# The Flightline

**Volume 43, Issue 9** **Newsletter of the Propstoppers RC Club** **AMA 1042** **September 2013**


### *President's Message*

There has been a lot of flying at Elwyn even with the slim field; all seem to be doing well. C/A field is cut and trimmed. The stickers have been cut back at the gate and along the path to the pits. The overhang at the back stop has also been cut.

The club picnic is coming up Sept 28th.starting at 3 PM till dark. If you want to come earlier that's fine. We are trying to work with the church so their people can come and watch the flying.

We will be having a cookout: Dogs, hamburgers, hot sausage chips, soda, water, and the one and only PINK SURPRISE.

Wed, Thurs, night flying at CA Field is working out well, and more people are flying

.If you have something to sell bring it you could just get lucky. For those who drink coffee try some that John Moloko brings its very good.

If you have something to show at the meeting bring it in See you there.

***Dick Seiwell, President***

### *Agenda for September 10th Meeting At Middletown Library;*
***Doors open 6:00, meeting at 6:30***

1. Show and Tell
2. Membership Report
3. Finance Report
4. Picnic Plan
5. Indoor Plan

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**Club Picnic 28th September**

**3 pm till dusk, CA Field**

**Food and drink provided**

**Flight Demos for the Church folks**

**Be there or be square**

### Minutes of the Propstoppers Model Airplane Club August 13th 2013 at the Middletown library

Call to order took place at 6:45 PM by President Dick Seiwell

Roll call by membership chair Ray Wopatek showed 13 members and 1 guest present

Minutes of the July meeting were approved as published in the newsletter

Treasurer's report was read by the president in the absence of the treasurer

**Show and Tell:**

Al Cheung showed several videos of his Apprentice and Beaver models. He flew them from the surface of one of the Finger Lakes where he was spending a week. He put floats on both of the foam models and after a learning curve could take off and land from the lake.

**Old Business:**

The club picnic on Saturday afternoon September 28 will be held in conjunction with the Christian academy church outing. They plan to shuttle their people back and forth from the church to the field. They have enjoyed watching the flying and interacting with the club members in the past.

**New Business:**

Dick Seiwell asked that we notify him if we plan to fly on a particular day so that he can mow the field beforehand.

Adjournment took place at 7:45 PM

***Dick Bartkowski, Secretary***

Calendar of Events

## Club Meetings

**Monthly Meetings**
**Second Tuesday of the month.**
**Middletown Library**
**Doors open at 6:00, meeting at 6:30 pm.**
**Next Meeting; 10th September**

**Tuesday Breakfast Meeting**
**Tom Jones Restaurant on Edgemont Avenue in Brookhaven. 9 till 10 am. Just show up.**
**Flying after in the summer at CA or Elwyn Field 10 am. Weather permitting.**

## 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**
**At Elwyn Field; Gas or Electric**
**Monday through Saturday 8 am till dusk**
**Sunday 12 pm till dusk**

## Indoor Flying

Wait till the Fall!

## 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.**
**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 at Christian Academy Field. The club also provides the AMA Introductory Pilot Program for beginners without AMA insurance.**


**Propstoppers RC Club of Delaware County, Pennsylvania.**
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# *At the Fields*

Al Cheung with his Visionair at the "narrow strip" of Elwyn Field. Both the model, Al and the field are working out great. This shot was taken after our weekly Tuesday breakfast. Rumor has it that the farmer is not happy with his yield at Elwyn. See Page 13

And folks are still flying up a storm at CA field. Aren't we blessed?

## *Al Cheung Flying on Lake Owasco, NY*

Al has a summer place on Lake Owasco, NY. We all know Al has a "need to fly" and he wasn't about to face some downtime when he went to his place for a summer break. So he put floats on two of his planes and taught himself to operate and fly from the water. Here is a video of some flights. http://www.youtube.com/watch?v=dja3cs5eWwY Thanks to his father-in-law Stewart G. Pollock, for taking the pictures of the Beaver at the lake.

Al is so please with his seaplane (after spending over $200 learning how to solve water related electronics failures) he plans to build something like a Canadair CL-415 Water Bomber for next year's adventure.

