bevan
(610)-566-9152 oldave@icdc.com
Secretary Richard Bartkowski
(610) 566-3950 rbartkwoski@comcast.net
Treasurer Pete Oetinger
610-627-9564
Membership Chairman Ray Wopatek
(610) 626-0732 raywop@juno.com
Safety Officer Eric Hofberg
(610) 565-0408
Newsletter Editor and webmaster
Dave Harding
(610)-872-1457 daveiean1@comcast.net

Propstoppers Web Site; www.propstoppers.org

Mick Harris with his Revolt


Bill Tomasco with his Beechcraft Staggerwing rubber powered model

Vice President Dave Bevan for Secretary Dick Bartkowski.

Keystone Indoor Report

By Tom Tredinnick

I visited relatives near Muncy, PA over the weekend, and attended KEIF Sunday10/17.

Vendors and flyers were packing up early, so we missed the main event. The dome is the largest air supported dome in the U.S., very impressive and ideal for indoor r/c.

It houses a soccer field, locker rooms and a small food court.

Here is a description of the dome by former AMA president and current editor of RC Micro World ,John Worth

After looking forward for several months to going to the Keystone Indoor Electric Festival (KIEF) in Pennsylvania, my friend Jin and I started

out a day early on the 6 hour drive, from the Washington, DC area, in steady rain. It stayed that way through 4 hours and then it started to snow! But we finally made it to the site -- the Generation Sports Dome – and checked in. The huge sports dome near Williamsport, PA,-- bigger than it might seem to be The site is a huge white rubberized inflated cloth structure with no supporting beams or other obstructions, except for the cloth walls that curve up to meet at the top to form the ceiling. The floor of the flying area (artificial grass) is 480 feet long and 180 feet wide. One end of the “building” was set aside for Micro RC flying and it’s floor space was 105 feet wide by 180 feet. The ceiling height at the center is 75 feet, curving down at the sides and ends.

The vast inside of the sports dome, big enough for flying many models simultaneously. The first impression of the dome, aside from its size, was that it was sealed all around to maintain air pressure so as to keep the structure intact, with entry and exit via a revolving three door air lock at one end. This was large enough, but barely so, to move planes and equipment in and out without causing air pressure leakage.

What's New?

By Eric Hofberg

I test flew the new Parkzone Night Vapor from my driveway, last Saturday after dark and it looked and flew great; I only wish that the bushes and trees were also illuminated! I did get away with it.

This new Vapor has more easily replaceable wings with tiny screws holding the attachments. I am more concerned than ever about mid-airs with the fast movers in the gym, because of the tiny wires to the lights and the cost of replacement.

My other new plane is a Flyzone WW1 German Albatross biplane. I have not flown it yet and I had to return the 1st one to Tower Hobbies for an exchange, because the servo had failed and the receiver/servo board was detached inside the fuselage. I had just bench tested the new one and painted and installed the included pilot figure when I discovered the same problem with this example. I WOULD not recommend this airplane, except as a display model.....

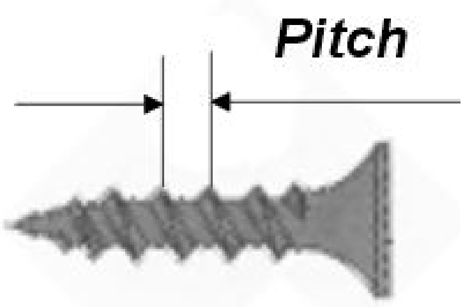
Eric Hofberg

Tech Note; Propeller Pitch Speed and Related Factors

Originally published in the May 2004 newsletter.

Pitch speed is a primary factor in the success of our propeller driven airplanes, yet it is not well understood by most modelers.

The lineal "pitch" of a propeller is just another way of describing the angle of the blades relative to the hub. If we envision the propeller as a screw, an "airscrew" in this case, the "pitch" is the distance it would screw itself through the air in one revolution, assuming there was no "slipping" between the screw and the air.



