publication agreement number 40050880

Issue 2, 2017

RECREATIONAL RFLYER

Recreational Aircraft Association Canada www.raa.ca
The Voice of Canadian Amateur Aircraft Builders $6.95

RAA
RECREATIONAL AIRCRAFT ASSOCIATION
RÉSEAU AÉRONEFS AMATEUR CANADA

From The President's Desk

Gary Wolf RAA 7379

LYCOMING AD

Lycoming has issued an AD dated August 15 2017 that concerns connecting rod top end bushings. Connecting rods and bushings variously shipped between 2015 and 2017 are affected, and within ten hours the operators of affected engines are required to comply. Google "Lycoming 632B" for the document. Table 1 lists the serial numbers of the engines affected by this AD, and Table 2 indicates the shipping dates of affected top end bushings and connecting rod assemblies.

Transport Canada AD's are sent to owners of certified aircraft but they have no way of knowing which A-B aircraft might have these engines or parts. Prime candidates are builders who bought new Lycomings from their kit manufacturers. Also, owners of engines that have recently been rebuilt should check their receipts to see if they might have suspect con rods or top end bushings.

If you are negotiating the purchase of an A-B aircraft you would be wise to have an AME go through the engine logs.

ROTAX 912 SERIES MANDATORY ACTION

As per the ROTAX installation manual, a Mandatory "restricted" fuel return line is to be incorporated within the aircraft's fuel system. The purpose of the fuel return line is to bleed off any vapours that may form within the fuel system that could cause vapour lock, resulting in a possible loss of engine power.

Essentially a bleed hose with a restrictor jet must be fitted after the pump and before the fuel pressure gauge to allow vapours to be bled off. You may reference the latest ROTAX installation manual and check with the manufacturer of the aircraft to verify that a fuel return line has been incorporated within the design of the aircraft's fuel system.

Many 912 engines are operated on auto fuel, which has a higher vapour pressure (especially winter fuel) than avgas. Rotax encourages builders to provide adequate cooling air to the fuel system components to minimize the possibility of vapour lock. The latest Rotax Installation Manual can be found at www.FlyRotax.com OR www.RotaxOwner.com

CHAPTER MEMBERSHIP AND NATIONAL MEMBERSHIP

Some chapters allow non-National members to become chapter members, but this is supposed to be only a stepping stone to National membership, and not an alternative. Some chapters have ignored this to the extent that they now have more non-National chapter members than National, and this does nothing to ensure the longevity of your RAA. Further some have been allowing non-Nationals to become chapter directors, the result being that a chapter can end up taking direction from people who do not have any national vision. Once the tipping point has been reached it is all but impossible to get the chapter back.

RAA Canada negotiates a very favourable rate for the insurance policy that covers your chapter events, and this is largely paid from the dues of National members. RAA Canada also works with Transport Canada to ensure that regulations remain favourable to the Amateur, Owner- Maintenance, and Ultralight categories, and the cost of lobbying is also paid by National members. Mean-

continued on page 42

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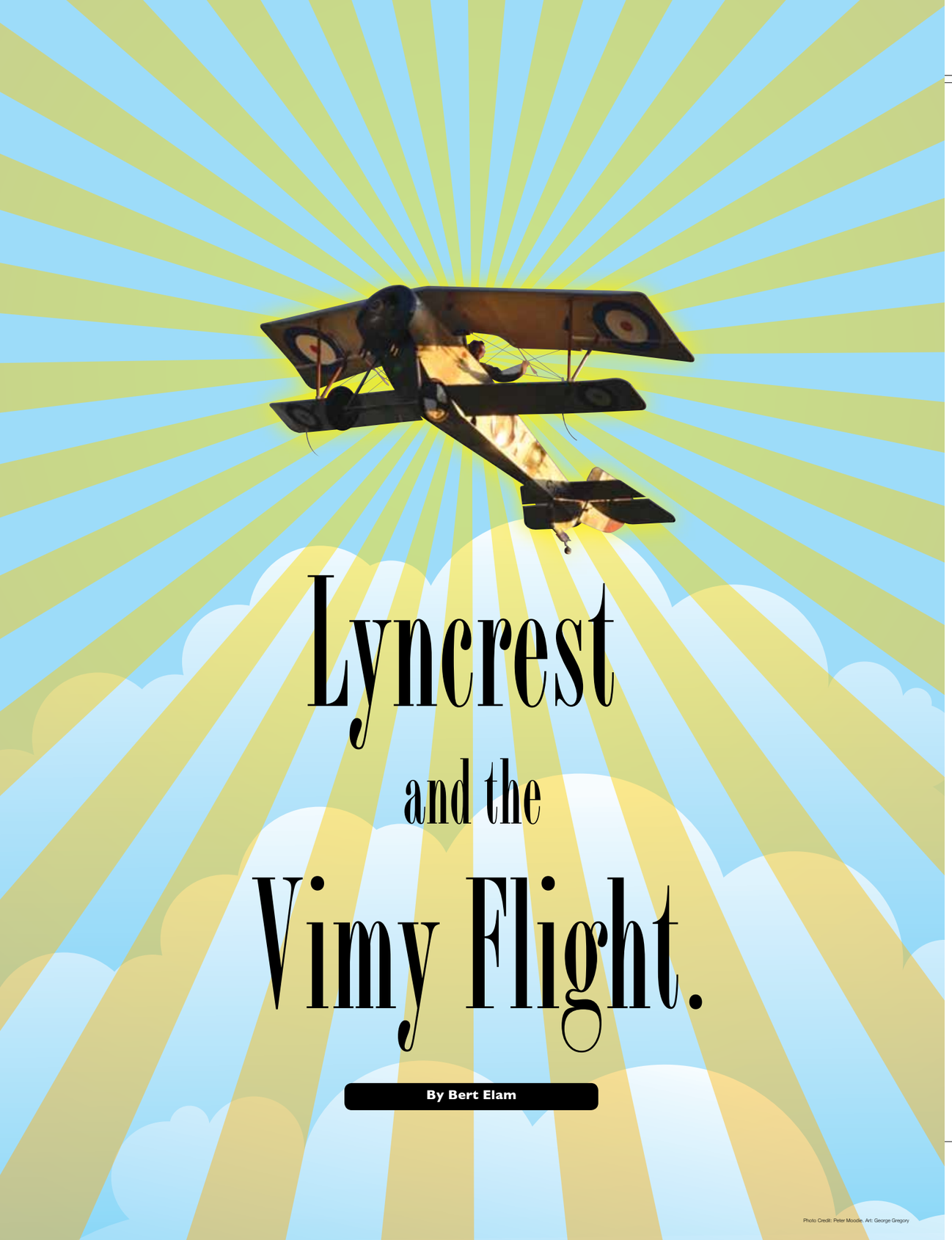
The Recreational Flyer is published bimonthly by the Recreational Aircraft Association Publishing Company, Waterloo Airport, Breslau, ON N0B 1M0. The Recreational Flyer is devoted to the aerospace sciences. The intention of the magazine is to promote education and safety through its members to the general public. Opinions expressed in articles and letters do not necessarily reflect those of the Recreational Aircraft Association Canada. Accuracy of the material presented is solely the responsibility of the author or contributor.

features

columns

George Gregory

Above: a lovely Taylorcraft at the Arlington, WA fly-in, July 2017. George Gregory photo.
On the cover: The amazing new Stampe replica by Ultralight Concepts of Belgium. See p. 18



Lyncrest and the Vimy Flight.

By Bert Elam

Photo Credit: Peter Moodie. Art: George Gregory

ON WEDNESDAY AUGUST 3RD Lyncrest airport was privileged to welcome the Vimy Flight group to our airport. The group consisted of Allan Snowie team lead and his wife Cynthia, Dale Erhart lead pilot and his wife Laurel, Larry Ricker pilot and his wife Lucy, Will McEwen pilot, Gordo Cooper pilot and Dan Daigle pilot/mechanic. The Nieuport 11's were trucked to Winnipeg to avoid the long flight from Ontario over inhospitable terrain; even in a modern day plane this could prove to be quite the challenge.

The first stop on the agenda was to offload one of the Nieuport 11's at the Royal Aviation Museum of Western Canada, where it would remain on static display and serve as a back drop for daily talks by Dale Erhart. The remaining three Nieuports were delivered to Lyncrest where re-assembly to flying condition began. The goal was to have the aircraft ready to fly over the museum Friday, Saturday and Sunday at 11 a.m. to highlight the presentation given by Dale. Led by Allan Snowie Larry Ricker and Will McEwan, a small group of volunteers consisting of local COPA, EAA and RAA members, a few local Air Cadets and Sturgeon Heights school students assisted in getting the first two aircraft assembled and ready for flight by Thursday evening. While days at Lyncrest were spent readying the aircraft for flight, Cynthia, her sister Lucy, and Laurel were busy selling Vimy Flight merchandise to help fund this largely self funded venture.

Manitoba has been blessed with one of the best flying summers in recent memory, but during the Vimy Flight's stay it was extraordinary. Every morning we were greeted with bright blue prairie skies and calm winds that persisted all day. When flying a kite that weighs less than most aircraft's useful load these conditions are not only important but necessary. Every day the 11 o'clock sorties went off without a hitch and provided ample time for some practice flying. The professionalism of Allan, Larry, Will, Gordo and Dan was amazing. Whether they were planning for a flight, reassembling the aircraft, or just interacting with the many veterans and cadets, students or aviation enthusiasts, they gave it their undivided attention. The highlight for us was the Lyncrest annual BBQ held on Sunday; we had one of our largest turnouts, not only in people, but in planes as well. In addition to the Vimy Flight, we had a contingent from the BCATP Brandon Museum, a local Sopwith Camel and a few other private warbirds that graced our field that Sunday. Allan gave an impromptu presentation during the BBQ and a couple of students who had been to Vimy Ridge were called upon to give their impressions, and to say that the crowd was moved is an understatement.

The mission of Vimy Flight was to recreate the original 1936 over flight of the monument and to pay homage to our brave veterans of the air and bring this message to all Canadians. Allan, Dale and Larry gave very moving presentations of the importance of Vimy to Canada as a nation. They also highlighted the importance that aviation played in that important battle. Without the maps that aerial reconnaissance supplied, the battle may have had a different outcome. They also pointed out that the average life expectancy of a WW I pilot was actually shorter than that of a soldier in the trenches. Not all was gloom and doom; they did interject a few of the lighter moments of aerial combat. They combined it all with the stories of their own journey to France, the hospitality they received and the high regards in which Canadians who sacrificed it all are still held.

It was with great sadness that we watched them depart for Brandon on Tuesday morning accompanied by two of the aircraft from Brandon BCATP museum, a sight

Bowen LeMay

Chris Black

likely never to be seen again. Watching these great machines being flown with such precision and professionalism was amazing, but to hear the stories as told by Allan, Larry and Dale brought it all together. If you are at all an aviation enthusiast or historian I urge you to go to their website http://www.vimyflight.ca/home2.html and watch for the upcoming film trilogy A Nation Soars http://www.anationsoars.ca/ **R**

Standing, l-r; Cynthia Snowie, Gordo Cooper, Bowen LeMay, Donna Prowse, Dan Dangle and Mark Odegard; front row (kneeling sitting): Dale Erhart, Will McEwan, Al Snowie, Lucy Bernier and Larry Ricker.

Peter Moodie

Chris Black

Chris Black

Peter Moodie

Above, left and centre: a pair of Pietenpols graced the event; Right, FV 725 is the Commonwealth Air Training Plan Museum Cornell returning to Lyncrest with Mark Odegard and John Blackner.

