The Flightline

Volume 32,Issue 2 Newsletter of the Propstoppers RC Club AMA 1042 February 2002

Editorial.

Auction and Swap Meet At February 5th Meeting

Scheduled for Tuesday, February 5 The club business meeting will start at 7:00 PM, and will be abbreviated so the auction can start at 7:30 PM.

There will be no show and tell this month.

Al Tamburro will again grace us with his auctioneering skills, and Al advises that the auction will be conducted in the same manner as in past years, that is:

Sale table – Item sale price marked on tag – 5% of sale price goes to club

Auction table – No reserve – 5% of sale price goes to club

Items placed on sale table and subsequently auctioned – 10% of sale price goes to club

So, go right now to the workshop and dig out the stuff you really don't need so you can share it with us in the auction.

Agenda for Feburary 5th Meeting

- Approval of January meeting minutes
- Finance report
- Membership report
- Field search and Sleighton status report
- Indoor flying plans
- New business
- Club Auction

Note, no Show and Tell. If you bring it, Al will sell it!

INSIDE THIS ISSUE

There are only a few more months to the good weather and we start flying in earnest again so I hope you are working feverishly on you 2002 airplanes. Just to spur you along I have included the pictures of our flying stalwarts from Sleighton Field on December 4th.

Bill and Monica Shellhase and Bob Crowell enjoy a perfect flying day

Continued on page 4

Calendar of Events

Club Meetings

NOTE Time

Tuesday 5th February 2002 7:00 PM
--Annual Club Auction
Marple Newtown Library

Flying Events

Propstoppers Indoor Flying
Tinicum School – 6:30 – 8:30 PM
Friday February 1, 2002
Friday March 1, 2002

Silent Knights of Delaware Indoor flying.
Jewish Community Center, off 202
See Dave or Dick Bartkowski
Jan 29 7:15-9:15
Feb 26 "
Mar 26 "
April 30 "
May 28 "
http://www.silentknightssoaring.org/club_indoor_flying.htm

Central Penn Aeromodellers / Lebanon Flea Market
March 9
At the Lebanon Fairgrounds

Regular Club Flying

At Moore and Sleighton Fields

Daily	**10 am til Dusk**
Saturday	**10 am til Dusk**
Sunday	**12 p.m. till Dusk**

Propstoppers RC Club of Delaware County, Pennsylvania.
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Propstopper's Web Site;
www.propstoppers.org
Check the web site for back issues of the newsletter, pictures of club events and the calendar of future events.
Pictures courtesy of Bob Kuhn and Dave Harding

The President's Message

Mike Black

Dear Fellow Propstoppers,

It may be the depths of winter but the club has a number of activities that deserve our attention.

The indoor season is gathering momentum and those of us that have made the plunge are developing our planes and learning to fly in confined spaces. Now, not only is there still time for more of you to join us but the Silent Knights of Delaware have invited us to five more dates at the Jewish Community Center just off Rt. 202. We flew there in December and had a blast. Of course, our third indoor meet is this Friday, 1st February at the Tinicum School.

Our club auction is always a winner both in terms of raising funds and providing members with an opportunity to pick up that airplane or kit that we didn't know we needed. Please support the auction by clearing out your shop and storage areas and bringing the offerings to the meeting next week. Remember, one man's junk is another mans treasure. Also, note that the meeting will start at 7 pm rather than the usual 7:30 so we can get the business matters over for an auction start at 7:30.

Another popular club activity has been a convoy of members to the Central Penn Aeromodellers Flea Market. This huge event is on Saturday March 9th. Some super bargains have been available at this popular event, last year I bought my biplane for $100, complete, ready for radio installation.

Since we will be retaining Sleighton Field for another year we need to start the planning process to prepare it for the 2002 season. We have discussed moving the runway to be close to parallel with the road and this will involve moving the shelter as well as potentially some earth moving, scraping, rock picking and seeding. Chris Catania deserves our full support in planning and doing this work so I am going to suggest formation of a committee to help plan this activity.

Finally, we all need to support Ray Wopatek and the club in getting our dues in. At this point in time many members have not yet done so. Ray has asked me to emphasize that even our junior members need to show evidence that they have renewed their AMA membership.

So mark your calendars and see you at the indoor's and the next meeting and auction.

