Skywriter

Monthly Newsletter of the Calgary Ultralight Flying Club

January 1992

View From Above

by Paul Hemingson

At the December 4, 1991 meeting we held some club elections. Stu Simpson is our new Director, replacing Jim Creaser who has done do much for the club and ultralight flying in the Calgary area. Stu Simpson is an active flyer (Beaver) and I know his enthusiasm will carry many a day for us. Thanks Jim, for the years of dedicated service and willingness to help any and all with our problems. I was over to Jim's place a few weeks ago and his self-designed, self-made, self-tested and self-modified homebuilt is looking good, and he is test flying it for rigging. Gord Tebutt and myself were reinstated and will need the assistance of volunteers to carry out the club's business.

Stu Simpson and Todd McArthur gave the club a presentation on their plans to fly to Abbotsford, BC for the August 8, 1992 weekend airshow. Their preliminary plan and itinerary is included in the December club newsletter. Much planning and preparation needs to be done to successfully conduct this flight through the Rockies. This is a flight with little margin for error and all the risks need to be identified. It can be done. Given the right weather, right machines in top running order, prior knowledge of acceptable forced landing sites, careful attention to fuel/leg limits, ground support, good air-air and air-ground communications and time so that one is not forced/coerced into inclement (windy) weather. I admire Stu and Todd's enthusiasm in putting forward this initiative. About 9 members put up thier hands as a show of interest in joining the flight.

In the spirit of education and information, I am getting CFI, Mike Dupuis to address the club at our February 5, 1992 meeting, to discuss mountain meteorology and mountain flying. Mike regularly does mountain check flights and this is an excellent way to learn the vagaries of the local wind gusts, swirls, and what to expect. It promises to be an interesting evening.

For the March 4, 1992 meeting I have a commitment from John Page to address the club. You may remember John as the pilot involved in an ultralight sprayplane collision with a truck near Didsbury on June 14, 1991, that resulted in a fatality. The trial is now over and part of John's sentence requires that he address the ultralight community about flight safety. I have given John the opportunity to talk to us and am looking forward to this presentation. I am sure we can all learn something from this terrible accident.

All in all, 1991 has been quite a year. The new regs are closer to reality and a new Advanced Ultralight category is promising to bring lots of former private pilots into our fold. I believe that the traditional UL will be around for a long time and those wishing to fly under the previous regs will continue to enjoy their machines. Ultralight pilots have the best of both worlds.

Our safety record in the club was excellent, thanks to your vigilance and attention to safe procedures. Keep it up! We participated in the Red Deer airshow and had numerous excellent speakers at the club meetings. Most of us would like to have flown more hours, but the everyday pressures seem to conspire against us.

My wish for 1992 is that we will have more time, good health and the capability to enjoy Ultralight flight more often. The weather over the Xmas holidays was excellent for some high density flying. Hope you all got some time in. We only need to remind ourselves of the feelings of heightened awareness, self-confidence and self-esteem that come over us when we put the plane away at the end of the day in order to motivate ourselves to get up more often.

On a sad note, a couple of small plane crashes over the holidays put a shadow over most pilot's enthusiasm. I always wonder what happened, and why? Not in a gorry, gruesome sense, but rather for what can be learned. The pilots who died were cautious and experienced. This shows it can happen to anyone at anytime...Ernest Gann, the author once noted, "Fate is the Hunter"...and I might add, we pilots the quarry. Keep the hounds at bay by keeping your altitude up, your speed up, and your stick ahead when a turn goes sour!

1992 Dues are due now!

Your CUFC membership dues are being kept at $15.00 again this year. Please pay you dues now to ensure that you will continue receiving your newsletter.

Fly Paper

by Gord Keegan

Fight of the Calgary Ultralight Flying Club - in Retrospect

The takeoff was somewhat hesitant and bumpy as a group of ultralight pilots decided that our association with the national UPAC organization was not proving to be beneficial. There was a need for a local club which would meet the needs of the very active ultralight community in Calgary. So the group formerly known as the Calgary chapter of UPAC became the CUFC.

As with any takeoff in a new machine, it took time to get use to the system, the new crew and the feel of the craft. After some 4 or 5 years, and still very much in the climb phase of the flight, we find ourselves flying steady and quickly gaining altitude thanks to the skilled pilotage of Paul Hemingson and his crew.