THE BATTLE OF VIMY RIDGE was pivotal in the recognition of Canada as a nation, rather than as a colony, so a group of Canadian military and airline pilots decided to celebrate the 100th anniversary of that event. Dale Erhart, Larry Ricker, Peter Thornton, Paul O'Reilly, Will McEwan, Dave Wilson, Rod Erman, Al French, Gord Cooper, and Alan Snowie obtained a collection of replica WW1 aircraft that had been built by a group in Oregon, and made elaborate plans to fly at Vimy France. The RCAF shipped their four Graham Lee Nieuport 11's, two Sopwith Pups, and an SE5-A to France in the hold of a C-17 Globemaster, and the pilots made their celebration flight over Vimy on April 6th.

Once back in Canada the group began a rigorous schedule of flights to celebrate Canada's 150th anniversary, beginning in Atlantic Canada and then Quebec, with fourteen planned flights before arriving in Ottawa for the Canada Day celebrations. The next stops were Toronto, Burlington, and then to Guelph which is the home of Dr. John McCrea who wrote "In Flanders Fields". The pilots were celebrated at Guelph Airpark with an address by the mayor, followed by an impressive flypast of their Nieuports over the twin spires of the Our Lady of Immaculate Conception Church. With little time to rest the intrepid pilots were off to London for that city's event.

Such a rigorous schedule would take its toll on any group of aircraft, and it must be borne in mind that these replicas are actually ultralights with a wing loading of perhaps 5 pounds per square foot, half that of a Cessna 150 that has a crosswind limit of 13 knots. With the need to maintain a schedule it is not surprising that there were some difficult moments. One occurred at Brampton a few days before Canada Day when Gord Cooper's Nieuport got blown by a gust and ended up on its back, fortunately without injury to Gord, but with damage to the fuselage, cowl, landing gear, and wing. After a career of flying F-18's and Boeings it was disconcerting to have an incident like this, but fortunately it happened at Brampton, home of RAA Chapter 41.

President Fred Grootarz sent out a request on Ian Parson's email hotline, asking for assistance to repair the damaged Nieuport. The plane was installed in the chapter's hangar, and members immediately pitched in to help. John Weatherseed did a masterful job of hammering the spun aluminum radial cowl back into shape. Mike Shave, Chris Pulley, and many others chased materials, cut and fitted landing gear parts, formed and installed a new lower longeron, repaired fabric, and made new cables. Because of the need to be in Winnipeg by August all work was performed under the gun. Finally all repairs had been effected and Gord did runups in front of the Chapter 41 hangar. The dismantled plane was trucked to Burlington where it was loaded into a truck for shipment, and this member of the Vimy Group was back in business. The icing on the cake was that the chapter generously waived the usual hangar rental fee as further support of the work of these pilots. Gord Cooper then put RAA decals on his plane to show his appreciation of the RAA membership. Next stop, Winnipeg!

Gary Wolf

Safety

In The Zone

New Watered-down Recreational Drone Regulations / by Gary Wolf

IN MARCH 2017 the Minister of Transport was on CBC news explaining the interim order that would govern recreational drone use. This order was meant to keep drones out of the 5 nm zone of all aerodromes, including farm strips and water aerodromes. It also limited their maximum altitude to 90 meters, so 300 ft. A recreational drone was forbidden to come closer than 75 meters from buildings, vehicles, vessels, or people, and the operator must maintain line of sight, day VFR and not in cloud, at a distance of no more than 500 meters from the operator. Entry into controlled or restricted airspace was forbidden, and every recreational drone became required to carry the name, address, and phone number of the operator.

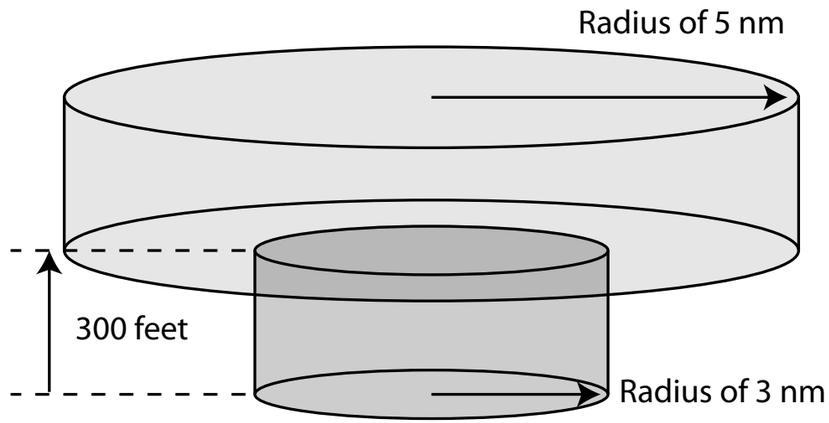
The April 2017 Toronto region Nav Canada meeting presented the same information but in the room were several representatives of drone manufacturers or clubs. Sometime after that meeting Transport was approached by lobbyists for recreational drones and TC performed a risk assessment, the result of which is that recreational drones may now fly within 3 nm of an aerodrome, with the same ceiling of 300 ft as the April order. Essentially this turns every uncontrolled aerodrome's airspace into an inverted wedding cake, including the zones of Mandatory Frequency airports.

On the face of it, narrowing the sterile area of an aerodrome's zone could seem to be reasonable. The justification given in the risk assessment is that aircraft do not fly at 300 ft, at 5 nm from the centre of a zone. However there are a few concerns.

A quick search of the daily occurrence reports shows that in the past three years there have been some 500 reports of drones flying at illegal altitudes and in controlled airspace. Here are two typical examples:

A British Columbia Helicopters Robinson R44 II (C-FAYQ) reported seeing an unmanned air vehicle (UAV) flying South Bound at approximately 1700' inside the control zone at around 4NM to the NW of Abbotsford, BC (CYXX). The helicopters was flying North Bound at 1000'. The Tower reported the incident to the Abbotsford police.

TSB Report# A17O0079: C-GGOK, a de Havilland DHC-8-402 aircraft operated by Jazz Aviation Lp, was conducting flight JZA8975 from Montreal/Pierre Elliott Trudeau Intl, QC (CYUL) to Ottawa/MacDonald-Cartier Intl, ON (CYOW). During the final approach to Runway 07 at 1500 feet AGL, the flight crew briefly observed an unmanned aerial vehicle (UAV)



at their 11 o'clock position, approximately 4.2 nautical miles from the threshold of the runway. The pilot flying made a small roll input as an evasive manoeuvre and the UAV passed just under the left wing of the aircraft. There was no damage to the aircraft, and no reported injuries to the occupants.

It is not enough for Transport Canada to make an announcement on CBC TV, or to print out handouts to be given to pilots. We are not the group that needs them. Recreational drone owners are typically young people who do not watch CBC news; they do not know that Transport Canada even exists, nor do they know that there are any federal regulations that govern their hobby. The occurrence reports have clearly shown that drones regularly fly at illegal altitudes and in controlled airspace. Their owners just do not know what controlled airspace is, and they appear to have no concerns about flying high enough to mix it up with the real airplanes. Despite this evidence the drone lobby was successful in narrowing the zones of aerodromes, with the hollow promise that drones would stay below 300 ft. Transport Canada does not have the manpower to assert control over airspace by recreational drones nor do they or the police have any simple means to determine altitude with the accuracy required for prosecution. The inverted wedding cakes will inevitably become de facto 3 nm cylinders.

The occurrence reports have clearly shown that drones regularly fly at illegal altitudes and in controlled airspace.

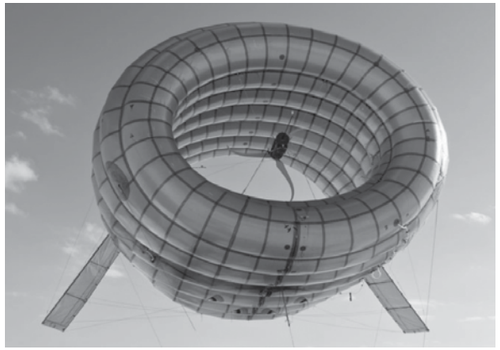
In the seventies and eighties the unlicensed and unregulated ultralight movement took off while Transport sat back and let it grow too large to reel in. They finally wrote regulations but had little chance of enforcing them, and they are now doing the same with recreational drones.

Recreational drones are equipped with GPS and it is possible for a manufacturer to program the machines to remain outside of control zones and to have a ceiling of 300 ft. Unfortunately any manufacturer that does this would lose sales. What it is going to take is for Transport Canada to step up to the plate to require that all recreational drones sold in Canada be programmed with the 300 ft ceiling. While they are at it the manufacturers could also program them to remain outside of every aerodrome's zone. All registered aerodromes have the necessary information in the CFS so this is not impossible. That would still leave the unregistered aerodromes out in the cold but at least the majority of aerodromes would be protected.

Safety

Blowing In The Wind

If you think wind turbines are a problem for pilots and small aircraft, read on / by Dan Oldridge



THERE IS A NEW DEVELOPMENT on the wind energy front for pilots.Airborne wind energy systems could be more of a threat to small aircraft than ground-based wind turbines currently are.

What is Airborne Wind Energy?

So far there are three main options for airborne wind generators. The first involves a shrouded turbine that work similar to conventional wind turbines but makes use of wind at altitude.

This option is ideal for remote locations when temporary power and quick set-up is required, such as an expedition into wilderness areas.

The second method uses a tethered kite or aircraft that is reeled in and allowed to be pulled out by the wind to turn a generator.

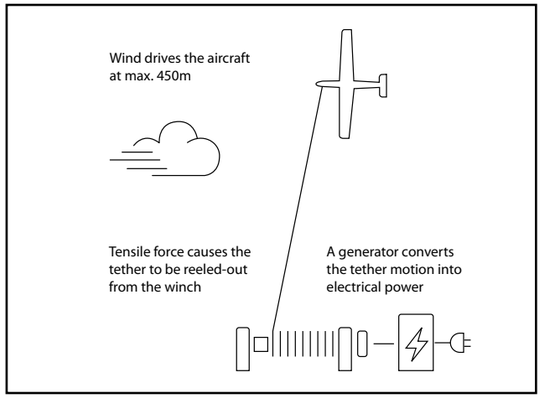
The second option is a more permanent installation requiring more advanced mounting and control mechanisms on the ground.

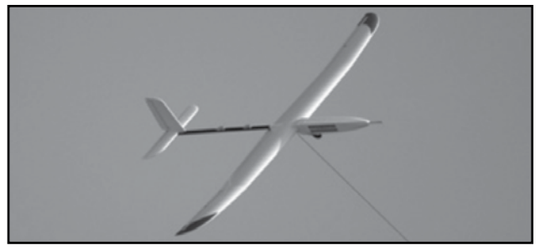
The third option is a fast motion tethered system that uses the cross-wind action of the wind to generate power. This is the one I will focus on in this article as it could present the highest risk to pilots of small aircraft in the near future.

This form of airborne wind generator uses a tethered aircraft that moves in a large swept area at an altitude of up to 450 meters, where the wind is much stronger and more consistent.

On the opposite page is a basic illustration and a photo of the actual airborne wind energy system known as the PowerPlane. To see this concept in action check out this video link… https://youtu.be/5azHRiZyC4U Here's another one in the EU https://www.youtube.com/watch?v=30iQG9nYDWk

The ground foot print is very small for these installations, but the volume of space occupied by these devices is massive compared to ground based





Left, a basic illustration and (above) a photo of the actual airborne wind energy system known as the PowerPlane.

wind turbines. Imagine a dome of sky almost one kilometer across and almost one half kilometer high that has a steel cable and unmanned aircraft darting back and forth across it. Now imagine a whole wind farm made up of several of these things darting around the skies …YIKES!!! I don't know about you, but I don't want to get anywhere near those things while I'm flying my small plane around!