Mike

President Mike Black discusses his biplane, a treasure he bought at last years Central Penn Aeromodellers Flea Market for $100. We will be organizing a convoy to this popular event again this year. If you want to go coordinate with us at the meeting next Tuesday.

January 8th Meeting Minutes

Rusty Neithammer - Secretary

Vice President Dick Seiwell called the meeting to order at 7:35 PM at the Marple Library. There were 27 members present. The minutes of the December 4, 2001 meeting, as published in the January 2002 newsletter, were approved by the membership.

Treasurer **Al Gurewicz** gave the treasurer's report with income of $991.05, expenses of $660.00 and a new balance of $3403.78 reported. Al noted that these figures do not include the cost of this month's newsletter, as those figures were not available at the time of the meeting.

There are still club hats available - $6.00 each.

Old Business

Field Search: Field Search chairman **Chris Catania** has had conversations with Rick Slossberg. the farmer from whom we sub-leased the Sleighton property. Rick has obtained a lease for the property for next year, and we can continue our sub-lease agreement with him. Chris will discuss relocating our runway along Valley Road as has been previously discussed at club meetings. Otherwise, there is no new news on any potential new fields.

Indoor flying; The schedule is for us to hold indoor flying sessions on the following Fridays – 6:30 to 8:30:

January 11 (Possible conflict with school activities – check w/ Mike Black)
February 1
March 1

Directions to Tinicum Elementary School (repeated from last month's minutes): I-95 north to the Essington exit, go to the first light and turn left onto 291 (Industrial Highway), go to the next light and turn left on Jansen Avenue, go to the first stop sign and turn right on Seneca, go three blocks to the school on the left.

Other indoor flying opportunities: Silent Knights Soaring Society at the Jewish Community Center off Rt. 202. There is also a group in New Jersey, but no dates have been set.

Club Auction: Scheduled for Tuesday, February 5. As in the past, the meeting will start at 7:00 PM, and will be abbreviated so the auction can start at 7:30 PM. Arrive early (6:30) to set up and tag items. **Al Tamburro** will again grace us with his auctioneering skills, and Al advises that the auction will be conducted in the same manner as in past years, that is:

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Fuel: There were 13 gallons left from the last bulk order. Bud McClellan Brought it to the meeting, and 10 gallons of it was sold at the meeting. The remainder is now in Mike Black's possession – see Mike if you wish to purchase any.

President **Mike Black** had received a letter from a man in Kenya asking for advice and materials that would be helpful in starting a youth aviation program. Some materials were brought by members and, once more are collected, the club will send a package to the gentleman.

Send **classified ads** for sale items or items wanted, to newsletter editor **Dave Harding**, for free publication in the newsletter.

Newsletter editor **Dave Harding** asks members to provide him with reports of events they have attended. This can be done in any way that is convenient, including a simple phone call. Pictures are also most welcome.

New Business

Central Penn Aeromodellers/Lebanon flea market – will be held Mach 9 at the Lebanon Fairgrounds. As usual, plan on convoying with other club members.

Technical presentation for club meetings: **Dick Bartkowski** presented a lecture on the fundamentals of electricity, as this relates to RC models. Dick started with the basics, static electricity, electrical current flow, volts, amps, Ohms' law, etc. and moved into the basics of batteries and motors used for RC models.

The next presentation will be at the March meeting and will cover soldering battery packs.

Dave Harding is considering a bulk battery cell purchase. Cells available are 1700 mah - $2 each in lots of 100 and 2400 mah - $3 each in lots of 100. If enough members are interested, Dave will follow through.

Break

The 50-50 winner was **Phil Sears**, who donated his share of the winnings to the club treasury**.**

Show and Tell

Marty Zeller showed his new ¼scale Fokker D V11. This is an impressive model, scale cable operated controls and operating cockpit functions – the pilot moves with the stick! There is even a scale (almost) wet compass gimbal and machine gun sounds. Power is a Laser 300 V twin. 27 lbs.

Ed Goretska showed his new 1939 Comet Clipper Mk1. Power is an original vintage 1939 Brown D (.60) ignition engine. Covering is silk and dope on the wing and tail surfaces, Micafilm on the fuselage.

