EL TORBELLINO

NEWSLETTER OF SAN DIEGO ORBITEERS FREE FLIGHT CLUB

JULY 2016

The Prez's Corner *– Don Bartick*

Summer is upon us and so is the heat of summer. As everyone is aware, our outdoor monthlies for July and August have been cancelled. Therefore, everyone should take this break as a good opportunity to build some planes. As for me, this is the time of the year that our wine grape vines need some attention. The berries are set and some are starting to turn purple. This is called veraison. Before they get too far along, we'll have to install our side nets to preclude the berries from getting eating by birds, turkeys, raccoons and wasp (yellow jackets). As small as our vineyard, the loss of one berry makes you cry. These are new nets for us. We installed them last year and they are very easy to erect and take down. They store on the trellis. They are extremely effective. We now have a net raising party to compliment our harvest party.

The June outdoor contest was cancelled due to heat and the July indoor contest was also cancelled due to construction at the Grossmont gym. With both the indoor and outdoor contests cancelled, there are no photos to share this time around. Maybe, just maybe Howard can review his archives and come up with some historical photos to publish.

This is a good time to thank Mike Jester for his articles that been published in the ET over the last several months. It would be nice if all of you reading this column would take a moment to send him an email or text message. You can find his contact info listed with the list of Board Members here in the ET.

Just in time. I just received an email from Roger Willis. It was just announced that he was inducted in to the FAC Hall of Fame. Way to go Roger.

That's a wrap for now.

Remember: "Mistakes are forgivable if one has the courage to admit them."

-Bruce Lee

Contest Information/Flying Fields

- M.Pykelny

August 13 Perris, CA.
SCAT Black Cup
F1A, F1B, F1C, F1G, G1H

August 17 Perris, CA.
SCAMPS Monthly
Moffet, Commercial Rubber
E Nostalgia
1/2A, A, B, C, Gas

Most Saturdays- SCAT practice
Wednesdays- SCAMPS

Otay Mesa
Federal Government has funded highway project through our old field.

Karl Gies

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ORBITEERS MEMBERSHIP DUES

Annual Membership - $20
Lifetime Membership - $250
Non-Member Newsletter Subscription - $15
Junior Members 16 years old or younger - Free

Submit Dues to Club Treasurer:
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THE FINE PRINT THE FINE PRINT

El Torbellino is the official newsletter of the San Diego Orbiteers, an Academy of Model Aeronautics (AMA) Charter Club (#1113) and a California not for Profit Corporation. This newsletter is sent monthly to all paid members, selected exchange and magazine editors. Non-Members may subscribe at $15.00 per year within the U.S.A., offshore price will be adjusted to reflect the postage required. Materials from El Torbellino may be reproduced on an unlimited basis by other publications, but proper credit is requested.

ORBITEER WEB SITE

www.SanDiegoOrbiteers.com
Webmaster: Kathy McLaughlin

2016 COMBINED FLYING SCHEDULE

Aug 14 - *Cancelled due to expected hot weather*

Sept 11 - **Coupe**
Power & Glider
(Rain date Sept 18TH)

Sept **US FF Championships, Lost Hills***

Oct 16 - **P-30**
Power & Glider
(Rain date Oct 23RD)

Oct **SW FAI Champs, Boulder City, NV***

Nov 12/13 **Scale Staffel FAC Scale Contest***
(3 of 3)

Nov 20 - **Old Time Nostalgia Rubber**
Power & Glider
(No rain date)

Dec 11 - **Coupe**
Power & Glider
(Rain date Dec 18TH)

*** Non-Club Points Event**
Otay Field Weather (619) 661-8297

Richard Woods

2016 INDOOR FLYING SCHEDULE

Aug 7 - Penny Plane, No-Cal*

Sept 4 - Catapult Glider, Embryo*

Oct 2 - A-6, Phantom Flash*

Nov 6 - Penny Plane, No-Cal* and
Canard One-Design* (Wrisley Zephyr)

Dec 4 - Catapult Glider, Embryo*

***Non-ORBITEER Points Event**

Don Bartick

Greg Hutchison

Prop Pitch Gauges

By Mike Jester

The flight performance of a model airplane is greatly dependent on the pitch of its propeller (prop). The diameter of the prop relative to the wingspan of the model is also very important, but choosing prop diameter is a different subject for another day. In this article I will discuss the nature of prop pitch, and how to measure the same with a prop pitch gauge. Different examples of prop pitch gauges used with indoor and outdoor rubber powered free flight models will be described and illustrated.