In 2013, Leo Goldstein wrote an article, Theoretical Analysis of an Airborne Wind Energy Conversion System with a Ground Generator and Fast Motion Transfer.

The abstract reads; "A novel airborne wind energy conversion concept is presented, in which the wind power, which is harvested by the crosswind motion of a tethered wing, is transferred to a ground-based generator by a belt with a high speed close to the speed of the wing. The belt trails behind the wing. The high speed of the motion transferring belt results in a low belt tension, a high rotational speed and a low torque on the shaft connected to the rotor. The theoretical analysis and numeric calculations, which consider the drag of the tether and the weight of both the tether and the wing, demonstrate the practical feasibility of the concept. Two practical constructions are described, one with a single wing and one with two wings in counter phase. The economic analysis shows that the proposed system is 10 times less expensive than a conventional wind turbine with a comparable average power output."

Just four years later, working prototypes have demonstrated that this device can actually generate more power than a conventional wind turbine and use 90% less material to build. This will be a game changer for utility companies trying to generate low cost electricity; in fact it could allow generation of electricity at a lower cost than natural gas, mostly because of the low installation and maintenance costs.

High altitude wind energy can be captured by kites, balloons, kite/balloon combinations, tethered gliders, tethered sailplanes, bladed turbines, airfoils, airfoil matrices, drogues, variable drogues, spiral airfoils, vertical axis turbines, spinning cylinders, multiple-rotor complexes, fabric para foil kites, piezoelectric materials and many more designs. But the design that seems most likely to get funding and perform the best appears to be tethered gliders or sailplanes.

Not only was that analysis proven sound, this 'theoretical analysis' is now reality with several working prototypes. Imagine where wind energy will be in another four years. I expect that we will see the first airborne wind systems sending electricity to the grid by then.

To illustrate my point, there are no less than two dozen companies cultivating this technology now, but many will require outside funding in order to speed up the research and development processes. However, some of the companies working on airborne wind energy are heavyweights with almost limitless funding, including Google. This article from 2015 illustrates this fact. http://www.theverge.com/2015/3/17/8236723/google-x-makani-project-wind-turbine-planes

Science Direct reports; "Makani has developed and tested a 8m, 20kW demonstrator, called 'Wing 7' that showed the capability of fully automatic operations and power production. After these results, in early 2013 Makani was acquired by Google. Makani is currently developing a 600 kW prototype, 'the M600'. The M600 AWT has eight turbines, each with five propeller blades, and has a wingspan of 28 m. The prototype is now undergoing testing. After M600, Makani plans to produce an offshore commercial version of AWT with a nominal power of 5 MW featuring 6 turbines and a wingspan of 65 m".

Development of this technology is unstoppable at this point. These things will be flying en-mass in the not-to-distant future as part of a worldwide move toward low cost renewable energy sources. The questions of where they will be deployed and how they will impact aviation have yet to be answered.

Mark Moore of NASA said in an interview in December of 2010, "Offshore deployment of these airborne systems probably makes the most sense in terms of both airspace and land use, because there is little to no demand for low altitude flight over oceans 12 miles (19 to 20 km) offshore. Also, unlike ground-based turbines, there is almost no additional cost for airborne systems offshore because huge platforms are not required to support the structure or resist large tower bending moments".

Let's hope that the opinion of the experts at NASA influences the US decision on where to position these devices. Maybe the Canadian government will follow their lead and put these things offshore where they will not create a significant hazard to aviation. Governments around the world are under increasing pressure to meet the Kyoto Protocol by moving away from dirtier technologies and this has the potential to deliver large amounts of clean renewable energy at as little as $.02/kwhr.

Although this will be a game changer for energy generation, improperly placed on the terrestrial landscape it will create havoc for pilots of small aircraft operating in the vicinity of these wind generating devices.

Although this will be a game changer for energy generation, improperly placed on the terrestrial landscape it will create havoc for pilots of small aircraft operating in the vicinity of these wind generating devices. If you think the large spinning disk of a wind turbine is a hazard to aviation, just imagine what hazards these new tethered aircraft operating up to 1500 ft. AGL will create. It will be interesting to see how this unfolds and how organizations like AOPA and COPA deal with the potential hazards created by this new technology.

We already know that the government's track record at adopting new legislation to deal with these risks is lagging behind by many years and in some cases it seems decades. A search of the Transport Canada and NavCan websites reveals that airborne wind power systems are not even on their radar yet. If they are, it appears neither one is commenting on them.

I suspect that when these new airborne tethered wind generators are deployed, there will be a lot of confusion about safety issues surrounding them. We are just starting to get an understanding of the vortices that trail behind wind turbines, but I doubt we will have much information about the wind shear created by the moving vortices behind tethered devices for some time yet as the technology develops.

I am as much in favour of low cost sustainable energy as the next guy, but I truly hope they are deployed in a responsible manner, unlike the ground-based wind turbines in Ontario that almost shut down airports and created on-going hazards for several other smaller airstrips. Our only hope as pilots is that these things don't proliferate uninhibited even faster than wind turbines and drones have over the last decade, but given their relatively low cost of manufacture and deployment, I'm not hopeful on that front. Our provincial governments are so hungry for revenue and clean energy solutions at lower cost than presently available, I am concerned that unchecked these things could render much of our skies un-flyable within a decade or two.

To learn more about the technology go to: https://www.ampyxpower.com/technology

Note that Ampyx has started the design of its first commercial product: a 35m wingspan AP-4 PowerPlane (scaled up version of the one in the earlier photo) with a 'wind turbine equivalent' power of 2 Megawatts. There is no doubt about it… this technology will be deployed somewhere soon!

Also check out: http://www.nearzero.org/reports/airbornewind/pdf

and: http://www.sciencedirect.com/science/article/pii/S1364032115007005

As for the impact on general aviation, time will tell! In the meantime… keep an eye out for all the other hazards we already face and fly safe!

***Dan Oldridge** is a retired firefighter who began his career in Cambridge, ON before eventually rising to the postion of senior manager in London. He is a member of RAA National and two local RAA chapters.*

We want to hear from you!

Do you have technical information to share?
Do you want to share the story of your build?
Have you had an adventure in your airplane?

Share it with your fellow members!

Contact Gary Wolf at garywolf@rogers.com
George Gregory at gregdesign@telus.net

ONLINE PAYMENTS TO TRANSPORT CANADA

Transport Canada has recently introduced an online fee payment option for many of their services. These include:

Replacement of a lost or destroyed licence, permit, or certificate
New licence or certificate
New Rating
Temporary Licence, permit, or medical certificate
Invoice for medical certificate or other invoices
Aircraft Marks
Certificate of Registration
Flight test conducted by a TC examiner
Written exams

Go to www.canada.ca/payments-air to submit the fee. Once the payment has been processed they will send a receipt and confirmation by email. All emails will include an ORDER ID which must be included as reference on application forms. The traditional methods of payment remain as before. Credit card payment may be made by phone at 1-800-305-2059. Cheques will continue to be accepted provided they are attached to the application being submitted. In the past they waited until a cheque cleared before processing an application so a certified cheque speeds the processing. Any questions may be directed to services@tc.gc.ca

Honda Fit Auto Conversions

THERE IS A LONG HISTORY of auto engine conversions in aircraft, and perhaps the earliest was the Model A in Bernie Pietenpol's 1929 Aircamper. Immediately after WW11 the German Kubelwagens became the donors of VW engines for the many little wood planes the French flying clubs built. In the seventies and eighties the Corvair and Subaru became the favourite conversions, followed shortly by the Suzuki 3 and 4 cylinder inline engines. The Suzuki 1300cc can match the Rotax 912 at 100 hp, and can be built within 20 pounds of its weight. Typically builders have been using auto engines for lighter aircraft, to replace the Rotax 912 and the Continental O-200, ie 100 hp category engines.

The game has now changed, courtesy the US automotive regulators who have mandated even better fuel economy. Cars and SUV's that used to have a 3 or 4 litre V-6 are now powered by 2 litre and smaller turbo engines that still have enough power to tow a trailer or a boat.

Honda has long been the leader in the design and manufacture of efficient 4 stroke engines and some ten years ago they introduced their 1500cc aluminum L15 inline 4 cylinder engine to North America in the little Honda Fit grocery-getter. There have been several iterations of cylinder head and fuel management but all have the same block and rotating assembly dimensions. The bore and stroke are undersquare at 73mm x 89.4 mm (2.87" x 3.52"), which results in a short fore and aft length, which means a stiffer crankshaft and shorter camshafts. Honda rates the single cam L15 A port fuel injected engine at 109 hp at 5800 rpms. Maximum torque is 105 ft-lb at 4800 rpms. The compression ratio is 10.4:1 and it runs happily on regular pump gas.

The L15 B1 130 hp version (2015 Honda Fit) of this engine has dual camshafts and Gas Direct Injection (GDI) which means that high pressure fuel is squirted directly into the cylinder, giving better control of mixture and the ability to forestall knock through the latent heat of evaporation.

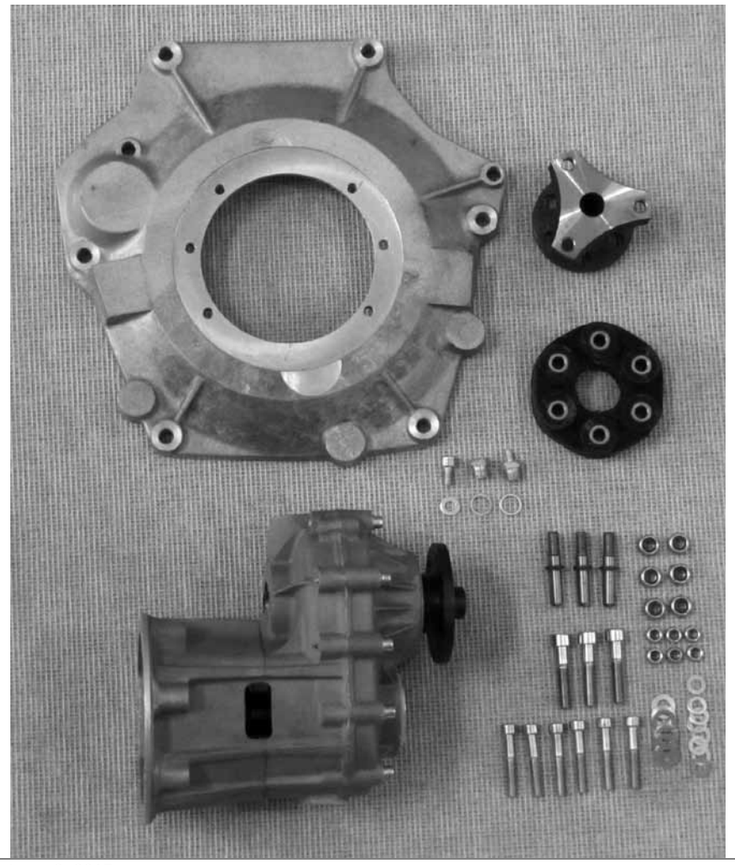
In 2017 Honda added a turbo to increase the hp to 170, and this is now the engine for the Civic sedan, replacing the previous 2 litre normally aspirated engine. It is also the base engine for the 2018 Accord. What is outstanding about the L15 B7 turbo is that the torque curve is flat, with 162 ft-lb torque from 1700-5500 rpms. For some applications this could mean direct drive.