Mike Black showed modifications he made to his Pico J3 Stick, necessary to make it fly, including a dihedral brace wire and covering the gap between the wing roots. Mike also showed his Mini IFO, which is powered by a 9V Ray-O-Vac NIMH battery from Wal-Mart. Last, Mike had a pack of reproduction WW2 vintage airplane spotter cards. These can be obtained from AMA, or locally (at lower cost) from Restoration Hardware.

Vice President Dick Seiwell adjourned the meeting at 9:15 PM.

Rusty Neithammer

Dick Bates trims for another flight in December at Sleighton Field

Editorial continued from page 1.

As you know, I am fortunate to have a daughter who lives in South Pasadena, California. We spent Christmas there and in addition to the excellent Tournament of Roses Parade Pasadena hosted the AMA Aeromodelling Conference 2002, otherwise known as the IMS Show.

Once again I was overwhelmed by the stuff in the vendor booths as well as the models on display. One of the neat things they do is host an indoor flying activity. Tony Naccarato and the Black Sheep Squadron club from Burbank usually run this part of the show.

Now one of the greatest complements in aeromodelling is when someone makes a model of your model. Tony made a 3/4-scale model of Dan Kreigh's Mini IFO

.

Better yet, Tony had Dan fly it because it was a little sensitive.

Dan's business of making and selling IFO's and their support equipment has mushroomed to the point he has a hard time running it as well as working for Burt Rutan. He enjoys them both though.

He has introduced a new IFO that he calls a trainer because it has a rudder and can be controlled using rudder and elevator just like a trainer. It is also a docile flyer. He now uses and supplies rip-stop nylon as a covering material. This material, which comes from the kite hobby, is becoming popular with the slow flyers because it is much more durable than the Mylar films and only a little heavier at 1/2 oz per square yard. It comes in a wide variety of colors and sold at the IMS show for $10 per yard

Dan Kreigh with the new IFO trainer that includes a rudder.

Yours truly with Dan and his wife at their Wild RC IMS booth.

Of course there is all kinds of wonderful stuff at IMS including some wretched excess in the form of a turbine-powered helicopter.

This installation takes power off the turbine shaft with a tooth-belt cog running at 100,000 rpm. But wait, that was my life, maybe I need one!

The wife says, "wait till next year"! ***Dave Harding***

The P Factor and Other Prop Related Effects.

You roll out your new Hanger 9 Cub. Chose a big fine-pitch prop for those scale-like takeoffs and slow fly-bys. Checked everything twice extra careful 'cause the railbirds are out in force and this is your first tail dragger. Set it nice at the end of the strip, wait one for a deep breath then roll on the power. Wheels start to roll easy, speed begins to build, go to full power; then it happens. A hard left turn! You are not ready for it and fumble with the controls steering the partially airborne craft off the left side into the rough and on its back. It's a long walk back to the pits carrying your once prized possession.

What caused that? You checked the alignment so carefully. Back in the pits the railbirds gather round and begin to sprinkle wisdom.

"Well, with a prop that big and heavy you would expect the gyroscopic forces to be greater than normal".

"Yeh, but with that large diameter the skewed prop wash hitting the outsized fin and rudder would do it".

" Nah, it is just the torque reaction from that big four stroke turning that big prop".

"I think it is the P factor"……..a quiet voice asserted".

"P factor……"?

"What is that" you say, glad you asked, it just so happens that Don Stackhouse of DJ Aerotech posted a comprehensive explanation of the P factor and all the other propeller effects to the e-flight list. Here is Don;

There are a number of aerodynamic and dynamic effects on our planes that stem from the propeller. They include torque, prop wash, gyroscopics and the P factor.

Torque is the twisting effect coming from the motor that makes the prop spin around. In accordance with Newton's third law (the one about action and reaction), when the motor (which is mounted to the airplane) applies a torque to the prop to make it spin, the prop reacts by applying an equal and opposite torque back onto the motor and airframe. A right-handed prop (i.e.: rotates clockwise when viewed from behind) will try to roll the airplane to the left.

Right-handed props follow the "right handed rule", just like right-handed screw threads. Make a fist with your right hand, and then stick out your thumb like you're about to give a "thumbs up" sign. A right-handed prop, when rotated in the direction that your fingers are curled, will make thrust in the direction your thumb is pointing. Left-handed props follow a similar rule except you use your left hand.