"Pitch speed" is what we get by multiplying the distance the prop theoretically travels in one revolution: the "pitch" times the speed of rotation. A close approximation is achieved when we use RPM and pitch in inches, then divide by 1000;

Pitch Speed in mph = RPM / 1,000 x Pitch (in inches)

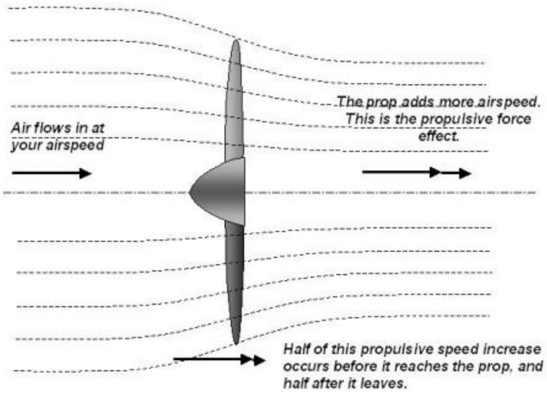
For example; we have our OS 40 turning a 10 x 6 at 10,000 RPM

Pitch speed is 10, 000 / 1,000 x 6 = 60 mph.

Hey, it works!

OK, so now let's look at the complications. First of all, for there to be zero "slippage", the prop has to be 100% efficient. As we all know, that's absolutely impossible. Theoretically there can be 100% efficiency at exactly zero thrust, but in a real world fluid that has viscosity, even that doesn't work.

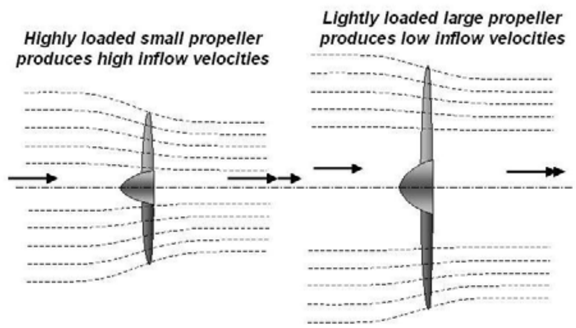
A prop makes thrust by pulling in the "working fluid" (air in this case) from in front of itself, and shoving it out behind. The force the propeller applies to accelerate the air results in an equal and opposite reaction force from the air against the prop. Its Newton's third law again, the one about action and reaction. Typically about half the acceleration occurs in the "inflow" in front of the prop, and the other half occurs in the wake behind the prop.



If the air has to be accelerated in order to make thrust, then the speed of the air in the slipstream behind the prop MUST be faster than the airspeed of the rest of the airplane. This speed difference is what we loosely refer to as "slippage".

The ideal efficiency is the ratio between the free stream airspeed divided by the airspeed in the fully developed slipstream (the air continues to accelerate for a few prop diameters downstream of the prop, so we have to take the measurement far enough downstream that the acceleration is essentially complete). For example, a prop with an ideal efficiency (just the induced losses resulting form the production of thrust, not counting the profile drag of the blades, etc.) of 80% would have a free-stream airspeed of 80% of the velocity of the fully developed slipstream. If the plane were flying at 20 mph, the average airspeed in the fully developed slipstream would be about 24 mph.

The ideal efficiency depends in part on the speed of the plane and the diameter of the prop. We're making thrust by accelerating air. For a given amount of thrust, we can take a small chunk of air (small prop diameter and/or low forward speed) and give it a huge, violent acceleration. Or, we can take a big chunk of air (higher forward speed and/or larger prop diameter) and give that bigger mass of air a much gentler push. The difference between inflow and outflow velocities for the large chunk of air is much smaller, so the ratio of those velocities is much closer to 1, equating to a much higher ideal efficiency.



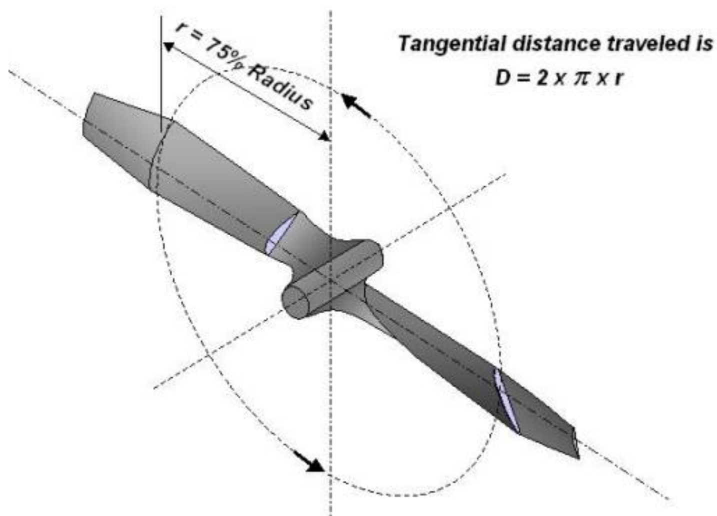
We can also infer from this that when we are trying to absorb a lot of power, make a lot of thrust and/or operate at low airspeeds (such as takeoff and climb), the efficiency of a given prop will not be as good as it is for lower powers and higher speeds (such as cruise).