Although pilots raise an eyebrow at automobile rpms they are actually very conservative for a modern engine, and the Honda handles these easily. Honda also uses the L15 as the power head for their 90 hp outboard motor where it is not unusual to run at full rpm for hours on end.

The L15 engines have a bare weight of 175-185 pounds, and when converted with a redrive and cooling system the all-up weight compares favourably with a Continental O-200. This is some 50 pounds heavier than a Rotax 912S but for the USA Light Sport category's 1320 pound category it is acceptable, especially when coupled with the 30-70 horsepower advantage of the Honda. The engine with alternator will fit inside a box 19" tall, 25" long, and 22" wide.

The Honda engine will require a redrive to reduce the crankshaft rpm to the 22-2700 rpm range so that the prop can have good efficiency for takeoff and climb.

There are two ways of handling the reduction - belt drive or gear drive. Raven had been building very nice HTD redrives for nearly twenty years but it looks as if they have recently left the aviation market. This is unfortunate because one of the problems of fitting an inline four cylinder is that if the engine is mounted vertically the propshaft must be near the head gasket line, if the plane's thrust line is to be maintained while keeping the top of the engine inside the cowling. A belt redrive by definition has an appreciable distance between the drive and driven pulleys, making it easy to maintain the thrust line. With a belt redrive the prop rotates the same direction as the crank so the prop turns clockwise when viewed from the pilot seat of a tractor airplane.



A 2 gear external spur redrive will have the driven gear much closer to the crank line, usually in the range of 3". If the engine is mounted vertically, the head will stick out of the cowling like a Model A in a Pietenpol. For a pusher this is less of a problem. A gear drive with a pair of external spur gears will reverse the rotation of the prop so for a tractor this means counterclockwise rotation.

When using an external 2-gear drive the usual way of dealing with thrust line is to lay an inline engine down and then clock the gearbox as necessary to centre the prop in the cowl. When an engine is laid down the oil pan and pickup will always require modification, usually a lowered sump and a repositioned pickup

There are currently two suppliers for gearboxes, Airtrikes in Montreal and Eggenfellner in the USA, who now calls himself Viking. Some may recall Eggenfellner from the Subaru days.

Airtrikes imports very well made Russian gearboxes that weigh a true 25 pounds with the rubber coupler and driveshaft plus the bellhousing. Many of these have been installed over the past fifteen years and RAA has never had a complaint about any of them. Airtrikes can supply intake and exhaust systems specific to an application, but only to purchasers of a gearbox. The best engine management system is the SDS unit from Racetech in Calgary. The builder will be on his own to design and fabricate the rest of the firewall forward components. RAA National members receive a discount on the Airtrikes gearbox for a price of US $1895 for the 130 hp SPG-3 gearbox package, and $1995 for the 180 hp SPG-4. The SPG-3 weighs 25 pounds and the -4 is 26.5 pounds, both

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Tech Tips

Chris Staines' GP-4

I WAS VERY MOVED by the number of people that thought enough of my project to travel many miles to view my current state of progress and was also impressed with the pertinent questions about some of my decisions in the build process. I humbly ask for your patience while I go a little deeper into my reasoning on the selection of this particular design and some areas that might be of further interest.

All builders select an aircraft design based on many factors and perceived uses for the completed project. I admire efficiency and elegant solutions to problems, so prior ownership of a Mooney 201 and my current Europa make sense in that both are efficient airframes. The Mooney, with a useful load of 1000 pounds, cruised at 155 knots on 10 US gallons/hour (120 horsepower) and became a point of comparison for all other designs.

I am briefly going to touch on some relevant areas of aerodynamics and why they apply to this project.

While I do not want to get bogged down in complex mathematical formulas, one equation we were all exposed to in high school physics says it all. Kinetic Energy of an object = ½ Mass x THE SQUARE of the VELOCITY. Notice the emphasis on the fact the energy of an object is directly related to the square of the velocity. What object are we concerned with? The molecules of air hitting your airframe!

The GP4 consumes roughly 6 gallons per hour when operated at about 145 knots/hour. Most builders find that the consumption increases to 12GPH at 200 to 210 knots/hour. Doubling the horsepower by doubling the fuel burn results in about a 40% increase in speed. Using the formula above, doubling the energy applied to the molecules colliding with the airframe, results in a velocity increase equal to the square root of 2 which is about 1.4. In other words, the approximate speed gain is 40%.

The idea then is not to hit and slow down those air molecules, thereby slowing your passage through them, but instead to deflect and redirect them slightly so that most of them go around your airframe, thereby decreasing the energy absorbed by a direct collision.

Many years ago I had the good fortune to see the Supermarine S6, designed by the legendary Reginald Mitchell of Spitfire fame, at the Solent Sky museum in England. It seemed inconceivable that such a sleek airframe existed in 1929, but Reginald Mitchell clearly understood that parasitic airframe drag is like death by a thousand small cuts. Everything was flush riveted and carefully faired to let the air molecules slide past with minimal disruption. It was as though he could visualise the passage of air.

It was awe inspiring to see such an immaculate attempt at drag reduction on a now nearly 90 year old design and it has forever influenced me. Similarly, at an Oshkosh seminar given by another aviation legend, Jim Bede, I clearly remember him saying the Cessna 150 rotating beacon created as much drag as the entire vertical stabilizer it sat on top of.

In building a custom aircraft, the drag you remove equates to the fuel and time on route you save. Because your range is that much better, a fuel stop on route might not be needed. Kent Paser, in his book 'Speed with Economy' shows how a carefully documented drag reduction program increased the top speed in his Mustang 2 by 49 mph, with exactly the same fuel consumption. This 28% speed increase from 175 to 224 mph would have required a 68% increase in horsepower and fuel burn.

One further requirement I had was for a tricycle landing gear. It is no secret that when comparing airframe and engine combinations that are essentially the same, except that one is a tricycle landing gear and the other a tailwheel aircraft, the first is without exception slower for a given power setting. The high velocity airflow from the propeller hitting the nose gear causes considerable drag as it is again proportional to the square of that much higher airflow velocity. A retractable nose gear was therefore a requirement.

The attraction then of the GP4 was the fact it is a very low drag airframe with a low cross sectional area optimised for economical long distance travel. Additionally, being of wood construction, it is light.

Parasitic drag reduction leads to an increase in speed for a given amount of propulsive force. The gift we receive from this is that the induced drag, that is the drag from the wing generated lift, DECREASES with increasing velocity. This counterintuitive statement is perhaps best understood by realising that as the aircraft slows, the angle of attack has to increase to generate the same amount of lift. We are all aware that the threat of wake turbulence is greatest when an aircraft is in the landing configuration. In other words it is flying slowly with the wing at a high angle of attack and a massive wingtip vortex is created as high pressure air slips from under the wing tips. The massive amount of energy involved in generating these vortices increases the drag from the lift generating wing. There is a mathematical way of explaining this but this example helps to visualise the effect. The bottom line is that the induced drag decreases with the SQUARE of the VELOCITY. Simply put, you get a bonus for going

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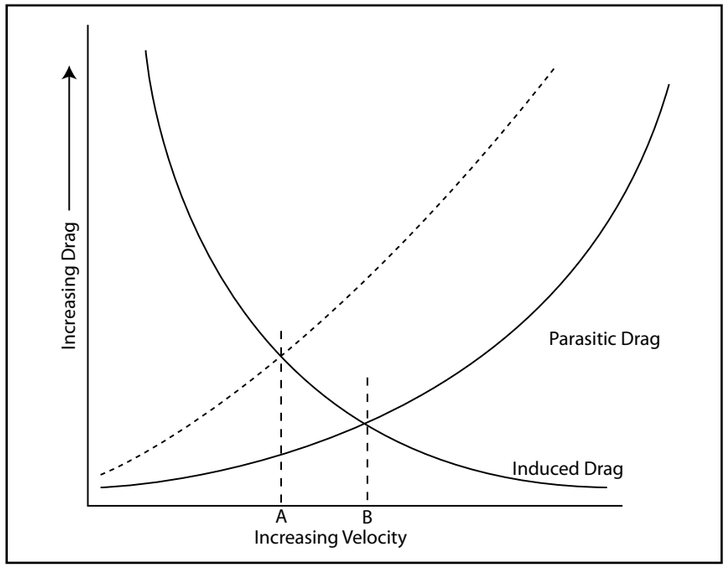


Stampe On A Diet

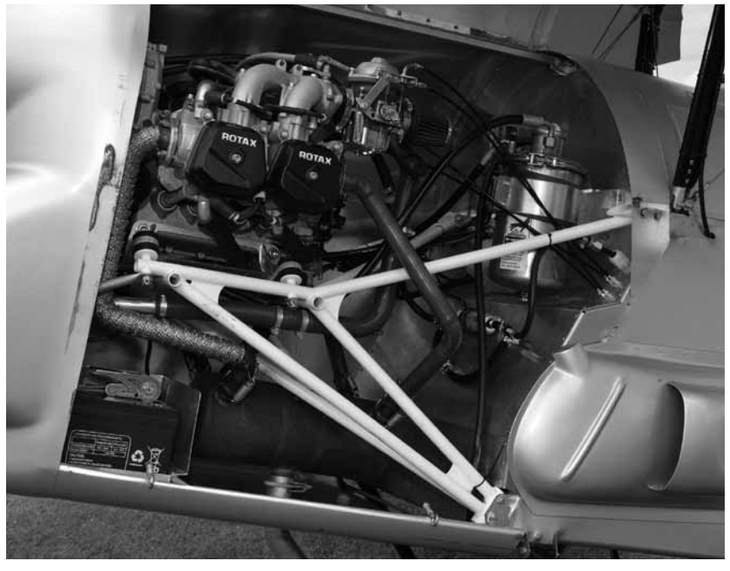
BELGIAN-BUILT SV-4RS ULTRALIGHT IMITATING THE REAL THING

By Stephan DeGraef

IN THE POST-WORLD WAR II-YEARS the Belgium-designed but France-built sleek Stampe-Vertongen SV-4C open-cockpit bi-plane training-aircraft was in vast use by the French armed forces. Constructed under-license by SNCAN (Societe Nationale de Constructions Aeronautiques du Nord) and the Algeria-based Atelier Industriel de l'Aeronautique d'Alger, some 940 aircraft saw operational service within the various (North Africa-located) elementary flying schools of the French Armee de l'Air (AirForce), Aeronavale (NavalAviation) and ALAT / Aviation Légère de l'Armée de Terre. Similar to the pre-World-War II A-variants, these C-models were equipped with a 140hp Renault 4-P engine. Simultaneously the 'Service de la Formation Aeronautique de la Direction General de l'Aviation Civile' (Civil Aviation Directorate's Training Center) operated SV-4's in their various 'Centres Nationaux de Vol à Moteur' for initial aerobatics- and instructor-training, spread all over France.

The excellent flying characteristics and easy maintainability of these biplanes triggered the French 'Service de l'Aviation Légère et Sportive' (Light and Sport Aviation Directorate) to offer the widespread and omnipresent SV-4's to various aéroclubs at bargain prices. The future of the SV-4C as France's dedicated civilian training aircraft seemed settled forever; however, the unstoppable quest for technical and performance enhancement—and the availability of more advanced and better-equipped general aviation and training aircraft—quickly made the old biplane obsolete for training-purposes. Luckily, a revived interest in vintage-aviation and nostalgic 'compass and stopwatch'-based flying in France and all over Western Europe made the (at that time) low-priced SV-4 variants a desirable flying collector item for a new-generation of private and professional pilots.