As with any aircraft, the pilot in command has an onerous responsibility to be intelligent, well informed, competent, conservative and safety concious. Our pilot is all of these and more. As a result of Paul's regular column in the COPA publication, CUFC is known nationally as a leader in the promotion of flight safety. Transport Canada has inspected the craft on several occasions and have been impressed with the safety of both machine and pilot.

I, personally, would like to thank Paul for his willingness to continue on as duly elected pilot of this ship. Who knows how long it will take for the flight of the CUFC to reach cruising altitude. Maybe ATC will keep moving the cruising altitude higher and higher with the craft in a constant state of climb and with a crew adaptable enough to handle the ever changing flight plan. There lies the difference between the well planned flight and the constantly evolving nature of a club like ours. It is impossible to say exactly where the club will end up cruising as we change and grow to meet the challenges that arise.

Now is the time to look back and thank those pilots in the past who have kept the machine in top condition, to our current pilot guiding us with wisdom and experience and to the rest of the members who are not content to be mere passengers, but volunteer their knowledge and expertise to be part of the crew at every opportunity.

On behalf of the executive of CUFC, I wish everyone a safe and happy holiday and best wishes for many safe flying hours in 1992.

Classified

Ivo Prop - updated 3-blade, ground adjustable, 60", composite blades. New - $300. OBO. Paul Hemingson 931-2363.

Rotax 503 - single carb, excellent condition. $1200. OBO. Paul Hemingson 931-2363.

Chinook 2 place - with floats, Rotax 447, needs some work, $4000.00. Terry Spokes 533-3748.

FireStar - Rotax 377, instruments, enclosed trailer, $7000.00. Jim Creasser 226-0180.

Ritz Standard A - completed and ready for covering, includes covering materials, Zenoah engine, $2000.00. Jim Creasser 226-0180.

Lazair - Estate sale. Needs recovering but selling for parts. $1000. OBO. 262-3959.

Classified ads are free to CUFC members. Call Bob Kirkby, 569-9541 to place your ad.

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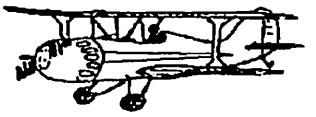
Skywriter is the official publication of the Calgary Ultralight Flying Club and is published 12 times per year. Opinions expressed by our writers are not necessarily those of the club. Articles and letters to the editor are very welcome from any readers. Address correspondence to: Bob Kirkby, RR 7, Calgary, AB T2P 2G7

Meetings of the Calgary Ultralight Flying Club are held the first Wednesday of every month at 7:30pm at

R.C.A.F. Association
110 - 7220 Fisher Street S.E.
Calgary, Alberta

One Pilot's Opinion



by Bob Kirkby

Prop Review

I have recently installed a NEW IVOPROP 3-blade on my Renegade and I am very impressed!

Last summer I tried out a 3-blade Old-style Ivoprop (now Warpdrive Props) and was very please with the improvement in smoothness, although the performance was not much different than with my 2-blade wooden prop. Because the hub on this prop was so large my engine was unable to keep it's cool, so I abandoned the idea of switching.

A few months later I heard about the NEW prop, developed by the now famous Ivo of Bellflower, California. I made a telephone call and discussed the new prop with the man himself, and immediately ordered one. Here's how it checks out.

The independent blades are made of a very flexible, but strong, carbon/graphite fibre composite. The already tough blades are further protected by a bonded stainless steel leading edge. There really is no prop hub. Each blade is attached to the geardrive hub with two of the six prop bolts, sandwiched between two 4" round pressure plates. The effective hub diameter, therefore, is only 4 inches. I bought the optional spinner which results in a very clean hub assembly. My engine now runs cooler than it ever has. To operate with 2-blades all you have to do is remove a blade and move one of the remaining blades 1/6th of the way around the hub, then bolt on with 4 bolts instead of 6. What could be simpler?

It is the flexibility of the blades that makes Ivo's unique pitch adjustment scheme a success. Each blade has a 3/16" chrom-moly alloy torsion rod running up the centre. The rod is free to rotate in the blade except in the outer blade section where it is anchored by a 90 degree bend in the rod (about 2/3's out). At the hub end, the rod is squared off and fitted with a cam (see diagram). By tightening the sandwiching plates, the cam will rotate the rod causing the blade to twist and the pitch to change. The cam can be attached to the rod in two ways, one rotates the rod for more pitch and the other for less pitch. The amount of rotation is varied simply by inserting specially designed washers between the outer pressure plate and the blades to vary the amount of pressure applied to the cam.