First, let me give you the boring science part. Roughly speaking, the pitch of a prop is the distance it would theoretically move through a soft solid medium in one revolution, with no axial slippage. In flight, as the prop is driven by the rubber motor, the blades of the prop push against the air. The reactionary force to the air that is moved rearwardly (thrust) drives the model airplane forwardly. A prop that moves more air provides more thrust. A prop with more steeply inclined blades will move more air at a given RPM than if the blades were less steeply inclined. However, in general the higher the pitch of the prop, the thicker the rubber motor will have to be in order to turn the prop at a given RPM. For the same weight of rubber motor, a motor with a larger cross-section will take fewer winds than a rubber motor with a smaller cross-section. Once a good prop for your model has been selected, you will need to match the rubber to the prop to achieve maximum flight duration. Both the weight and cross-section of the rubber motor can make a big difference with the same prop. Sometimes the trimming process indicates that a new prop is needed with a different diameter and/or pitch.

In connection with model airplanes props are specified in terms of *diameter x pitch*. In the United States, these parameters are given in inches. Thus a 9 x 12 prop would have a diameter of nine inches and a pitch of twelve inches. The pitch (P) to diameter (D) ratio for a prop, known as P/D, is extremely important in terms of the performance of a rubber powered model airplane. The previously described 9 x 12 prop has a P/D of 1.33.

Indoor duration rubber powered models such as a Limited Penny Plane can fly well with a P/D has high as 2.2. The prop of my best performing Limited Penny Plane currently has a P/D of around 1.7. Outdoor rubber powered models usually use a prop with much lower P/D to achieve a rapid climb. My KIWI-KOOP model which is intended for competition in the Coupe (F1G) class has a folding prop with a P/D of 1.23. John Barker, a highly respected free flight master from the UK, wrote a useful spread sheet program for selecting the P/D for the prop of a rubber powered model airplane based on many parameters of its airframe and rubber motor. The program is called Prop Picker and is available for free on the Hip Pocket Aeronautics web site. Most rubber powered models have props with a fixed pitch. The best efficiency would be achieved by mechanically reducing the pitch of the prop as the torque of the rubber motor declines. However, except for F1D prop assemblies, I have not seen rubber powered models with mechanical mechanisms for actively varying the pitch of the prop.

Most commercial injection molded plastic props have a helical pitch distribution to optimize efficiency since each part of the blade must travel forward the same distance. The angle of the blade at any point along its length (relative to a plane perpendicular to the prop shaft) is given by the formula:

$$\text{Tan } \Theta = \frac{(P/D)}{\pi(r/R)}$$

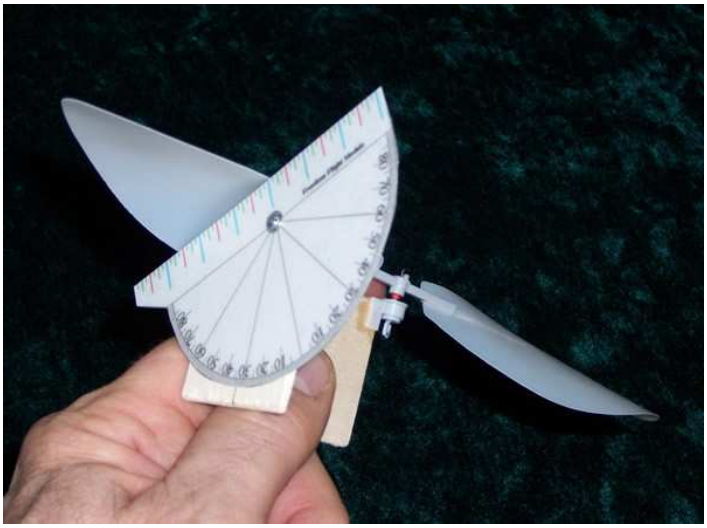
Where: R = radius
P = pitch
D = diameter
r = radius at point of interest
Θ = angle at point of interest

The formula above can be re-arranged to obtain P/D directly, which is what the modeler is really interested in, as follows:

$$P/D = \text{Tan } \Theta \, (\pi)(r/R)$$

Here is a practical way to determine the P/D of a given prop which I attribute to John Barker. Measure the angle of the blade at the ¾ radius position. Then the P/D equals the tan of the angle times 2.355. For example, if the angle is 30 degrees, then the P/D = tan 30 degrees x 2.355 = 0.5774 x 2.355 = 1.36.

The legendary indoor flyer, Cezar Banks, used to hold up a right angled triangular piece of cardboard to the bottom of a blade. He would quickly determine the pitch of the prop with this simple tool. I can only guess how he did it. For us mortals, a pitch gauge can be used to simplify the measurement of prop pitch. Set forth hereafter is a picture of a simple pitch gauge designed to measure the pitch of a plastic Ikara prop used in indoor flying. This one can be purchased from Freedom Flight Models for $6. Note that the prop shaft needs to be mounted in the cylindrical Ikara bushing.