Since then, the SV-4 community is well settled within today's European vintage aviation scene with a vast



number of aircraft still flying all-over Western-Europe, witnessed by frequent well-attended Stampe-dedicated get-togethers of SV-4-owners in Belgium and France and individual attendences on a multitude of local fly-ins. On each occasion the SV-4's gather a lot of interest from aircraft aficianados and owners alike.

The increasing popularity and purchase prices of these old vintage biplanes (including Tiger Moths and Bucker Jungmanns), increasing PPL/PrivatePilotLicence-training cost and operational and maintenance expenses made these aircraft financially out-of-reach for the average pilot and family man. The 21th century's 'recreational' pilot was forced to look for more financially sound hobby-flying alternatives, gradually becoming omnipresent in Europe's skies: modern and well-equipped ultralight-aircraft.

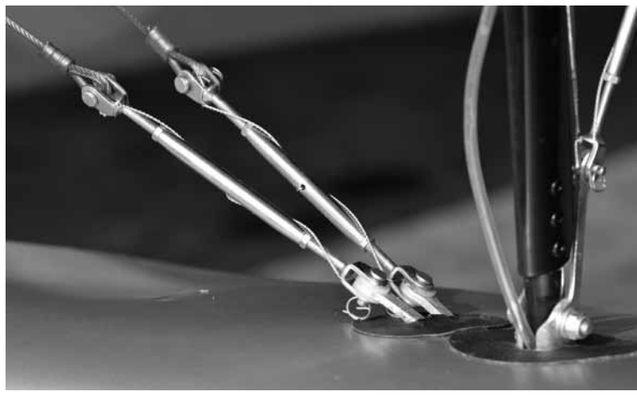
Since the conception of micro/ultralight aviation in the eighties, the development and variety of aircraft, depending on and fully compliant with the various national regulations, saw the creation of many companies offering a wide array of modern, user friendly, comfortable, well-equipped ergonomic aircraft at relatively affordable prices (at least compared with PPL-aircraft).

In the recent years the renewed quest for vintage-like affordable ultralight aircraft has triggered various small companies on a mission to develop as identical as possible replicas of the old masters. One of these niche-market ultralight-companies is Belgium-based Ultralight-Concept offering the eye-catching SV-4RS replica, based on the orginal SV-4C trainer.

SV-4RS CONCEPT

The Belgium-based Ultralight-Concept aviation company and its SV-4RS microlight biplane are the brainchild of Raoul Severin, a former experienced Belgian Army Aviation and Air Force helicopter and fixed-wing pilot. At the end of his active army career, he created his own metal-distribution company, also specialising in aviation materials. Raoul Severin's first steps within the world of ultralight/microlight aviation was the construction of a Platzer Kiebitz biplane, based on and using the plans bought from Michael Platzer. Distributing welded steel tubing, usable for Kietibz- and other amateur-build aircraft, he quickly became familiar with needs and desires of a large number of mostly German ULM aficianados. Once proficient with building self-build 'barn-made' aircraft with relative ease, the self-builder community slowly shifted to more realistic replicas of existing vintage aircraft.

Sensing business opportunies and having good contacts within the German and French amateur building scene and—most of all—willing to design and fly its own vintage-like microlight, Raoul started to conceive his own ULM/Microlight-design. In order to meet his business-plan and objectives he had to choose as his basis an easy-to-build, sleek and eye-catching airplane, as popular in Germany and France. These neighbouring countries, within driving distance of this eastern-Belgium home-base, not only witnessed an increase / *continued on page 33*



Zenith Redux

Restoring a piece of Aviation History / by Adrian Meilleur

First, A little history.

Chris Heinz designed the Zenair 100 Monoplane Z in 1974 as a prototype for a kit plane which was narrow enough to be built in a single car garage. Chris Heinz' partner, Gerald Boudreau built NYM in their factory as a prototype so it was classified as a homebuilt and precision built. Chris Heinz conducted the first flight in May 5, 1975. I have Chris's original drawings with his notations and original weight and balance still intact, along with other archival documents. When the plane was completed it was given the Canadian aircraft identification C-GNYM.

Chris Heinz flew the plane across western Canada and to Oshkosh several times, promoting his kit planes. Eventually he sold NYM to Joe Hendrick. Joe painted NYM blue, changed the engine, and flew NYM out of Burlington, ON airport for a few years.

Victor Baldour purchased NYM and brought it to Manitoba in 2003 from Burlington Ontario on a motorcycle trailer.

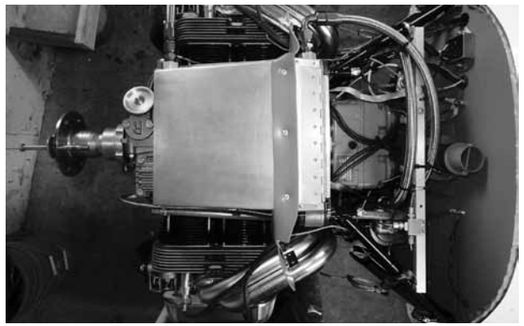
Bill Tee and other original RAA members fondly recall flying NYM when it was based at the Brampton airport. Soon after NYM arrived at Lyncrest Airport, Bill Tee emailed Jill saying how wonderful it was to fly - his signature is in the journey log, and Bill has been in contact with me and is thrilled to know its flying again.

Vic parked NYM at Lyncrest in 2003 when he first brought it to Manitoba, he flew it a few hours and moved it out to Silver Falls and then in 2006 moved it to Lac du Bonnet where he flew it a few more hours and then it sat at Lac du Bonnet for several years. Jill Oakes purchased NYM, and Dennis Doersam and Vic Prefontaine helped her remove the wings and trailer it to Lyncrest in Dennis' trailer. When they were removing the wings Dennis and Vic both commented on how well built it was. NYM sat in pieces in Jill's hangar for a few years until I purchased NYM from Jill in July 2015. I was recovering from lifesaving surgery in April 2015 and decided to purchase and restore NYM to help my physical and mental recovery. The first order of business was to move the aircraft from Lyncrest Airport to my garage at home. Then began the removal and inspection of every moving part which was either labeled and bagged for further cleaning and priming to prevent corrosion, or discarded and a new part made.

Engine and all firewall forward components were removed as none of the existing including the engine and mount were to be reused.

The instrument panel had been scavenged over the years when the airplane had been abandoned at a local airport. All remaining instruments and gauges including the panel were cut out and discarded.

A replacement engine (Revmaster 2100D) was located in Grand Forks BC and bought as a core due to a burnt head, likely due to the use of Mogas. Over the next twelve months, the engine was given a completely new top end overhaul with quality parts



including new cylinders, pistons, and CNC heads with stainless steel valves, forged rockers, new springs and pushrods. The compression ratio was reduced from 9.8:1 to 8:1 with no reduction in power due to the new high performance heads.

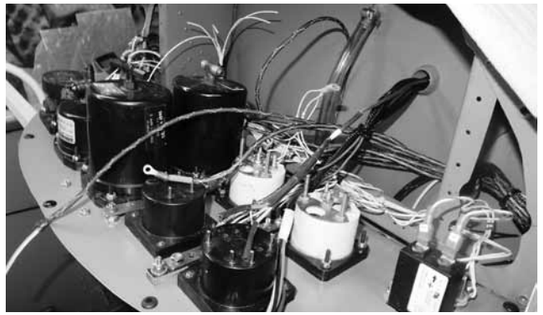
After the paint was either stripped or sanded, it was primed with a PPG two-part epoxy primer, then painted with a single stage PPG epoxy paint. All control surfaces including the wings were done in a spray booth except for the fuselage which was painted in my back yard on a calm day. The finish has a few imperfections but I am happy with the overall result and I can truly claim that all the work was done by myself without any outside help.

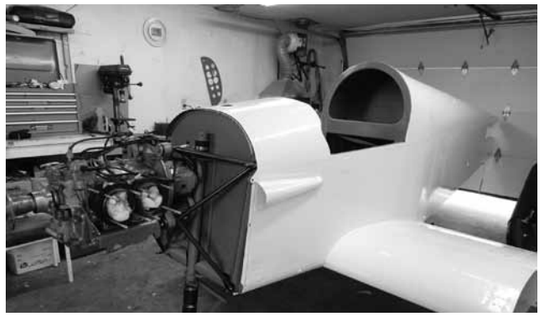
One of the most challenging aspects of the project was making a new engine mount as the pickup points on the new engine were different from the engine that was removed, as well as the length of the mount, while maintaining the required offset and pitch. The original engine did not have electrics. This new engine was tight and rubbing on the cowling so I had to modify the top and bottom cowling to accommodate the new engine, meanwhile keeping in mind that every change here meant a change in the centre of gravity due to the heavier engine. With a starter and generator as well as the addition of a remote oil cooler and oil filter with upgraded braided stainless steel hoses and fittings for both oil and fuel lines, it had gained weight. I was banking on the addition of a battery aft of the cabin in the fuselage to compensate for the extra weight forward but during the weight and balance procedure a five-pound weight was required at the tail post.

A new instrument panel was fabricated and new flight and engine instruments were installed. A wiring harness including relays, switches and breakers were installed and tested. This was probably the most enjoyable part of the project for me as everything had to be designed and built from scratch.

The landing gear was disassembled and refurbished by soda blasting all parts, and then epoxy primed. New braided steel hoses were installed and new seals were installed in the brake cylinders.

Early in 2016 reassembly began with the installation of the engine and all related components - oil cooler, remote oil filter, and braided steel hoses for all fuel and oil lines. About this time a custom wood propeller was ordered from Props Inc. who was familiar with the Revmaster engine. A new exhaust system was made up including heat muffs for carburetor and cabin heat. I also had to fabricate a new section of intake manifold to accommodate the existing carburetor and air box within the modified cowl.





About this time, I received the upholstery which was done by Ron's Upholstery in Winnipeg. This included a new seat, dash pad and baggage compartment liner panels. I have received numerous complements on the seat which is very light weight yet extremely comfortable.

I received the new prop in May of 2016 and installed whereby an initial run-up was done on the new engine. I installed tail group and control cables with new hardware ensuring everything was installed properly and in good working condition.

About this time the process with Transport Canada to obtain the necessary permits and inspections which included an Amended C of A, Major Modification Report, Flight Permit, Climb Test and final inspection by TC and signed off by an AME. I must add that the official from Transport Canada was very helpful in guiding me through the process and making what can be an arduous task fairly easy and straight forward.

In mid-June of 2016 the airplane was transferred back to Lyncrest Airport for final assembly and weight and balance. All paperwork was completed by June 30th. On July 7th 2016 C-GNYM took to the air for the first time and showed very few problems other than a minor aileron adjustment. At the time of this writing the aircraft has over sixty hours of flight time and is a real joy to fly.

I would like to thank Jill Oakes for selling C-GNYM to me and for promoting this project at every possible occasion. Also thanks to fellow RAA member Tom Stoyka for repairing the dual magneto and inspecting the carburator to ensure it was in good working order. I also would like to credit another RAA member, Bob Stewart for encouraging me to tell my story and for doing the hard work of putting it all together for this article.