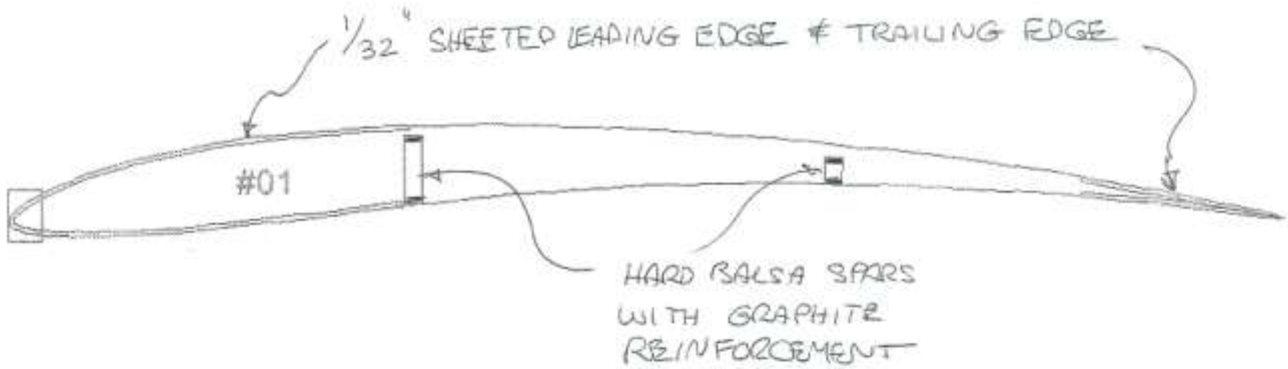
Photo by: Stan Wagner

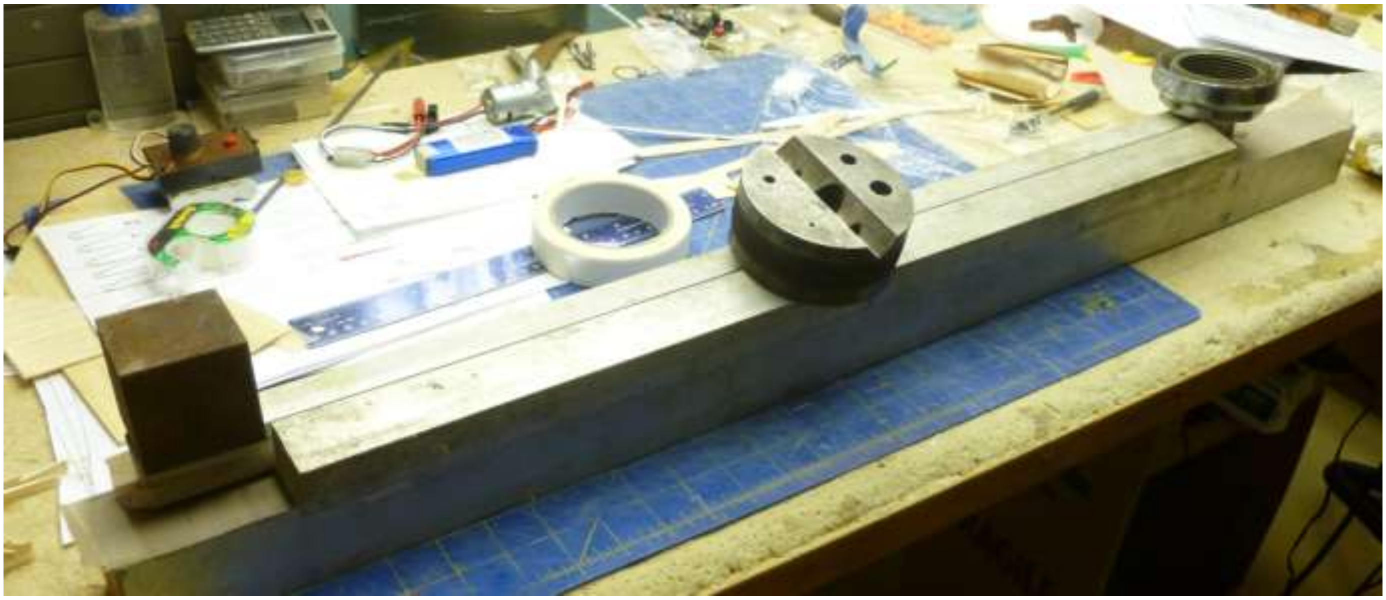
## *Speed 400 Scale Duration Antoinette Build Status*

Well on its way, but less than two weeks to complete and test it!  Fuselage, tail, controls and servos installed. Here with the real one for comparison.

The fuselage needs the complicated landing gear and eventually the dummy engine and pilot/seat/controls.  I should have shot this picture from the other side as the elevator control is just like the real one; on a hand wheel off to the RH side.  I mounted a servo there and connected it with the proper "cables".  Same with the rudder.

Next build is the wing with this challenging construction.  The trailing edge is the real challenge, how to make it sharp and straight then connect it to the very thin ribs and provide strength.  With Dick Bartkowski's suggestion (see we do discuss model airplanes at the Tuesday breakfast) I am making it with two 1/16 inch laminations, stiffened with some uni glass strips rather than the two-piece 1/32 inch design shown in the rib drawing below.  I am forming it over one of my favorite tools; a long straight square aluminum bar.  The necessary curvature in the chordwise direction is formed by slipping a thin cardboard strip under the center while forcing the front and back edges down with additional bars.  Turned out just fine.  Now to make a wing.



Now if I can just get this newsletter out I can get back to the shop!

Dave

# Ryan's Extra

Rumor has it that a new wing has solved the stall problem Ryan was having with his big Extra.  He is a happy flyer now.

## *The P Factor and Other Prop Related Effects.*

*Originally published in 2004 newsletter*

## By Don Stackhouse with Illustration by Dave Harding

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…………………."?