In addition to the induced losses from making thrust, we also have to include the losses due to other factors such as the profile drag of the blades. Total efficiency of a typical prop might therefore be somewhere around 60% during takeoff, increasing to somewhere in the 80's in cruise assuming the prop, motor and airframe are well matched with each other. I have seen cases of props that were exceptionally well matched to their applications that achieved cruise efficiencies in the 90's. On the other hand, a poorly matched propeller/motor/airframe combination might have trouble breaking 50%. Props are like shoes, not only do they have to be well designed in and of themselves; they also (perhaps even more importantly) need to be well matched to their application.

Much of the myth that "two blades are always better than three" is due to just sticking the closest available 3-blade prop on a 2-blade application, without properly allowing for the effects of the extra blade in the overall size of the prop. By the way, one of those props I mentioned that had cruise efficiencies in the 90's was a 3-blade, and if I'd used a 2 bladed prop instead, even a properly fitted one, the cruise efficiency in that particular application would have been lower.

OK, so how does all of this relate to the original question? To answer that, we need to understand the relationship between the "pitch" of a blade in inches, and the "pitch angle" in degrees. Let's take a spot on the blade 3/4 of the way out from the propshaft towards the tip of the blade. This 75% radius location is approximately where the aerodynamic center ("AC") of the blade is located (this is because the tip is moving faster than the shank, and therefore the outboard portions of the blade are aerodynamically more important than the inboard portions).

If we multiply the radius at this point times 2 π, we get the circumference of the circle this spot on the blade traces out at the prop rotates, or in other words the distance this spot on the blade travels in the plane of the prop disk in one revolution.



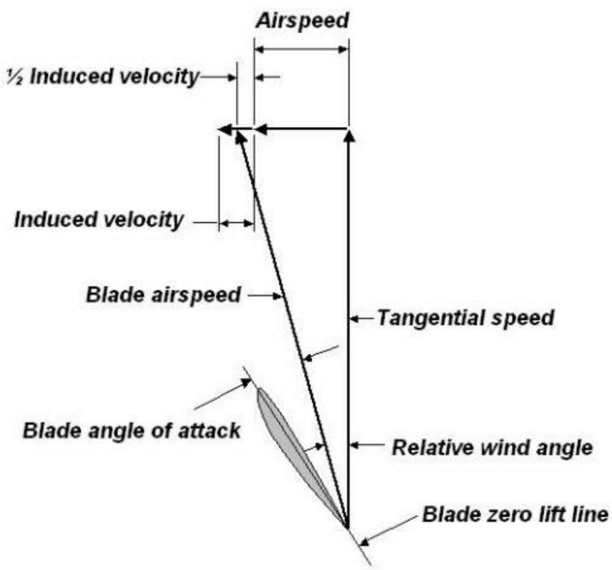
If we multiply that by the revolutions per second that the prop is spinning, we get the velocity in the plane of the prop disk of that location on the blade. We call this the "tangential velocity".

However, in addition to spinning around, that spot on the blade also moves forward during that same revolution. From the point of view of the airfoil at that spot on the blade, it moves forward by the forward airspeed of the airplane plus one half of the speed increase in the slipstream (remember, one half of the acceleration of the air going through the prop occurs ahead of the prop disk, and the other half occurs behind).

Now, let's make a right triangle. One leg is the tangential velocity. The other leg is the plane's airspeed, plus half the acceleration of the air by the prop (the "induced flow").The length of the hypotenuse of this triangle is the airspeed that spot on the blade sees, and the angle between the hypotenuse and the tangential velocity leg is the angle of the "relative wind" that spot on the blade sees.