Post Script

C-GNYM, a CH100 Mono Z first flew on May 5, 1975 at Brampton Airport with Chris Heinz at the controls. Pilots like Bill Tee and other original RAA members fondly recall NYM and entries in the log when Chris Heintz would let them fly it. Mr. Heintz made several trips across Canada and down to AirVenture to promote the aircraft and his other designs. Jill mentioned the restoration on Facebook and she and I have had numerous responses from aviation enthusiasts who knew NYM. They have followed NYM over

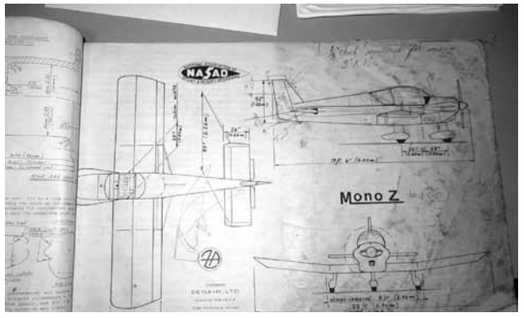
Feature

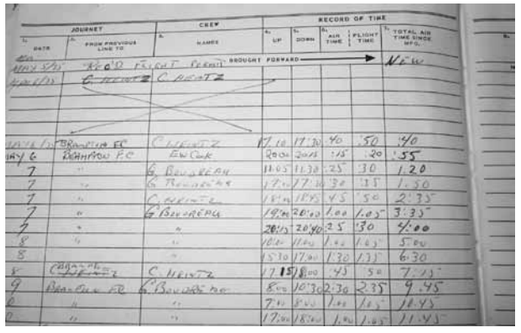
the years and have been in touch with me to encourage me during the restoration process. Old photos were provided from the Chris Heintz family archives.

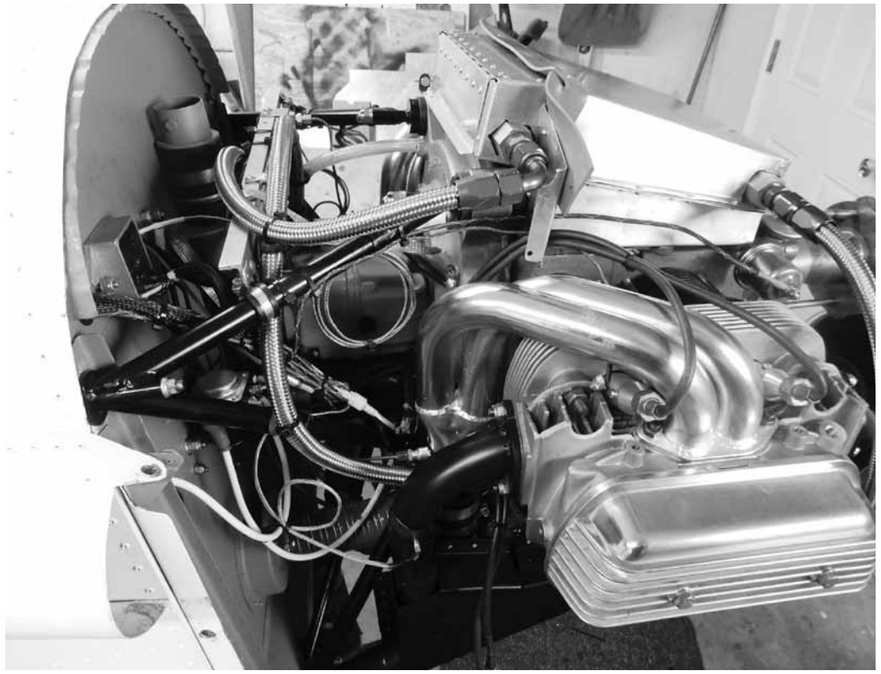
I have all the original log books, drawings with annotations by Chris Heintz, weight and balance calculations, original flight permits and letters signed by Chris Heintz to subsequent owners of NYM. At one point, the drawings show that Chris had considered flaps on NYM. CH100. NYM was one of the first Canadian designed kitplanes.

The journey log is like a diary of the Canadian story of how a one-man operation became internationally renowned as one of the largest kitplane designers and producers, second only to Van's Aircraft. Lyncrest Airport is proud to have the original aircraft Serial number 1000 hangared at our airport.

Happy Flying!







Congratulations Adrian Adrian Meilleur receiving his First Flight Plaque from Jim Oke, President RAA Winnipeg. Left, NYM's sanitary engine compartment.

A Little about CHRIS HEINTZ

An accomplished aeronautical engineer, Chris Heintz is a graduate of the E.T.H Institute in Switzerland. After serving in the Air Force, Heintz worked for Aerospatiale on the supersonic Concorde jetliner, and later became chief engineer at Avions Robin (France) where he designed several fully-certified two and four seat all-metal production aircraft.

In his spare time, Heintz began to design and build his own aircraft, which he named the ZENITH, anagram of Heintz. Being an engineer and not a craftsman, his all-metal homebuilt aircraft incorporated simple construction methods throughout. After a little more than a year's work, the two-place low-wing Zenith was rolled out and successfully flown in 1969. Soon afterwards detailed blueprints and construction manuals of the aircraft were drawn up and offered to the growing number of interested builders and flyers.

In 1973, Chris Heintz, his family and the Zenith moved to North America, where Heintz worked for de Havilland (in Toronto) as a stress engineer on the Dash 7 commuter. Chris decided to form his own aircraft company in 1974, and under the name of Zenair Ltd. started to manufacture Zenith kits himself from his two-car garage. Through the company, Heintz has introduced more than twelve successful kit aircraft designs over the years. In 1992, Heintz licensed the kit manufacturing and marketing rights to Zenith Aircraft Company for the STOL CH 701 and the ZODIAC CH 601 designs, and subsequently developed the STOL CH 801, the ZODIAC XL, and the STOL CH 750 light sport utility kit airplane.

As founder, president and chief engineer of Zenair Ltd. since 1974, Mr. Heintz has designed and developed more than 12 new aircraft models, which have been marketed as kit aircraft around the world. More than 800 aircraft are presently flying around the world in 48 different countries. Heintz designs have earned an excellent reputation among pilots, builders, the press, and aviation authorities for their durable all-metal construction, normal flight characteristics, reliability, and low maintenance requirements. With a career-long dedication to aviation, Chris Heintz is a past recipient of the EAA's coveted Dr. August Raspet Memorial Award "for outstanding contribution to the advancement of the design of light aircraft," and his designs have been honored with numerous awards around the world. In 1995 the Federation Aeronautique Internationale (FAI) awarded Zenair Ltd. the prestigious Honorary Group Diploma for "greatly contributing to the progress of aviation" and Chris Heintz was inducted into the EAA "Hall of Fame" in 1999. In 1996, Chris Heintz and Zenair Ltd. obtained FAA type-certification for the ZENITH CH 2000, a two-seat low-wing aircraft based on Heintz' kit aircraft designs.

"Pilots around the world owe a debt of gratitude to Chris Heintz whose creative engineering genius has produced the most affordable all metal production aircraft, with the largest cabin of any two seat FAA type certificated airplane on the market today. No other airplane in the world offers so much strength, stability, comfort, or operating economy. Chris Heintz has made a significant contribution towards preserving affordable airplane ownership while ensuring durable cost efficient flight training aircraft of the 21st century."

- Recreational Airplane Pilot, by Edwin Quinlan, Aviators Publishing

Chris Heintz does not only design, test and promote aircraft, he is also actively involved in all facets of general aviation as a long-time EAA member, frequently giving lectures and forums at chapter meetings and fly-ins. Heintz is also a sought-after light aircraft engineering consultant, consulting to governments, organizations, universities, and private individuals. A leading authority on light aircraft design and market direction, Heintz has worked closely with aviation authorities and organizations in developing new aircraft regulations and has been actively involved in promoting aviation (and industry) in developing countries. Chris Heintz was actively involved in promoting, developing and implementing the standards for the FAA's Sport Pilot / Light Sport Aircraft category.

While Heintz is now retired, he is still active as a designer and engineer, and has written a book on light aircraft design, titled Flying On Your Own Wings - A Complete Guide To Understanding Light Airplane Design, to share some of his expertise in the field of light aircraft design and construction.

Science of Flight

Myths about aerodynamics

By Frank Gue

DO YOU NEED TO READ THIS?

Associates who read my earlier column on this subject ("What you don't know can kill you"), in the Nov-Dec. 2003 Recreational Flyer, added several other aerodynamic "myths". It became apparent that the subject deserved a more thorough airing. This is it.

Many of us who know how to fly airplanes don't necessarily know how airplanes fly. This article is intended to address that gap by discussing myths, and is written for pilots who want to learn more about how airplanes fly. There are also safety overtones.

Each of these myths has been seen in print or heard from licensed pilots right up to the CFI level. A few of them have killed people.

Before you start:

Definition: Velocity is speed along some specific path at some specific angle - it's a vector, not merely "speed".

Reservation: These explanations ignore wind profile, angle of bank, and several other details.

Assumption: I hope we have all long since agreed that the airplane travels with respect to the air, not with respect to the ground.

Convention: Angular rotation is taken to be clockwise from true North. E.g. East is 90 degrees true.

Myth: a fable or legend that is believed by many people (Webster).

Now the myths:

Making corrections

It is not necessary to correct every deviation. A rule-of-thumb used by one veteran airline captain is: Except in an emergency, count three before doing anything. One airline captain crashed his airliner when he encountered turbulence on takeoff and used his rudder too aggressively to correct for it: he ripped off his fin and rudder.

How your aircraft turns; the rudder myth

Your aircraft does not turn by rudder action unless you can tolerate a sloppy, skidding, unco-ordinated turn, which is what rudder-only will give you. The myth is that the rudder deflects the nose and the motor pulls the aircraft in that direction, as told to me by a CFI, no less (causing me to wonder how to turn the aircraft when it is gliding, or how a sailplane, lacking a motor, turns).

In fact, however, the ailerons roll the aircraft in the desired direction; then the banked wing "lifts" the aircraft in that direction; and the tail surfaces act exactly like the feathers on an arrow, deflecting the tail in the opposite direction. As Wolfgang Langweische says in his classic book Stick and Rudder, "The rudder is there to correct the errors of the designer." The "error" is adverse yaw: the downgoing aileron creates more drag, and the upgoing aileron creates less drag, both in the wrong (adverse) direction. A touch of rudder in the desired direction will correct this, and is often mistaken to be the control that is creating the turn; this is the "myth". But in fact it is the ailerons and tail that turn the aircraft, while the rudder merely co-ordinates them. The "Frise" aileron is designed offset adverse yaw.

The Flying Flea was an exception, designed to turn by rudder only and depending upon an exaggerated dihedral angle in the huge aft wing to roll the aircraft into its turn.

Longitudinal (pitching) stability, myth #1

Even some textbooks incorrectly say that the horizontal tail surface must fly at a negative angle of attack for stability. Anyone flying free-flight models (such as the Wakefields of old) knows better; such aircraft are often trimmed with the c.g. at the trailing edge of the wing and thus some of the weight is carried by the tail, which flies at a positive angle of attack obtained by using a positive angle of incidence. And of course, the Quickie has its "tail" carrying lots of the load with its c.g. between the two surfaces.

Longitudinal (pitching) stability, myth #2

Action by the pilot is not needed to correct for routine nose-up or nose-down disturbances. Modern General Aviation (GA) aircraft are stable in pitch, which means that they will by themselves return to whatever attitude and speed they were disturbed from. This does not apply to steady up- or down-drafts such as thermals. See Myth #4.

Longitudinal (pitching) stability, myth #3

Your aircraft is not "designed to be nose heavy so that in case of an engine failure it will nose down into a glide". It will do it by itself. Try it next time you are up. At straight-and-level cruise, holding stick fixed, ease off throttle to idle. Your aircraft will nose down and settle into a stable glide at the same speed at which it was cruising (except possibly for a little change owing to thrust line position above or below the c.g.).