Most American engines (and therefore their props) tend to turn in a right-handed direction when mounted in a tractor (i.e.: prop on the front of the engine) installation. If you mount it as a pusher, you need to use a left-handed prop to make the prop wash blow aft and the airplane fly forwards. Installing a prop backwards does not turn it into a pusher, it just makes it less efficient because the airfoils are now backwards and upside-down.

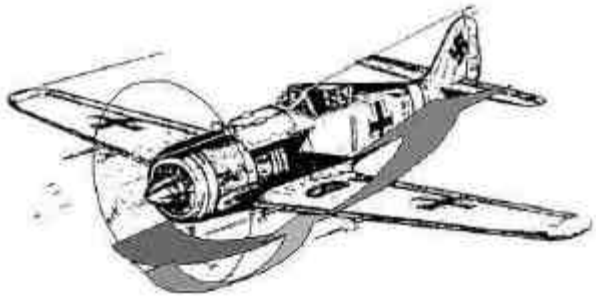
Torque tries to roll the airplane. Theoretically you counteract it with some aileron, although for most airplanes the amount of aileron required to do this is almost too small to notice. In some cases the airplane may be rigged with a little more incidence on one wing relative to the other to help counteract torque, although this is rare (it tends to create some funny stall characteristics). Airplanes with way too much power and too little airplane, such as WW II fighters and some aerobatic airplanes are some exceptions.

Propeller torque can usually be counteracted by aileron deflection.

One of the advanced training exercises in a P-51 was to take it up to a safe altitude (maybe about 20,000 feet!), extend the gear and flaps, slow the airplane down to final approach speed, then quickly apply full takeoff power. Even with the stick against the stops on the right side of the cockpit, the massive amount of torque would inexorably roll the airplane over to the left. Novice Mustang pilots quickly learned to respect all those ponies that resided inside that throttle, and to be very careful about waking up too many of them at once at the wrong time and place. .

There are slipstream effects that may tend to roll the airplane as well as yaw the airplane. Some folks call this P-factor, although as I was taught, P-factor is something else (be patient, I'll get to P-factor in a moment). Rolling and yawing slipstream effects are due to the helical swirl that the prop imparts to the slipstream interacting with the various parts of the airplane behind it.

The classic example is the slipstream of a right-handed prop swirling around the fuselage and then striking the left side of the fin and rudder. This tends to shove the tail to the right, which therefore yaws the airplane to the left. Slipstream effects are influenced by power and airspeed (these influence how much swirl the prop imparts to the airflow), but not very much by angle of attack.



The swirling prop wash effects can induce rolling and yawing from interference with the airframe

P-factor is something else. Both it and slipstream effects tend to be constant, continuous forces at any given airspeed and power setting, but P-factor forces are generated directly within the prop disk by the interaction between the blades and the airflow.

P-factor occurs when the prop disk is not exactly perpendicular to the incoming airflow. Power and airspeed are important, but (unlike slipstream effects) the airplane's attitude is a major determining factor.

For example, imagine a Piper J-3 Cub at full power and in a max-performance climb. The nose is high and the prop disk is therefore tilted up quite a bit. It's a right-handed prop, so the blade on the right side of the airplane is descending. The angle of attack of that descending blade on the right side is a function of the prop's pitch PLUS the angle of attack of the airplane, and the local airspeed that each location along the blade sees is a function of the rotational speed at that radius PLUS the component of the airplane's airspeed that acts in the plane of the prop disk.

High angle of attack flight such as take-off and climb produce P factor forces

Meanwhile the blade on the left side is rising. Its angle of attack is a function of the pitch angle MINUS the angle between the inflow and the propshaft. Its local airspeeds along the blade are a function of the rotational speed at each location MINUS the component of the inflow airspeed that acts in the plane of the disk.

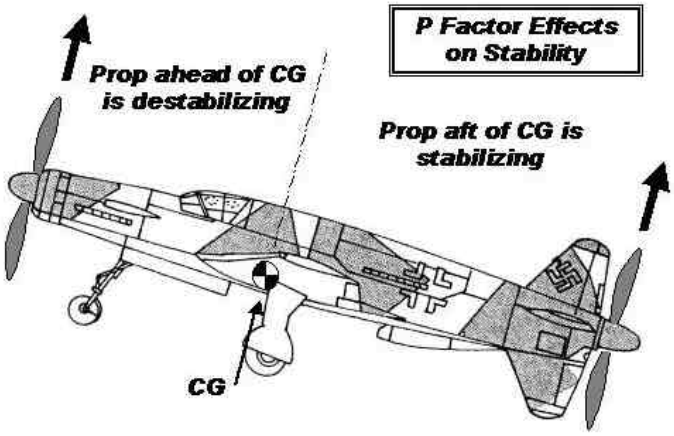
If the airplane were flying with the propshaft parallel to the plane's flight path, there would be no differences in the blade angles of attack and the blade local airspeeds. There would still be swirl, so there would still be slipstream effects, but there would be no P-factor.