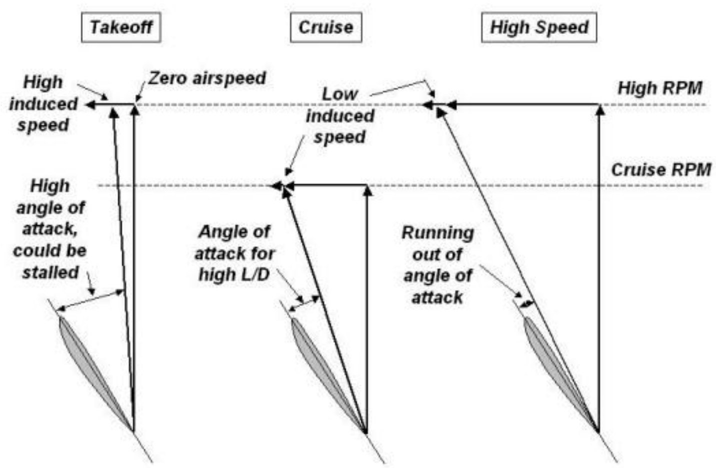
The difference between the angle of that relative wind and the angle of the airfoil at that blade location is that location's angle of attack. When the plane is just beginning the takeoff run, the rpm is high (due to the high throttle setting), while the airplane's airspeed is very low. At the very instant of starting the takeoff run (assuming no wind), the plane's airspeed might even be zero. The "induced flow" is fairly high, because of the high throttle setting. However, the total of those two still tends to be fairly small, resulting in a right triangle that is relatively flat.

There is a big difference between the blade's airfoil shape and the angle formed by the tangential velocity leg of the triangle with the hypotenuse, so the airfoil's angle of attack is relatively high. If it's too high, the airfoil will be stalled.



As the plane accelerates, the plane's airspeed increases, so that leg of the triangle increases. This increases the angle between the hypotenuse and the tangential velocity leg, which therefore reduces the difference between that angle and the pitch angle of the airfoil. The angle of attack that local airfoil sees is reduced.

In general, at high powers and low speeds, the inflow to the prop is low, so the prop needs to accelerate this small inflow of air a whole bunch to convert the power into thrust. To do this, the airfoils along the blade need to have very high lift coefficients, which therefore means they need a lot of angle of attack to generate those lift coefficients.

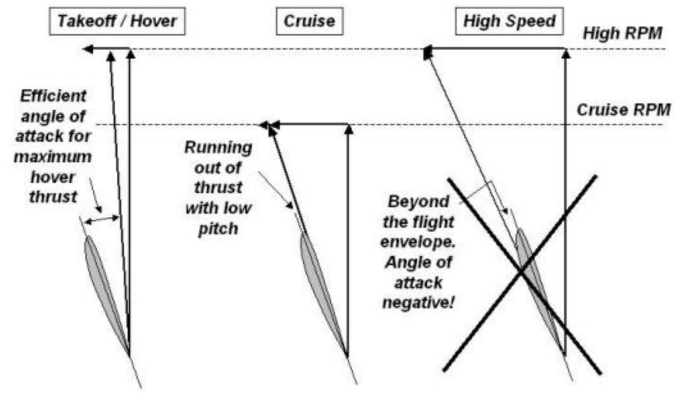


At higher airspeeds, there is more air flowing through the prop, so that air needs less acceleration to convert the power into thrust. This means lower lift coefficients, and therefore lower angles of attack. At the highest speeds the increased airspeed causes the prop angle of attack, and thrust to reduce until thrust equals drag at maximum speed.

Since the fixed pitch propeller cannot efficiently match all flight conditions we are faced with the choice of just where to make it "work".

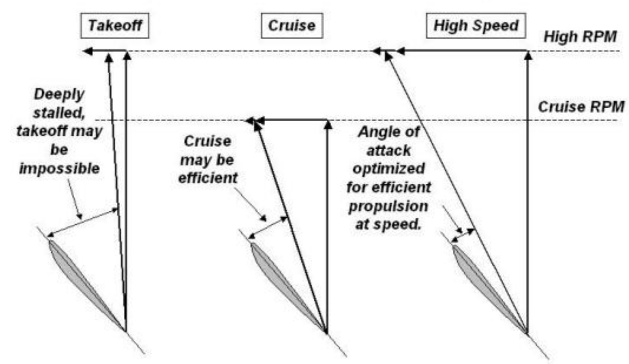
Consider the case where we want to have hover performance. Here we see that this requires the best blade angle of attack at zero airspeed. The result of this choice is limited cruise performance and no high-speed flight is possible. Indeed, if it were possible to "jump" the plane to this speed condition the propeller would exert considerable braking force in the form of reverse thrust, until the speed dropped.