The simplicity of this design is incredible. There is no need to measure the pitch with protractors, just count the number of washers. Each blade will be twisted exactly the same amount, so the resulting pitch is identical in all blades, automatically. I have found that it takes no more than 10 minutes to change the pitch setting, not that you need to do this more than once. It took me an hour and two short test flights to get mine set up for optimal performance.

Another amazing feature of these flexible composite blades is that they will change pitch in flight. At high RPM the blades tend to flatten out, resulting in a lower pitch and higher thrust for take off and climb. At lower RPM they return to the preset pitch for higher cruise at the same RPM. Here's how my testing went.

Following the instructions, naturally, I first installed the prop with no cams. This gives a "natural" pitch of 10 degrees (at the tips). I ran it up on the ground, with the tale tied to my truck, and found the engine wanting to rev beyond 6500 RPM. I then installed the cams and set the washers for the first courser pitch setting, which twists the blades to 11 degrees. On the ground I was now getting exactly 6500 RPM at full throttle, so I opted for a test flight.

I noticed the effect of the blade flexing right away. As I increased RPM to begin my take-off roll, the thrust seemed to increase more slowly than I was use to. Then, suddenly, at close to full throttle, the thrust increased dramatically and I was accelerating down the runway much fast than normal. Likewise climb- out was better than I was used to. I throttled back to test the cruise and set my RPM at 5300, where I would normally expect an airspeed of 75-77 mph. Instead I was cruising at 80 mph! Wow, this was great. I played around with a few different speeds, all with the same results, then landed to try another pitch setting.

This time I set the pitch for one degree courser and again took off. The take-off and climb performance was not quite a good as before, but no worse than it was with my 2-blade wooden prop. This time however, my cruise was out of sight. At my customary engine speed of 5300 RPM I was flying along at about 90 mph. I throttled back to 4500 RPM and slowed down to about 80. I say "about" because I didn't spend a lot of time playing with the settings, this was clearly too fast. A simple extrapolation would put me over my VNE at 75% power. I was beginning to wonder how I was going to get back down. (Cut the power stupid, that usually works). I throttled back to idle and dead-sticked in, although she wasn't quite as dead as she usually was at idle. I finally got stopped and proceeded to reset the pitch back to the 11 degree setting I liked so much. I loctited all the bolts

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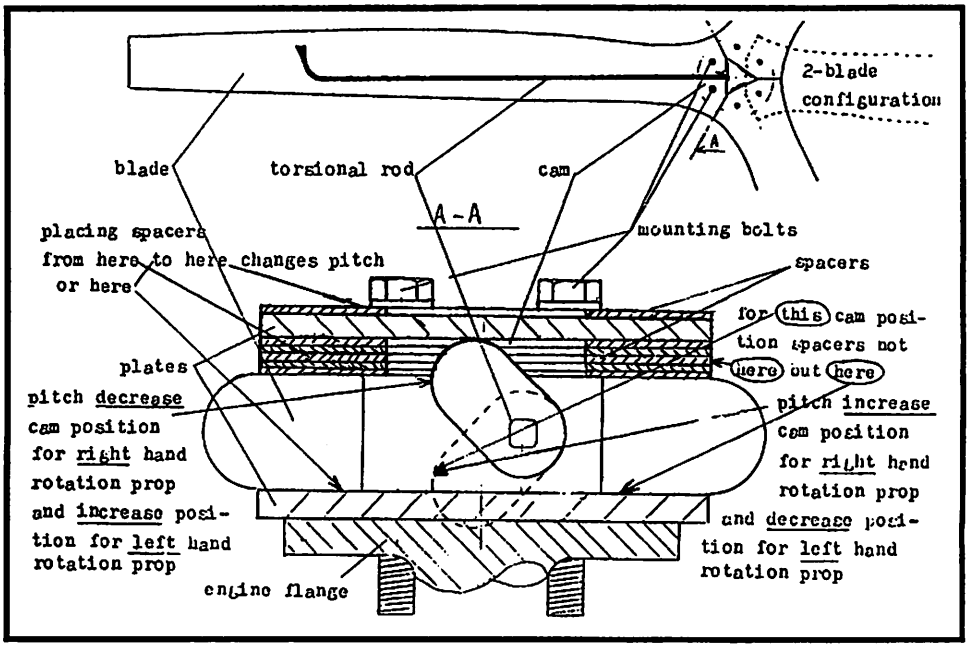
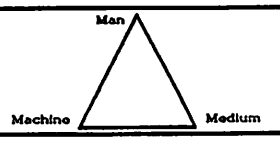


Safety Corner

by Paul Hemingson



THE GREENIES ARE GOING TO GET YOU!