Freedom Flight Models prop pitch gauge

The now defunct A2Z Corp used to sell a beautifully crafted prop pitch gauge which is well suited for indoor props. As pictured hereafter, it includes a spring loaded clamp for holding a narrow prop shaft in a set of V-shaped machined Aluminum jaws. A long lever arm pivots on an upright. When the lever arm contacts both the LE and TE of the underside of a blade its angle at that point is indicated by a pointer on a scale. The upright can be moved to 2 inch, 4 inch and 6 inch fixed radial positions to accommodate a range of prop diameters. Three columns of data on a label attached to the base give the pitch for each station position for the measured prop blade angle. I bought one of the A2Z pitch gauges several years ago and have used it often, especially with my Limited Penny Plane props. Kang Lee, our Orbiteers club member who is the two time world F1D champion, uses this same prop pitch gauge.

A2Z Corp prop pitch gauge

Recently a new prop pitch gauge has become commercially available from Retro RC LLC. It can accommodate a wide range of prop diameters and shaft diameters. The good news is that you no longer have to calculate the P/D for the prop you mount on this pitch gauge. You just read the P/D on the rotating scale. This prop pitch gauge is particularly well suited for measuring the pitch of large plastic props used on outdoor models. I bought one of the Retro RC LLC prop pitch gauges and I am very satisfied with its quality, especially given that the price is only $22.98. The older I get the less I want to bother with tedious mathematical calculations just to find out the P/D of a prop. As pictured hereafter, the plywood parts of this new prop pitch gauge are precision laser cut and assemble beautifully. It would be difficult to scratch build a similar prop pitch gauge with the degree of accuracy afforded by the Retro RC LLC prop pitch gauge pictured hereafter.

Retro RC LLC prop pitch gauge

If you don't have a pitch gauge, I recommend obtaining one, if, for no other purpose, to confirm that the pitch of each blade on a prop is identical. If not, your model airplane that uses this prop will experience asymmetric thrust, vibration and inefficiency. Commercially available injection molded plastic props can be re-pitched to a small degree with relative ease. That's all for now. See you on the flying field.

Orbiteers
SAN DIEGO

2016 Swap Meet

San Diego County Association of Model Clubs

Sellers: $5.00
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Saturday
Time: 07:00AM-12:00PM
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Sponsored by the Chula Vista Model & Radio Control Club

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Winging It

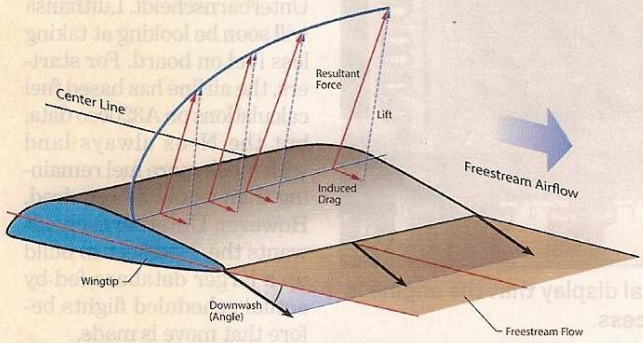
Instrumented Prandtl testbed could help validate claimed aerodynamic benefits

Guy Norris Los Angeles

NASA is studying turning its largest subscale, unpowered Prandtl-D3 flying-wing demonstrator into an instrumented aerodynamic testbed by installing a fiber-optic shape-sensing (FOSS) system on one wing.

The installation, if approved, would pave the way for another flight-test series later this year at NASA Armstrong Flight Research Center. Led by Albion Bowers, chief scientist and Prandtl-D program manager, the program is attempting to prove the viability of this potentially paradigm-shifting low-drag aerodynamic configuration.

Thanks to a slight wing twist first proposed in 1933 by pioneering German aerodynamicist Ludwig Prandtl, the design produces a bell-shaped span loading rather than the classic elliptical span loading seen on nearly all current wing configurations. According to NASA, this creates a wing that is 11% more efficient, but with 22% greater span than the equivalent elliptically loaded wing, all while using the same amount of structure.



The standard elliptical spanload produces uniform downwash along the trailing edge and upwash at the tip, which results in a strong vortex at the tip. The constant downwash along the entire span tilts the net force vector backward, and the resulting horizontal component manifests itself as induced drag.