Low Pitch "Hover" Propeller Performance



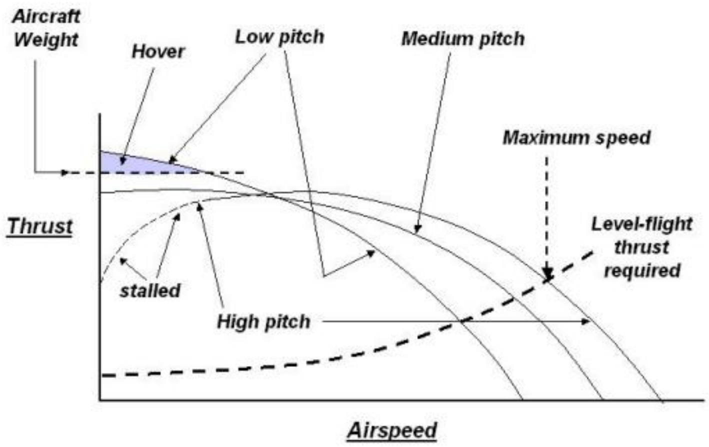
If we select our propeller to match the high-speed flight performance we may not be able to take off due to the propeller operation in deep stall, although the cruise condition may be efficient.

High Pitch "Speed" Propeller Performance



One of the few cases where this kind of fixed pitch propeller was acceptable was on the Schneider Trophy airplanes because, as seaplanes, they could use the unlimited "runways" for takeoff. Look closely at the very high pitch, fixed pitch propeller on the Supermarine S6B in this photo. It achieved a world record of 407.5 mph in 1931.

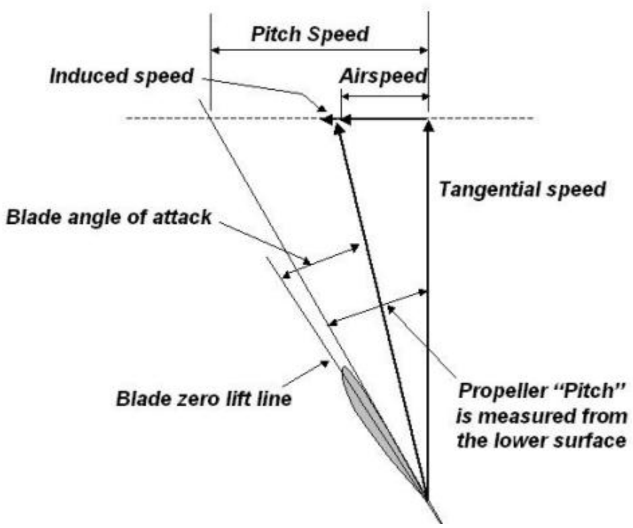
These issues and choices are depicted as they vary with flight speed below.



Propeller Performance Issues and Choices

Let's examine the various pitch measures. The manufacturers define the pitch as that measured from the bottom of the blade airfoil. Usually, for gas props these are so called flat bottom airfoils like the Clark Y. The significance of this is that in terms of blade lift or prop thrust the Clark Y zero lift angle of attack is about 4 degrees negative. So if we define the datum as the lower surface, the blade is already at a four-degree angle of attack. Now props typically have thicker airfoils inboard so this nominal four degrees might easily be six or more.

This is not accounted in the definition of Pitch Speed but it does affect the thrust at speed. If we just for a moment ignore the inflow velocity (sorry Don!) then we might expect the prop to make zero thrust when flying at it's pitch speed, but we can see that the actual angle of attack allows thrust to be made even beyond the pitch speed.



Now let's put some numbers into all this. In the table over leaf are the blade pitch angles for various propellers. We use the definition pitch-to-diameter ratio: P/D, for the propeller because it is this ratio that determines the blade angles.

So, the 75% radius blade pitch on a P/D = 0.5 prop, is 14 degrees, whether it is a 6 x 3, a 10 x 5 or a 12 x 6.