The Greenies are here! They have been for some time. You might even be one of them. At times, we all are. Yes sir, I am talking the new-age, born-again, nineties version of environmentalists. Suburbanite subterfugilists. They mean well, even if sometimes misdirected. A few snorts and blasts from your trusty Rotax will be enough to alert them to your presence, and get them to thinking and scheming about curbing your pastime. But there is a way to stay on their good side. Being a good pilot today involves a little PR and attention to the sensitivities of groundlings who do not share your enthusiasm for flight.

We have all heard, or soon will hear about, or read about the small rural acreage owner with his private strip that comes under the scrutiny of local council due to complaints aired by his neighbours. For example its easy to visualize this story.

LAND USE BYLAWS CHALLENGED

Anywhere, Canada: Council today heard a petition from local residents who are challenging the local municipal land use bylaws. The signers of the petition argue that the quality of their life, especially on weekends, is being threatened by local UL enthusiasts who insist on using full power in their take-offs.

Councillor Green made a motion that, since the engines sounded similar to lawn mowers, the UL pilots should refrain from operating their aircraft before 10:30 AM similar to the bylaws in force for lawn-mower operation. The motion was turned down when it was discovered that many residents regularly cut their grass before 10:30 AM and enforcing the bylaw would create undue hardship on local estate owners who have much grass and must necessarily start early in order to get the job done. Council also considered a noise-ban that would go into effect 3 hours before sunset but withdrew the idea when other residents stated this was their favored time for grass cutting after getting home from the office.

Councillor Verdant in an attempt to reach a compromise wondered if the pilots couldn't use half-power. As it turns out, he wasn't even half-right. Pilot Black stated that full-power takeoffs is the only recommended method for safety, but was interrupted by Councillor Tealgreen who felt that the suppression of noise was more important than rocket-like takeoffs.

Both sides agreed that no problem existed before the nearby subdivision was approved and built-up, but petitioner Greenlief stated that, since residents now outnumbered the pilots, it was only fair that that democracy prevail and the pilots locate elsewhere.

They also complained that, in addition to the noise, their privacy was being invaded by low flying aircraft and pets were risking injury in running for cover.

Local sun-tanners had a spokesperson who said that she was unable to get Golden-brown "all-over" since pilots discovered her "sans articles de clothing".

Another nearby resident had noticed that when the planes go overhead, her TV reception was degraded by the chimerical appearance of ghost images, instantly doubling the cast on Another World.

Children of the residents were also noted to be making pugnacious demands of their parents to get one of these aircraft for them for Christmas. Many concerned parents felt that exposure of this activity to their children created a conflict whereby they were adopting poor role models.

Only one resident spoke out in favor of the pilots. Mr. Bluesky, a former WW II pilot, said that the pilots created no serious threat and that he quite enjoyed the aerial displays overhead. He also stated that he knew it was going to be a great day (weather-wise) when he was awakened by the distinctive buzzing sound. He felt that he was more productive when awakened in this manner from his state of somnambulent bliss.

After several hours of debate, Council decided to table the issue for more information. A County employee will be sent to investigate the complaints. Meanwhile, UL pilots stated that they are prepared to alter the standard left-hand circuits so that they will not overfly the built-up areas on takeoff and approach, even though this means they will be over more hostile terrain in the event of a forced landing.

Well, that's just a little story, but it has the potential for coming true. I fabricated the issues and people to make a point.

I believe this little ficticious story has some gems of truth embedded within it and some lessons for UL pilots. While the day of the Greenies has dawned with the seemingly recent realization that we need to husband the earths resources more prudently, the question of 'quality of life' has always been important to the thinking person.

One of the reasons we fly is that it adds to the quality of our life. It gives us an appreciation of Nature and her powers, and from our unique perspective "how all things are related". Generally we need to be conscious of the sensitivities of others. More specifically we need to recognize how and when we infringe on the rights of others. Most former urban dwellers escape to the countryside to enjoy the peace, quiet, and solitude that is lacking in the cities.