The P Factor causes the prop to produce a yawing moment in high angle of attack flight

However, since the Cub is climbing with its nose high relative to the airflow, the descending blade on the right sees a bigger angle of attack AND a slightly higher airspeed than the rising blade on the left, and so the blade on the right makes more thrust than the blade on the left. This tends to yaw the airplane to the left.

There's another factor that arises from this same effect. Since the blade on the right is seeing both a higher airspeed and a higher angle of attack, it also makes more drag than the blade on the left. This results in a net upward force acting in the plane of the disk. In this case it's trying to pull the nose up. For a plane with the prop ahead of the C/G (such as a typical nose-mounted tractor), this is destabilizing in pitch. Likewise, if the plane yaws, you get a sideways force from the prop that tries to make the yaw worse.

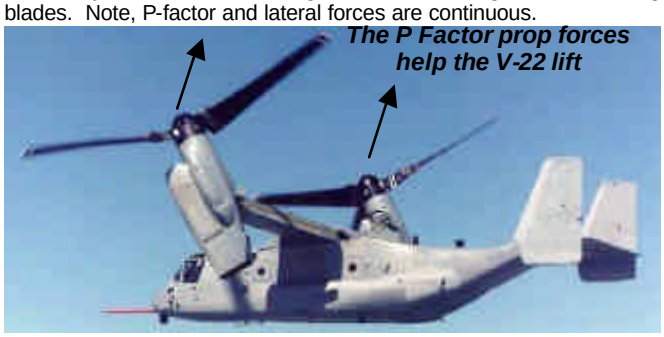
On an aft-mounted prop (such as most pusher installations), these forces tend to fight a yaw or a pitch excursion (same as a horizontal tail), so a pusher prop tends to increase pitch and yaw stability (one of the very few good things about pusher props!).



For example, when Northrop converted the propeller-driven XB-35 flying wing into the jet-powered YB-49, they had to add four little fins to replace the yaw-stabilizing effects of the props.

The YB-49 needed fins to replace the yaw stability previously afforded by the props

This effect is especially important on the V-22 Osprey. When the rotors are tilted down for cruise, the lift to support the airplane is made by the wings. When the rotors are tilted up for "helicopter mode" flight, the rotors provide the necessary lift. However, there is a regime of flight about halfway between those two modes where the combined lift of the half-tilted rotors plus the low-speed lift of the wing is still not enough to support the entire weight of the aircraft. The additional required lift comes from the lateral force in the plane of the rotor disks caused by the difference in drag between the rising and descending blades. Note, P-factor and lateral forces are continuous.



The P Factor prop forces help the V-22 lift

There's another prop related force, gyroscopic precession, which folks sometimes get confused with P-factor. Gyroscopic precession occurs when the propeller disk is being yawed or pitched to a different position, and ONLY exists while the disk's position is changing. It's related to the spinning mass of the blades, and has nothing to do with aerodynamics. A propeller spinning in the near vacuum of the moon (now there's a useless exercise in futility of ever there was one!) would have gyroscopic precession forces, but no P-factor or slipstream effects.

Precession forces happen whenever you try to change the tilt of a spinning mass. You've probably observed them if you've ever played with a gyroscope. When you try to tilt a gyroscope one way, it reacts by trying to tilt in a direction 90 degrees from the direction that you tried to tilt it. A spinning propeller works the same way.