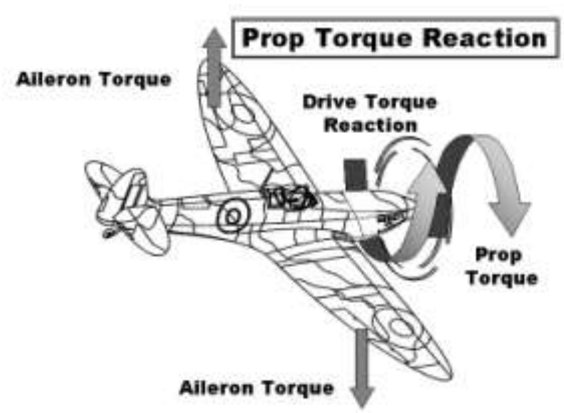
"What is that" you say, glad you asked, it just so happens that Don Stackhouse of DJ Aerotech posted a comprehensive explanation of the P factor and all the other propeller effects to the e-flight list. Here is Don;

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.

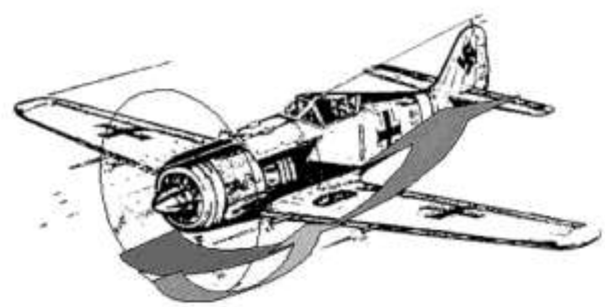



Torque tries to roll the airplane. Theoretically you counteract it with some aileron, although for most airplanes the amount of aileron required to do this is almost too small to notice. In some cases the airplane may be rigged with a little more incidence on one wing relative to the other to help counteract 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.

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.



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.

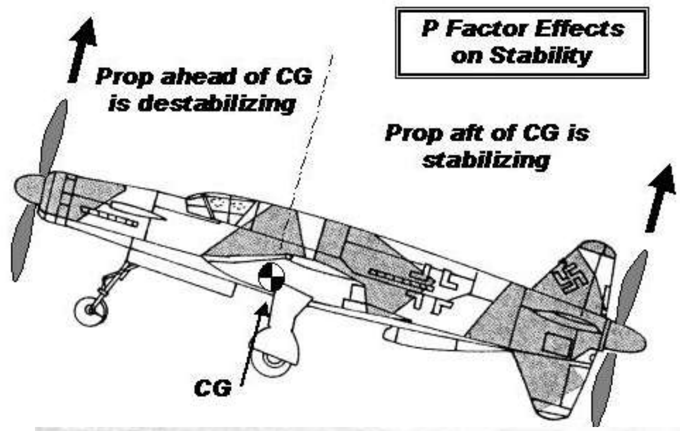
For example, imagine a Piper J-3 Cub at full power and in a max-performance climb. The nose is high and the prop disk is therefore tilted up quite a bit. It's a right-handed prop, so the blade on the right side of the airplane is descending. The angle of attack of that descending blade on the right side 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.


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.

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.

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.

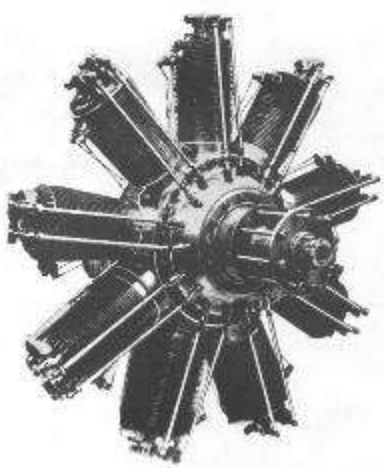
There's another prop related force, gyroscopic precession, which folks sometimes get confused with P-factor. Gyroscopic precession occurs when the propeller disk is being yawed or pitched to a different position, and ONLY exists while the disk's position is changing. It's related to the spinning mass 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, let's 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 Camel's large Clerget rotary engine and large prop has very high inertia.***

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.

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

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.  (But not in this picture however.  But it is the best one that I can find!)

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/dj_askjd/

(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 old eflight chat group that was THE source for electric flight information back in the dark ages of electric flight. Ed.) The pictures also all came from various sources on the web as I assembled this article.

***Dave Harding***

## *The Elwyn Farmer and His Produce*

Al Cheung recommends supporting the Elwyn farmer who sells his produce at the Media Farmers' Market. Despite past experiences and our differences, having a farmer at the field is far better than a nursing home or condo complex! The Media Farmers' Market requires certification that all produce is organically grown which may explain in part the appearance of his crops.

**Media Farmers Market**
**Every Thursday**
**3 PM to 7 PM**
**May through November**

We are located at the Media Theater parking lot, on State Street between Monroe and Gayley Streets. Parking information can be found here. There will be plenty of street parking available as well as guidance for cars and pedestrians on market days.