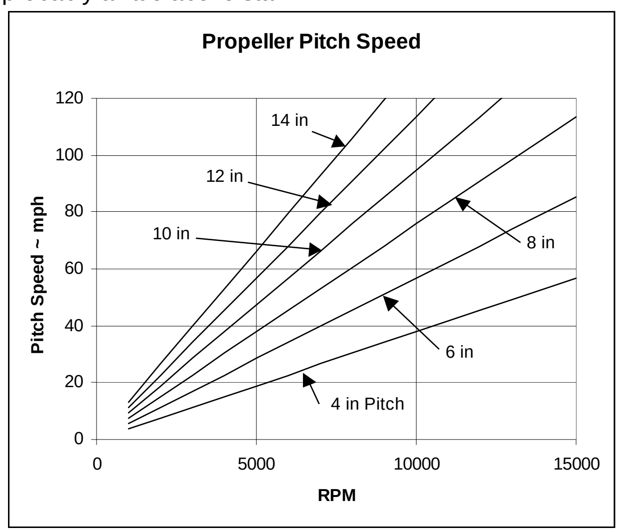
The table of blade angles applies to all propellers.

Pitch/Dia.	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
% Radius										
20%	10.6	20.6	29.8	38.0	45.0	51.1	56.2	60.6	64.4	67.7
30%	7.1	14.0	20.6	26.9	32.7	38.0	42.8	47.2	51.1	54.6
40%	5.3	10.6	15.7	20.6	25.4	29.8	34.0	38.0	41.6	45.0
50%	4.3	8.5	12.6	16.7	20.6	24.4	28.1	31.6	34.9	38.0
60%	3.6	7.1	10.6	14.0	17.4	20.6	23.8	26.9	29.8	32.7
70%	3.0	6.1	9.1	12.1	15.0	17.8	20.6	23.4	26.0	28.6
75%	2.8	5.7	8.5	11.3	14.0	16.7	19.3	21.9	24.4	26.9
80%	2.7	5.3	8.0	10.6	13.2	15.7	18.2	20.6	23.0	25.4
90%	2.4	4.7	7.1	9.4	11.7	14.0	16.3	18.5	20.6	22.8
100%	2.1	4.3	6.4	8.5	10.6	12.6	14.7	16.7	18.7	20.6

Propeller Blade Angles ~ degrees

Just bear in mind that for these airfoils and Reynolds numbers the maximum lift occurs at about 10 degrees angle of attack, beyond which stall begins to reduce the lift. Below this angle the lift is roughly linear with angle of attack.

Now, let's get back to your OS 40 turning the favorite 10 x 6 prop, a P/D = 0.6, at 10,000 rpm. At the 75% radius station the pitch is 16.7 degrees. At takeoff the induced velocity is fairly significant so the actual angle of attack is somewhat less, but probably a little above stall.



The Pitch Speed of this prop at this rpm, as shown in the graph, is about 60 mph. Takeoff probably takes place at about half this speed so the blade angle of attack, considering this inflow, will be about half the 16.7 plus the four degrees of incidence, or about ten degrees. So, we have maximum thrust at takeoff. At cruise the throttle is reduced to say 8.000 rpm, which would match a flight speed of somewhere near 50 mph. At maximum speed the engine unloads so the rpm might increase to 12,000 and the pitch speed to 65 mph. Flight to 70 mph might be possible: this prop is well matched.

Now if you want to go faster you must use a higher pitch prop, say a 9 x 8. With this higher pitch you will have to reduce the diameter to maintain the desired rpm and power. Takeoff will be more sluggish as the blade is probably stalled with the angle of attack at almost 22 degrees. Maximum speed might be over 80 mph although this assumes the engine has the power and the propeller has the thrust to achieve this speed. Just matching the pitch speed with the performance desire does not mean you will achieve it. But that is a subject for another time.

Don Stackhouse (http://www.djaerotech.com)
and *Dave Harding*

Dave Harding – Editor
4948 Jefferson Drive
Brookhaven, Pa. 19015
610-872-1457

Propstoppers R.C. M.A.C

Let's get the kids out to our indoor meets.

The Indoor Flying Season

Get your models ready for nine plus great flying evenings.

Tinicum School,

Friday nights 6:30 till 9:30 p.m.

Nov. 5 Dec. 10 Jan. 7 Feb. 4 Mar. 4

Brookhaven Borough Gym,

Saturday nights 6 till 10 p.m.

Nov. 13 Dec. 11 Jan. 8

Bring your family, your friends, and invite other flyers. AMA required but we can sign up youth flyers at the site.

Club Monthly Meeting

Tuesday November 9th

At the Middletown Library

Doors open at 6 p.m.

Meeting 6:30 till 8

Bring your models or other paraphernalia for show and tell.