The same holds true if you hold stick fixed and go full-throttle; the aircraft will settle into a climb at the same speed as before. Recall ground school: the throttle is the altitude control, while the elevator is the attitude control.

Longitudinal (pitching) stability, myth #4

Your aircraft does not "nose down and speed up" to recover from a pitch upset or to avoid a stall. See myth #2 above. On entering an updraft, the wing centre of lift moves forward, tending to worsen the nose-up tendency; but the gust also increases the horizontal stabilizer lift; and since it is on a long lever arm (the fuselage) it overcomes the unwanted movement of the wing's centre of lift, keeping the aircraft level. (This applies to our usual flat-bottom wings: wings cambered upward (reflexed) at the aft 25% or so are used on heavy aircraft to enhance their stability and for other reasons.)

It is not necessary to correct every deviation.

Longitudinal (pitching) stability, myth #5

The aircraft does not have pitch stability because of a difference in angles of incidence between wing and tail "makes the wing stall first". Normally your aircraft's wing operates between about two and about four to six degrees, nowhere near the stall. Stall happens around 16 degrees for most wings, and then only (hopefully!) just at touch down.

Longitudinal (pitching) stability, myth #6

Recovery from a stall does not require that "the nose be brought back up". Different aircraft have different stalling characteristics, some mild and harmless, some vicious and deadly.

Stalls range from soft, mushing, nearly harmless (C150) to deep, irrecoverable, and fatal (early BAC111). This brings up the importance of learning (at altitude!) what are the good and bad stalling habits of your aircraft.

A stall usually drops the nose sharply, and the pilot's instinct is to haul back-stick; but that is a myth because it worsens the stall, as in the Airbus A320 Air France hull loss (329 fatalities) in the South Atlantic.

A stall is called a stall because one or both wings have stalled, therefore the aircraft must be nosed down to recover.

There is a ghastly video on the Web of a business twin on final, at just about dead-level attitude. Suddenly the left wing stalls and in about two seconds the twin rolls inverted, plunges to the ground and explodes.

Stalling speed myth

This aircraft's stall speed is ….. is a myth.

An airplane stalls when its wing passes a certain angle of attack, usually around 15-17 degrees, regardless of speed. E.g. pulling out of a loop or dive at high speed can invite a stall if the recovery is too abrupt.

The ASI can be used as an angle of attack indicator when turning. The POH will state the "stall speed" at various angles of bank. Each of these speeds represents about 16 degrees (stalled) angle of attack. Interpolate by eye. Beyond these limits the airplane is in an "accelerated stall".

A pilot should know her airplane's

stalling mode. Timely stall warning? Soft, mushy stall or sharp, sudden stall? Controls steady or vibrating? Stalls level or drops one wing?

Test it. Power all off, gently nose up until your airplane does its stall, and record how it did it.

Cessna and others, after 40+ years of nagging, are finally supplying angle of attack indicators. Until you have a late model airplane, make do with the above.

Whether instrument rated or not, you must be on the instruments

One of your most valuable instruments - the seat of your pants.

Well, after a while we all learn to fly partly by the seat of our pants, whether consciously or not, don't we?

But that valuable instrument can let us down. Here's how:

We inadvertently fly into IMC. So, we comply with our ground school instruction and do the three-Cs, Climb, Communicate, and Confess.
But: climbing needs higher power, and stick-fixed high power leads to a spiral dive, unrecognized because you've lost your horizon. RPM, ASI, and wind noise rise. Is this a spin? No, because we're not being thrown around in the cockpit and the seat of our pants says everything is OK - "down" is still the floorboards. What's going on here?

Instrument rated or not we must use the instruments to tell us we are nose down, rolled way over, and approaching V_{ne}. Cut the power, roll level, and then let the airplane do its thing; it will pull up into a zoom, which you may have to control with nose down, lest you over-stress your wings as your aircraft does this pull-up. Ignore the seat of your pants this time.

Spins: which way is she spinning?
To recover from a spin, we must apply opposite rudder. But we are, let us say, a trifle anxious and confused as we find ourselves pressed to one side and probably disoriented. So here's a handy rule we can use without wasting precious seconds figuring it out: Apply rudder in the same direction as the scenery seems to be swishing past.

Trim and stability
Some myths (e.g. stabilizer negative incidence) confuse trim with stability. Most GA aircraft fly with a small amount of negative stabilizer incidence. The pilot, when passengers and baggage are loaded aft causing nose-up, can crank in nose down trim to restore the wing to its prior angle of attack. Stability depends, not on stabilizer incidence or incidence difference, but on having a greater moment aft of the c.g. than before the c.g. That is worth repeating for emphasis: stabilizer incidence has nothing to do with stability. "The feathers must be at the back of the arrow!".

A spiral dive is not a spin
There are important differences between a spiral dive and a spin. All aircraft, left alone with stick fixed, will spiral. Some - chiefly stubby low wing designs - will settle into a spiral dive at increasing speed, a dangerous state that the pilot must correct promptly. It usually results from losing horizon by inadvertently flying into IMC or foolishly flying into very marginal conditions as JFK did. It is recognized by rising wind noise, IAS, and RPM, turning gyro horizon, altitude loss. The aircraft is not stalled.

A Cherokee, climbing stick fixed, will be in a full-blown spiral dive in 40-50 seconds.

A spin, on the other hand, forcibly pushes occupants sidewise by centrifugal force. The wing inside the turn is stalled. Loss of altitude is steady, not increasing. A spin usually results from a stall.

The foreplane of a canard is not a "stabilizer"
An aircraft must have more area aft of the c.g. than before the c.g. to be stable in pitch or yaw (roll stability is another matter). In other words, the aerodynamic centre of the airplane must be aft of the c.g.(15% of wing chord is a conventional number). Area before the c.g. is, therefore, de-stabilizing. The foreplane of a canard thus should be called a foreplane, not a stabilizer, and treated accordingly. A canard's stability and habits are dealt with separately. Briefly, a canard will ride more roughly than a conventional aircraft because the foreplane amplifies, rather than stabilizes, any jiggle in pitch.

Climbing by impulse
A fight instructor said that, upon entering a riser, an aircraft would receive an upward impulse and then, by Newton's first law[1], would continue to rise until forced to change, because "An object in motion stays in motion". This is a myth. To rise, an airplane has to acquire additional potential energy (height above ground). It gets this from extra lift, which can only come from extra speed, which in turn is developed by nosing down into the updraft, as its inherent stability says it must. Thus to rise steadily in an updraft, an aircraft must fly more nose-down than in calm air, giving it a higher speed and lift than before. If the air is not rising as fast as the airplane is sinking, the airplane simply does not sink as quickly as in calm air, which is the same result.

The "dangerous downwind turn"
Turning downwind, it is said, causes the aircraft to lose airspeed and may cause a stall.

Wrong.

Pages of mathematics explain this. Endless opinions contradict each other. All on the Web. But, more simply, do this thought experiment, for which you need only to understand elementary vectors:

You are preparing to land on Runway 27 and are on downwind due east (90 degrees) at 100 mph. You have a 10 mph tailwind at 90 degrees. Your velocity across the ground is thus the sum of your velocity through the air plus the velocity of the air mass through which you are flying, or 100 mph at 90 degrees plus 10 mph of wind also at 90 degrees. Imagine these arrows, 100 mph and 10 mph, total 110 mph, in-line, both pointed east.

You turn left base: your velocity across the ground is now 100 mph at 0 degrees (due north), plus the 10 mph crosswind, still at 90 degrees (due east); draw these arrows at right angles to each other. Join their tips.

The result is a right triangle. The hypotenuse of this right triangle is longer than either of the other two. This hypotenuse is the ground path that has to be made good. The pilot makes it good by crabbing rightward, into the wind's direction (this en-route crab has to be corrected at the last instant before touchdown to align the aircraft with the runway; however, this is a separate subject and so we proceed with our explanation of the approach and landing).

You turn final (left 90 degrees again): your velocity across the ground is now 100 mph at 270 degrees plus 10 mph of negative wind (headwind) at 90 degrees, total 90 mph at 270 degrees. You proceed to land on 27 (see the "Reservation" above). This ignores irrelevant detail such as carb heat etc.

This analysis applies to any instant you would like to consider, turning at any rate you like. That is to say, it is independent of whether you are turning. The aircraft doesn't "know" it is turning, and airspeed remains constant throughout (again, ignoring detail such as the need for increased lift in a turn; that there is a wind profile causing the wind speed to drop in the last few feet of altitude; that the wind veers[2] from ground level upward, etc.).

The optical illusion of excess speed on downwind:
Cruising at altitude, the ground below seems to be drifting slowly by. But at circuit height, and increasingly as we let down for base and final, our human-optical-land-based-human sees the ground seeming to flash by at excessive speed; there is a strong urge to back-off throttle and ease in back stick.

Wrong.

Whether instrument rated or not, you must be on the instruments! Check airspeed constantly during the approach and ensure that it does not fall below the minimum required speed. There is not much doubt that some stall-spin accidents have been initiated by this optical illusion.

We hope this has helped some of our freres de l'air!

CAV OK to you!

Notes:
(1) More formally, Newton's first law states, "Every object persists in its state of rest or uniform motion in a straight line unless it is compelled to change that state by forces impressed on it."
(2) "Veer" is a change in wind angle, clockwise in the northern hemisphere).

Frank Gue *is a Registered Professional Engineer living in Burlington. He is a published author on factory management, education, politics, and economics. He flies a C150, which he uses better to understand the theoretical basics of flight. He uses R/C models to test outrageous designs that would be too expensive for a human to test. One result is a patented hydrofoil landing gear for waterplanes.*

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fast as far as the induced drag is concerned.

The induced drag is affected by many other factors but most importantly it is directly related to the SQUARE of the LIFT. The lift, in level cruise flight, equals the weight of the aircraft. In simple terms weight is very important in terms of induced drag and by extension, performance.

Induced drag is also influenced by the aspect ratio (span/chord) of the wing. The wing of the GP4 would just fit in the length of my basement and therefore lengthening it to increase the aspect ratio for improved efficiency was not possible to any great extent.

The diagram below is simple but a picture is worth a thousand words. By decreasing the parasitic drag, the point of intersection with the curve representing induced drag, as shown in the diagram, shifts on the curve from line A to B. This point of intersection is the lowest total drag and the point of optimum airframe efficiency. Increases beyond this speed cause the total drag and fuel consumption to increase in a fairly dramatic fashion. We all know that many designs will loudly proclaim their top speed, but talk to owners and they fly at a much slower speed because the cost of going near that top speed is prohibitively high fuel consumption.

What we want is a design not with an outrageously high top speed but one with a high OPTIMUM AERODYNAMIC SPEED, the point at which the parasitic drag and induced drag coincide.

The general trend has always been to keep putting bigger engines into an airframe to get better 'performance'. With the GP4 I intend to do the opposite by using a turbocharged Rotax. This diminutive airframe is almost exactly the same size in both wing area and length as my EUROPA. When burning 6 US gallons per hour, the heavier GP4, though powered by the less efficient IO-360, travels at about the same speed. Based on this I suspect the GP4 airframe is more efficient than my EUROPA. Because of the large heavy engine and high fuel burn, both requiring larger fuel capacity, it weighs 50% more at gross takeoff weight compared to the EUROPA. Further, to offset the weight of the heavy Lycoming a large 35 ampere hour battery is placed well towards the tail of the aircraft to keep the center of gravity within limits.