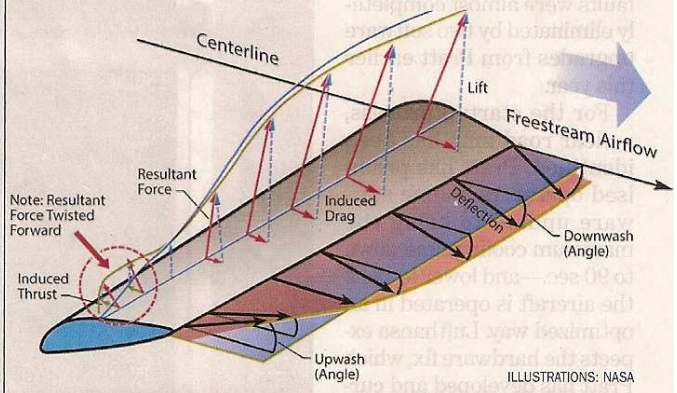
"All of a sudden it becomes possible to not have to carry the load at the tip, and here's the secret—downwash at the middle of the wing becomes upwash at the tip," says Bowers. The resultant force is tilted forward of the vertical, and the horizontal component shows up as induced thrust at the wingtip, due to the resulting upwash.

"The new spanload does not have downwash at the tip," he says. "In fact, because you overcirculate the air, you have more downwash in the middle and decrease the downwash as you go out to the tip. You end with upwash at the tip, and if you do that your lift vector is located forward. This is what [NASA aerodynamicist] Richard Whitcomb did with the winglet. So now if you increase lift you increase thrust, so you yaw in the correct direction and you don't need a vertical tail."

By eliminating vertical tails, another 30% fuel savings could be achieved, says Bowers, who team argues that Prandtl's wing is the correct basis for bird flight, as well as a means of obtaining better efficiency and coordinated control in a single solution. In terms of translating this phenomenon into a practical aircraft, Bowers says an aileron located in the local thrust region of the outer span will produce a yawing moment—proverse yaw—into the turn.

Analysis of results from initial flight tests of smaller subscale Prandtl wings at NASA Armstrong now appears to support the theory that a bell-shaped spanload coordinates roll-yaw motion so that birds can maneuver without a vertical tail. It also explains, says Bowers, why birds fly in formation with wingtips overlapped and why they have narrow wingtips that do not experience tip stall. "It turns out that local lift coefficient goes to zero at the tip, and you can have a sharp tip because there is no load on it," he adds.

Adding pressure-sensing instrumentation to the 25-ft.-span Prandtl demonstrator will turn the vehicle "into an aerodynamic testbed. The previous one was a controls or flight mechanics testbed. We were seeing the reaction the aircraft had and it behaved in the manner we expected, but I couldn't tell you what the aerodynamics are for a fact. So that is what this will do," says Bowers.



ILLUSTRATIONS: NASA

The bell-shaped spanload produces strong downwash near the wing root, which tapers outboard to become upwash near the wingtip. The resultant force is tilted forward and, due to the upwash at the tip, the horizontal component is manifested as induced thrust at the wingtip.

The FOSS system, which processes information on strain, shape deformation, temperature and other parameters at rates up to 5,000 times per sec., will be installed in one wing. "In the other we have a traditional aerodynamic test set up where we measure pressures on the wing," says Bowers. "We are going to add the pressures up, and then we will get the load on the wing, and I should get the same answer from the FOSS."

Bowers acknowledges that despite the growing evidence from the tests traditional aircraft designers will find it difficult to accept the claimed superiority of the Prandtl wing. Although he points out that for some designs, particularly those that are span-constrained such as some commercial jet aircraft, the conventional wing design approach remains valid. Bowers believes the wider benefits of this breakthrough research are yet to be fully realized by the aerospace community. "Change can be difficult, and I suspect this one is going to be a very difficult one."

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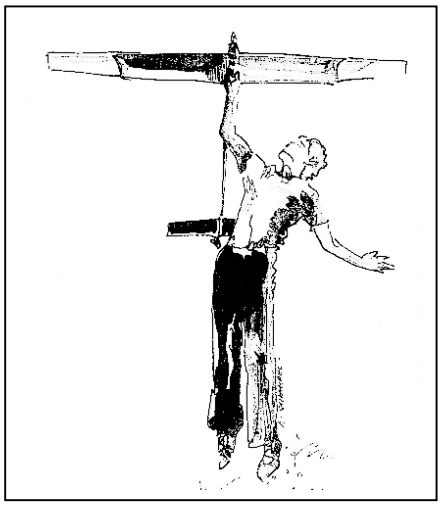

WHAT'S HAPPENING - August 2016

Aug. 7 - **Indoor Flying**, Grossmont College (Upper Gym), 7:30 am to 11:30 am.
Feature Event: **Penny Plane,** Other Event: **No-Cal ***

Aug. 14 - **Orbiteer Outdoor Monthly,**
Cancelled due to the expected Hot Weather.

Aug. 20 - San Diego County Association of Model Clubs 2016 Swap Meet
(See enclosed flyer for all the details)