Keeping an ultra-low profile is something we need to be aware of so as to not raise the angst and ire of residents. Maintaining a low profile will go a long way towards sustaining our freedom to fly. One pilot's actions reflect on the public image of all pilots and I encourage you to police yourself against doing things which attract unfavorable scrutiny.

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*(**Prop** continued from page 3)*
and attached the spinner. Now I was ready for some flying.

The pitch of the Ivo Prop blades can be varied + or - 7 degrees from the natural 10 degree setting. This should cover just about anything. The 64" version that I bought weighs in at only 7 pounds, including the bolts, washers and spinner. I took Ivo's advice and reduced my diameter to 64" from the 68" 2-blade I had. This increased my ground clearance by 2" which, is very important in the Renegade. I still have better performance.

The low weight of the prop means low rotational inertia. The spool up and spool down time is slightly longer than my old wooden prop but much less than the old-style Ivo prop I tested previously.

(continued on page 5)

The following article and the one on page 6 are supplied by Jim Creasser as a followup to a discussion of downwind turns at the December CUFC meeting.

(Prop continued from page 4)

If you are in the market for a propeller I highly recommend this new innovation. If you are not in a rush you might want to hold off awhile. Rumour has it the Ivo is working on a cockpit-adjustable version. It will probably be a lot more expensive though.

Speaking of price, my 3-blade cost $350.00 plus $40.00 for the spinner, for a total of $390.00 US. At today's exchange rates that's $448.50 Cdn for both, plus shipping. Not cheap, but if it stands up better than the two wooden props that I've broken, it will be well worth the price. The extra performance is an added benefit.

The Myth of the Myth of the Downwind Turn

by Chuck Beaty, reprinted from Rotocraft magazine, June 1991

Sir Isaac Newton, some 300 years ago, discovered that there was a definite difference between upwind and downwind turns when he deduced Mother Nature's Laws of Motion. Unfortunately, that information has trickled down more slowly to some of us than to others.

The difference between upwind turns and downwind turns is kinetic energy. Kinetic energy is the reason bullets make holes in people, mortar shells reach heights of several hundred yards, roller coasters coast up hills and gyroplanes fall out of the sky when making downwind turns.

The influence of kinetic energy on the flight of a gyroplane is easily demonstrated. At a time when a strong wind is blowing, fly your gyro downwind at an airspeed of 50 mph, chop power and see how much altitude you can gain before the airspeed falls to 30 mph. Do the same thing flying into the wind and you will have proven to yourself the influence of kinetic energy on flight.

What has happened is that during a power off climb, some of the gyro's kinetic energy is transformed into potential energy (altitude). An aircraft flying downwind possesses more kinetic energy than one flying upwind at the same airspeed and will coast farther uphill.

We deal with and manage, more or less, three types of energy in a flying machine: kinetic energy, potential energy and latent energy.

$$\text{Kinetic energy} = {}^1/_2MV^2 \quad M = \frac{W}{32}$$

$$\text{Potential energy} = \frac{W}{h} \quad h = \text{height, ft.}$$

Latent energy=fuel in tank
All units are pounds, feet and seconds.
Velocity means absolute velocity (groundspeed, not airspeed).

By way of illustration, we'll consider an extreme case, a 500-pound-gross-weight gyro flying at an airspeed of 50 mph in a 50 mph wind. if we fly directly into the wind, our groundspeed is zero, as is kinetic energy. If we fly downwind, our groundspeed is 100 mph (147 feet per second) and our kinetic energy is:

$$E_k = {}^1/_2MV^2 = 1/2 \times \frac{500}{32} \times 147 \times 147 = 168{,}820 \text{ ft.-lbs.}$$

If we were flying at an altitude of 337.64 feet, our potential energy would be:

$$E_p = Wh = 500 \times 337.64 = 168{,}820 \text{ ft.-lbs.}$$

If we lived in a frictionless, lossless world, 100 mph of ground could be converted to 337.64 feet of altitude or vice versa.

When making a downwind turn under the conditions of this example, the kinetic energy of our gyro must increase from zero to 168,830 ft-lbs. We can supply this energy either by using up some of our potential energy (altitude) or by using up some of our latent energy (fuel) over and above the amount required to maintain airspeed.