Imagine a right-handed prop on a tricycle-geared airplane on takeoff run. The airplane reaches rotation speed, and the pilot pulls back on the controls to raise the nose for liftoff. At that particular instant, lets assume that the plane's right-handed 2-bladed (or in propeller industry lingo a "2-way") propeller is vertical. The blade at the top is headed toward the right, and the blade at the bottom is headed toward the left. When the airplane starts to rotate nose-up, the top blade has to accelerate aft, and the lower blade has to accelerate forwards. This means that by the time the blades are horizontal, the formerly top (now right) blade wants to be a little behind the original prop disk, and the formerly lower and now left blade wants to be a little further ahead. The net result is that the prop disk wants to momentarily yaw to the right, and take the plane with it. Note, this is only happening while the plane is changing its pitch attitude; the effect stops as soon as the plane reaches the new pitch attitude and stops pitching up.

If we yaw the airplane, we get a pitch-up or pitch-down precession from the prop, depending on the direction of the yaw and the direction that the prop is spinning

This is probably one of the biggest culprits behind the somewhat checkered safety record of the Sopwith Camel.

The WW I Sopwith Camel, like many airplanes of that period, used a rotary engine. This rather bizarre variation of the radial engine (i.e.: the cylinders are arranged in a circle like the spokes on a bicycle wheel) had the prop bolted to the crankcase, and the crankshaft bolted to the firewall. The whole engine spun around with the prop! One of the biggest problems of engine design in those days was cooling; especially on the ground, and spinning the cylinders was a very effective way to deal with this problem. The power-to-weight ratios of the WW I vintage rotary engines would not be bettered by conventional non-spinning engines until many years after the war. However, this meant that those tiny and extremely lightweight airplanes had a spinning gyroscope of an engine in their noses that might weigh several hundred pounds. More importantly, the enormous mass of that spinning engine could create some extremely powerful gyroscopic precession effects. Which is part of the explanation as to why there were far more Camel pilots killed in training accidents than were lost due to combat.

The Camel had a relatively large and heavy Clerget rotary in the nose. In addition to its being a rotary, with all the quirks that go with that, it also had a little problem with its carburetor. About 200 feet of altitude after takeoff (just about the time the plane would be making its first turn after takeoff), it needed to have its fuel mixture adjusted a little, or else it would start to sputter and misfire.

The Camel's large Clerget rotary engine and large prop has very high inertia.

Now imagine that you're a new Camel pilot, taking off for your first time. You're climbing out, at minimum airspeed and holding a whole bunch of rudder to counteract the P-factor. You reach the altitude for your first turn (about 200 feet above ground), the engine starts to sputter. Your attention is immediately drawn to the sparse instrument panel and the motor controls, and the sudden mental workload causes your leg muscles to relax on the rudder pedals (studies done for human-powered aircraft demonstrated that the work a human can do drops quite dramatically if they also have to think about something at the same time). The rudder deflection decreases a little and the airplane creeps into a slight yaw.

Meanwhile the plane is still turning, changing heading, which means there are gyroscopic precession moments being generated. It just so happens that you're turning in the direction that creates a nose-up precession effect, and you're already nose-high and at low airspeed due to the climb. The still-sputtering engine is losing power, and it plus the nose-up effects of the precession cause airspeed to decay, until the plane stalls. The nose drops suddenly, and the combination of precession, torque, P-factor, etc. causes the plane to stall one wing first, and the plane goes into a spin. However, you're so low that when you suddenly look up from the engine controls to see the ground coming up VERY fast, you don't see the spin's rotation. In a final moment of panic you instinctively yank back on the stick, sealing your fate (although from 200 feet you probably don't have room to recover anyway, even if you did everything correctly). The plane has time to do about a quarter turn before impacting the turf and turning you into another sad statistic. You probably don't even realize that it was a spin that ended your career, as well as everything else for you

Not exactly the kind of Camel crash described but interesting nonetheless

However, years later an astute reader looking at an old photo of your Camel's wreckage in a history book will see that it was a spin that resulted in your untimely demise. Clearly visible in the picture, one set of wings is wrapped slightly around the top of the fuselage and the other wrapped around the bottom, indicating that the whole airplane was rotating when it hit.

Precession moments tend to be transient; they only occur when the pitch attitude, yaw attitude or the heading are changing. As soon as the airplane stops changing those and holds a constant pitch attitude, yaw attitude and heading, the precession moments become exactly zero. For example, a plane rotating nose-up at the moment of liftoff feels precession effects. As soon as it lifts off and holds a steady climb angle and heading, the precession effects go away, but the airplane still feels P-factor, slipstream effects and torque.