The additional fuel which must be consumed to maintain altitude can be estimated as follows:

1 BTU = 778 ft-lbs.
1 lb. gasoline = 19,000 BTU
Propulsion Efficiency = 15%

Our downwind turn requires the addition of 168,820 ft-lbs. of energy or 217 BTUs. At a propulsion efficiency of 15%, and additional .076 lbs. or fuel must be consumed to maintain altitude.

When turning upwind, the opposite conditions exist and we must back off on the engine power to keep from gaining altitude, since the kinetic energy of our gyro must decrease from 168,820 ft-lbs. to zero.

The notion that there is no difference between an upwind and a downwind turn is one which is widely held. I've even seen it discussed in FAA literature, but is totally false.

FLYING

TURNS WITH ISAAC NEWTON

by Ralph Taggart
602 S. Jefferson
Mason, MI 48854

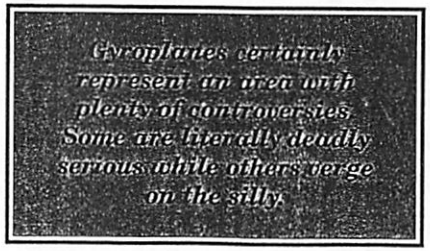
In a previous issue of *Rotorcraft*, I was so bold as to write an article on "The Myth of the Dreaded Downwind Turn". I made the point that, in terms of aerodynamics, downwind turns were no different than any other turns and that the real problem was that pilots ground reference the turn, leading to all sorts of problems.

While I didn't expect I would convince everybody, I was surprised to discover Chuck Beaty taking pen in hand in the June/July issue to settle the matter for the opposition (p.52). He effectively called forth the ghost of old Isaac Newton and wielded flawless mathematics to indicate the error of my ways, although he was gentlemanly enough not to mention me by name!

Gyroplanes certainly represent an area with plenty of controversies. Some are literally deadly serious while others verge on the silly. In this case however, we have the best kind of disagreement—one where the results can be instructive instead of just confrontational.

Let me start by saying that Chuck represents one of the best examples of the kind of technical talent that is gradually producing some real innovation in our sport. There is absolutely nothing wrong with his math in this case. The problem is, it is also too easy to believe that just because the numbers work, they must be describing reality.

This particular case is interesting because it shows how an elegant mathematical analysis can fail because of problems with the assumptions in a problem.



Let's look at some specifics. Chuck's argument is based on the relative kinetic energy of the gyro in an upwind as opposed to a downwind situation. For his analysis, Chuck used an aircraft gross weight of 500 pounds, an airspeed of 50 mph, and a wind speed of 50 mph, with the following results: (1) When flying upwind, the aircraft has a velocity of 0 mph (0 ft/sec) and thus kinetic energy equals 0 ft/lbs. (2) When flying downwind, the aircraft has a velocity of 100 mph (147 ft/sec), resulting in a kinetic energy of 168,820 ft/lbs.

The math is absolutely correct and seems to coincide with commonsense observation. The aircraft would appear to be hovering on an upwind leg while moving like the proverbial bat out of you-know-where on the downwind leg.

From here Chuck launches into two conclusions about turns and it is here that the analytical train jumps the tracks.

(1) In turning from an upwind to a downwind leg, kinetic energy must go from 0 to 168,820 ft.-lbs. Unless you apply throttle to supply this extra energy, the gyro must lose altitude since gravitational potential energy is the only other energy source available.

(2) In turning from a downwind to an upwind leg, kinetic energy must drop from 168,820 ft.-lbs to 0. Here you must come down on the throttle or that energy differential will cause the gyro to rise as kinetic energy is converted to gravitational potential energy (altitude).

Since the figures are beyond dispute, how can you argue with the conclusions? The problem is the frame of reference for the kinetic energy calculations. Velocity, in Chuck's examples, is always calculated in terms of groundspeed, so the calculated kinetic energy values are referenced to the ground. The only time that is a valid consideration is when the aircraft is interacting with the ground: takeoff, landing, flying into a cliff, etc.

In executing any of these, I would strongly advise that you chose the upwind option. Chuck's 168,820 foot pounds, in reference to the ground, is quite "real" and more than sufficient to scatter pilot and gyro parts all over the landscape if you fly into the side of the barn while proceeding downwind!