Precession effects are normally negligible for models because our props generally have a negligibly small mass and moment of inertia in comparison to the rest of the plane. On full-scale aircraft with metal props, the picture can be quite different.

For example, to do a true Lomcovak, you need to use precession and torque from the prop as additional flight controls to perform the maneuver per its specifications. (Contrary to popular belief, a Lomcovak is in fact a precision maneuver, not the random tumble so many folks mistakenly think it is; rather, it's a whole class of precision maneuvers with five major subcategories, with additional variations within each category; the best description of these that I've seen is in the book "Aerobatics" by Neil Williams) Model airplane propellers are usually too small, too light and with too low a torque to do a Lomcovak properly; the forces simply aren't there in the right magnitudes and proportions.

Precession forces in high pitch and yaw rate maneuvers such as Lomcovaks and snap rolls ("flick" rolls for you Brits out there) can get dangerously high on full-scale aircraft. There have been a number of cases of prop damage and even snapped crankshafts on competition aerobatic airplanes such as the Pitts Specials.

The Brazilian aerobatic team had some interesting propshaft problems on the turboprop Tucano military trainers they performed Lomcovaks in as part of their aerobatic displays, and the Soviets had some spectacular failures from doing too many Lomcovaks in their Yak 18's. They had a total of five major engine or propeller failures, including one where the big radial engine was literally ripped off its mounts and out of the airplane. After that they issued an edict that anyone caught doing a Lomcovak in any of their Yaks would get a free one-way scenic train ride to one of the colder and more remote destinations on the eastern end of their national train routes.

In my "previous lifetime" when I worked as a full-scale propeller engineer, one of the many projects I worked on was a Kevlar-bladed prop for aerobatic aircraft. The pilots had switched to wood props so they wouldn't break crankshafts anymore, but the lower strength of wood required thicker, less efficient blades, and they still had blade failures because the wood, even with more thickness, still couldn't handle the loads.

Kevlar is pretty awful for most structural applications because its compressive strength is truly atrocious, but its tensile strength is actually better than carbon fiber, and it's also about 5% lighter than carbon. For a propeller blade, which in most cases sees only tensile loads because of the massive amount of centrifugal force involved (typically about 25,000 pounds for a composite blade, and about twice that for an aluminum blade on a typical small to medium sized full-scale aircraft), it would be difficult to find a better material than Kevlar. We were able to give them blades that had weight and inertia similar to wood, but with the strength and aerodynamic efficiency of aluminum blades. They could even go to a three-bladed prop for better climb and vertical performance and still save weight relative to their old 2-bladed metal props.

Propeller forces in general can have a profound effect on the safety, performance and handling of an aircraft. Their relationship, both aerodynamically and structurally, to the rest of the airframe and engine is usually extremely complex. History is full of sad examples of what happens when an airplane designer, builder or pilot does not adequately respect this fact.

Don Stackhouse @ DJ Aerotech http://www.djaerotech.com/
(Former full-scale propeller engineer in a "previous lifetime")

Don has many such informative articles on his web site.

See what interesting and informative information you can get from the web, in this case from the electric flight group yet! The pictures also all came from various sources on the web as I assembled this article.

Dave Harding

Volume 32,Issue 2 Newsletter of the Propstoppers RC Club February 2002

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Propstoppers R.C. M.A.C

Club Auction and Swap at the next meeting

Tuesday February 4th 7 pm

- ***Note the time, 7 pm not the usual 7:30.***
- ***Go to the workshop right now and make a pile of stuff you know you don't need.***
- ***Also put in the stuff that you think someone else could use***
- ***Then, and only then, cut a deal with the significant other and draw out your modeling kitty. You will need cold hard cash on Tuesday, as Al Gurewicz will not accept any other form.***

Stop Press (as the newspapers say in England for breaking stories);

New Additional Indoor Flying Dates

The Silent Knights of Delaware have invited the Propstoppers to an expanded series of indoor flying sessions at the Jewish Community Center on Eden Road in Wilmington. (next to the Holliday Inn on 202 by the split).

Dates are; Jan 29 7:15-9:15
Feb 26 "
Mar 26 "
April 30 "
May 28 "

This means that there are five or six dates on which you can fly so why not consider building something and joining us. Beats the alternative of not flying at all.

How about a 50% Zagi with un-geared GWS motor?