Flying, however, is another matter. In flight, the aircraft doesn't "know" anything about the ground. In flight, all interactions of the aircraft are with the medium in which it moves: the air!

The performance envelope of any aircraft is defined in terms of airspeed, not groundspeed for that simple reason. Groundspeed is irrelevant in terms of aerodynamic flight performance.

In Chuck's analysis, he chose a constant airspeed of 50 mph—upwind, downwind, and (presumably) anything in between. So what is the kinetic energy of the gyro, relative to the air, at 50 mph airspeed? You can use the formula if you don't trust me. Everything is the same except for V. 50 mph is 73.5 ft/sec and if we plug that value in, we get a value of 42,205 ft-lbs.

Since our example involves a constant airspeed of 50 mph at all wind headings, the value for kinetic energy is a constant as well: 42,205 ft-lbs, upwind, downwind, or anything in between! There is no kinetic energy change with a change in heading and no altitude gain or loss as a result.

Now just because there is no change in the kinetic energy of the aircraft with respect to the air in which it is flying does not mean that there aren't other energy-related things happening. There definitely are, but they are not the ones Chuck was concerned with in his analysis.

For example, Sir Isaac would be the first to remind us that turning—changing the heading of the aircraft—is going to cost us some energy. Turning involves angular acceleration and the energy required is stolen from the lift of your rotor blades. We must bank in order to execute a proper turn and the bank vectors a portion of the rotor lift so that it drives the turn. Because energy that had been directed to provide lift is now driving the turn, lift is decreased and the gyro will lose altitude as it turns, assuming it was trimmed for level flight when the turn was initiated. Additional throttle will be required to hold altitude in the turn. If both bank angle and airspeed are held constant, the throttle increment required to compensate for the "lost" lift is constant, irrespective of heading relative to wind direction.

The fact that the FAA (not to mention NASA and every other civil aviation agency) discusses turns in the same way I did simply reflects the fact that that is the way the universe works! I may not be successful in convincing all of you, but I am quite confident that if we could dig up Sir Isaac and teach him to fly a gyro, he would come down on my side of the argument!

In some ways this is a harmless yet instructive controversy. It invites you to make up your own mind on the issue, but how are you to decide?

You could go out to the field and hold a vote or we could have a nice PRA survey on the subject but, the fact is, nature doesn't particularly care whether we reach consensus or not! Each of us has presented a hypothesis. The ideas are not mutually compatible, so we both can't be right. One of us may be correct, leaving the other out in the cold, but also keep in mind that it is also possible that we are both wrong.

Science and engineering resolve such disputes with tests or experiments. Our experiment involves flying a nice big circle in the air with a steady wind, at a constant bank angle, using a throttle setting that allows us to exit the circle at the same altitude we entered, and at constant airspeed. A steady wind makes it far easier to maintain a constant airspeed. The latter is necessary since airspeed variations will complicate the results with either hypothesis.

A constant bank angle is required to fly a circle in the air mass in which the gyro is moving. Assuming you have a significant wind component, the ground track will not be a circle, but that is irrelevant.

If you fly through a 360-degree heading at constant bank angle and airspeed, it will be a circle relative to the air. The reason for using a throttle setting that yields the same entry and exit altitude is that it makes it simpler to spot altitude variations. Now if Chuck is correct, your altitude will always increase as you move from the downwind to the upwind side of the circle, with an altitude decrease as you fly from the upwind back to the downwind side. Gain and loss of altitude should balance out so that, assuming you have set the throttle carefully, your entry and exit altitudes will be the same. If I am correct, there will be no altitude change anywhere in the turn. Obviously, how "clean" your results will be will depend on how precisely you fly the course and read your instruments. Any variation will cause some change in altitude but, if you do it often enough, you should see consistent trends—predictable altitude gains or losses relative to wind heading if Chuck is correct or small random variations if I have my act together.

If the family complains that you are spending too much time at the airport, inform them that you are conducting valuable aeronautical research! This flying is a dirty job but someone has to do it! Meanwhile, you will learn a lot about flying precision turns, receive a practical education in basic mechanics (a la Sir Isaac), and an object lesson in the use and mis-use of numbers. Not a bad return for the cost of a tank of gas!

This article is reprinted from the September 1991 issue of Rotorcraft. Look for a future article on this subject more pertinent to ultralights.
-Editor