I will review the approximate numbers.:

Typical mpty weight approx. 1260 lb

Engine, mount, accessories, spinner and propeller, 400 lb
Reduction in battery weight, 15 lb
Airframe weight without the above, 845 pounds

Add the complete weight of a Rotax 914 with accessories, 175 pounds

Airmaster constant speed propeller with blades, 15 pounds

Empty weight of GP4 with the Rotax 914 engine, 1035 pounds

Two people and luggage allowance 400 pounds

40 US gallons of fuel (reduced from 55 gallons) 240 pounds

Calculated gross weight 1675 pounds

The gross weight with the IO-360 is 1985 pounds and with full fuel (55 gallons) this equates to the same passenger load as shown above. The total weight saved is about 300 pounds with the Rotax 914 installation. For comparison purposes the gross weight of a Cessna 152 is 1630 pounds, with a fixed pitch propeller and a normally aspirated engine.

The Rotax 914 produces 115 HP at takeoff and 100 HP continuously up to 16,000 feet, which is the critical altitude. The altitude at which the IO-360 produces less power than the Rotax 914 depends primarily on the ambient temperature, but the crossover point is in the area of 12,000 to 14,000 feet.

The weight saving lowers the induced drag significantly as it is related to the square of the lift or weight.

The decreased gross weight lowers the stall speed by approximately 10%, which in turn lowers the energy of an off airport landing by about 20%, a safety consideration.

Climb performance with the ROTAX 914 will be less, but the EUROPA with a ROTAX 914 will climb at 1500 feet/minute and maintains that climb rate with increasing altitude. Part of this exemplary climb performance is due to the higher propulsive efficiency of the Rotax geared engines. While the mathematics is again complex, a larger propeller turning at lower rpm and moving a greater mass of air at a lower velocity is more efficient than a smaller diameter propeller at higher rpm, such as one would see with a direct drive engine.

Range with a turbocharged engine is very much dependant on altitude, but at a true airspeed of 150 knots at 8000 feet, which is very close to what I see with my EUROPA at a fuel flow of 5.5 GPH , 6 hours with a 1 hour reserve or 900 nm would seem to be achievable with the GP4. The speed difference between a GP4 with a large Lycoming engine versus the Rotax 914 at lower altitudes does not result in a great time saving on shorter trips, while the gains in speed attained at higher altitudes, say 15,000 feet where the turbocharged Rotax 914 excels, are worth the climb and significant fuel savings on longer trips. This closes the speed differential between the Lycoming and Rotax 914 powered versions of the GP4.

This has been an interesting project with many challenges and I have no doubt that there are many more ahead, but it has been an opportunity to acquire a deeper insight into aerodynamics and appreciate the brilliance of some aeronautical engineers.

Chris Staines *is the builder and pilot of a Europa powered by a Rotax 914 turbocharged engine. His GP-4 project was the feature of a recent London-St. Thomas chapter event.)*

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in homebuilding activity. Success in matching all prevailing microlight/ULM legislations and prescriptions would hugely boost the aircraft's homebuildable exposure and make it easily salable and marketable in other, more remote, countries. The decision to use the Belgium-designed vintage SV-4C biplane trainer was straightforward since a large number of SV-4 models were and are still flying all over Europe.

The kick-off of the ambituous SV4-RS project started in 2007 with the purchase of CD-ROM-stored original manufacturing blueprints of the SNCAN SV-4C-variant from the Angers (France)-based 'Espace Air Passion' museum. Based at 'Angers-Loire' airport in western-France, this museum houses one of France's most important collection of old aircraft manuals and technical archives within the country's vintage aviation community.

Gradually deciphering and remeasuring in detail all the dimensions of the original SV-4 biplane-aircraft, Raoul quickly concluded that the widely available prewelded metal tubes, used for Kiebitz-biplanes, in his possession, were of limited use. Since all 'Kiebitz'-like tubes have a standard length of five meters and the original SV-4C measures 5.15 meters, the only option to build and 'market' a 100%-scaled ultralight-replica enforced the acquisition of new sets of metal tubes and sending the available undersized tubes to the dust bin.

Correctly convinced that a smaller, 97% scaled biplane-replica would deter future customers and home-builders from buying the available kits, the decision was quickly taken to focus on a full scale replica and being the first to offer this type of ultralight in a growing pleasure aviation segment. Since Raoul was still active part-time as both a military helicopter pilot and HEMS-pilot (assigned to the 'Centre de Secours Médicalisé de Bra-sur-Lienne' HEMS-organisation based at Bra, located in Belgium's eastern Ardennes-region), the development of the SV4-RS proceeded slowly. In 2013 the first set of the replica's fuselage, ailerons and tailplane were constructed by Raoul. Soon afterwards he was contacted by the RWTH Aachen-university (aka Rheinisch-Westfälische Technische Hochschule) to allow students attending the university's "Luft und Raumfahrttechnik-Vertiefungsrichtung Flugzeugbau". (Aerospace) syllabus to use various technical aspects of the SV4-RS as the topic of their master-degree graduation-paper. The influx and technical input of these young motivated engineering students boosted the development process. The various aircraft-components were designed by these students, calculating in advance all technical and structural characteristics and limits in anticipation of future official validation. Finally in 2015 a naked, engineless SV4-RS with winged fuselage, ailerons and undercarriage was demonstrated at the 2015-edition of the AERO-Friedrichshaven (Germany) and Festival International de l'Aviation Ultralegere in Blois (France). In the aftermath of these wellknown ULM-events ten SV4-RS kits were sold at competitive 'launch'-prices to trigger the official kick-off of the SV4-RS and gain international exposure within the microlight 'business'. AERO2016 saw the presence of an non-flyable but complete Rotax912-engined aircraft.

FIRST FLIGHT AND AIRCRAFT VALIDATION

Finally, with all necessary groundtests successfully executed, the SV4-RS 'prototype' made its maiden flight on 28/12/2016 at Büllingen airfield (EBBN), close to the Belgo-German border.

Its first flight successfully completed, Raoul and his team quickly initiated the process of gaining the various official certifications in the various nations and markets of interest in Belgium, France, and Germany. At first German certification of the SV4-RS, powered by the Rotax 914, was targeted, since the verification and tests were quite elaborate in number and detail. This objective, all aspects and transparent listing of 'to do and to test' evaluations and certification criteria would enable the Ultralight-Concept crew to evaluate in depth its own design and development skills and also use the German prescriptions as basis for similar certification processes in other countries.

From February 2017, some sixty structural tests were executed—and validated by the inspectors—on the airframe and its various components (wingload, ailerons, seats, sticks, harnesses, landing-gear, etc.). To pass German microlight weight-limitation the SV4-RS may not exceeded 297.5 kilogram and a 472.5 maximum take-off weigth. For these structural testings, two complete spare fuselages and wings were manufactured and tested to their limits. Initially planned to be +4/-2G capable, the aircraft-limits were increased to +6/-3G. Every three to four weeks German inspectors travelled to Kelmis (Ultralight-Concept's homebase) to check a prepared list of aircraft components. In completion of the ground certification tests, various flights were flown by Raoul and his German university student and monitored/recorded by GoPro-cameras to certify onboard instruments such as airspeed indicators and flying characteristics, including stall testing. Finally an inspector will re-examine some of these tests during two actual testflights having full control of the aircraft during the various testing profiles, assisted when needed by Raoul Severin in the front-cockpit of the SV4-RS.

By mid 2017 fifty-two SV4-RS kits have been sold to clients in Belgium, Germany, France, Poland, Czech Republic and Lithuania.

During the Aero 2017 event Ultralight-Concept's SV4-RS replica received its German permit to fly in anticipation in having a minimum of fifteen overall flying time and successfully passing a noise-test.

Simultaneously the process of obtaining Belgian and French type-certifications have already been initiated with planned acceptance the latest late 2017.

HITTING THE MARKETPLACE

In order to be able to successfully target its SV4-RS as the only full-scale vintage biplane replica on the market, Ultralight-Concept has created a diverse set of options by allowing its customers to choose out of three 'kit'-alternatives. When deemed to be fully-able to 'self-built' the microlight by himself, a buyer can opt for 'KIT 1', including all building-blueprints, documentation and materials. Even so, an 'Ultralight-Concept'/UC-member will need to inspect the overall structure of this aircraft before applying the fabric. Once fully assembled and ground-tested, the maiden-flight will need to be flown by an UC-representative.

The more elaborate 'Kit 2'-option included all elements of the first kit to be supplemented by two four-day long workshops at the UC-hangar. During these workshops clients will be assisted in building their own fuselage, four individuals wings, wingspars and ailerons. Neverthless all clients are ought to prepare the workshops by building various components at their home (hangar) before heading to Kelmis for assistance and instruction if needed. Finally a completed aircraft, sans fabric, is offered in a comprehensive 'Kit 3', forcing the client-owner to look and install his own engine (most likely Rotax912), avionics and instrument-wiring. Whatever Kit-option chosen by the customer, all halfway-inspections need to be performed and the maiden flight flown by a Ultralight-Concept staff member.

If needed, depending on the previous PPL/taildragger-experience of the client, a small type-conversion

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including bellhousing, driveshaft, and damper unit.

Eggenfellner's Viking company has taken a different route, supplying complete converted engines and firewall forward packages. Early kits used the single cam L15 A 109 hp engine laid down to horizontal. Cooling for all Vikings is by Evans waterless coolant in a system that does not use a pressure cap. The laid down engine's oil sump was modified to lie below, with an oil return line to drain the cambox back to the sump. Later Eggenfellner eliminated the return line but without an explanation of how this would affect draining the oil from the cambox.

The early Viking engine management computer was badly programmed and did not take into account cold temperatures. Later versions were better but still required many turns of the engine before it could get a mixture to fire. Once it did fire the sound was music, a smooth quiet purr from the Viking exhaust system. The latest computer is claimed to operate properly and it backdates to the early engines.

The latest version of the Viking uses the DOHC L15 B1 normally aspirated GDI engine that was introduced in the 2015 Honda Fit. Viking now mounts the engine nearly vertically, and their new gearbox has a train of three gears to raise the propshaft to the cylinder head line. The three gears also maintain the clockwise rotation of the engine. The 130 hp normally aspirated converted engine sells for US $10,000 and the firewall forward package adds another US$8000. Add $6000 for the L15 B7 turbo version. Viking uses as-pulled engines from damaged cars so while the conversion parts will be new, the engine will have some miles on it. It did take a string of emails to determine that the engines are not new.

There are several online Honda Fit and Viking newsgroups, some offering praise and some with critique. It is well worth reading these. Just google "Honda Fit aircraft engine."

Another way to convert the Honda is to find a used Raven HTD redrive and adapt it to the Honda, as Kasper Naef of BC did for the L15 A in his Rans floatplane. He mounted the engine vertically, cut the original intake manifold apart and rewelded it to place the intake plenum below the head gasket line, and used an SDS computer for engine management. He previously had the redrive on his Suzuki 1300 to which he then added a turbo. The Fit engine rivalled the power of the turbo Suzuki 1300.

Would you like to build your own conversion? Japan Auto Parts in Toronto has low mileage 109 hp L15 A long blocks in stock at CDN $900. The 130 hp GDI L15 B1 long block is CDN $1200, and the 170 hp L15 B7 long block with turbo is $2500. The GDI engines can retain the original intake system, meaning that only an exhaust muffler and engine mount need be constructed.

www.airtrikes.net is the site for Airtrikes' SPG gearbox

www.vikingaircraftengines.com

This site is a gold mine of photos of installations, horsepower and torque graphs, and thrust comparisons. If you subscribe to their email list they will send you a promotional email every day and you will never be lonely.

Japan Auto Parts brucew@japanauto-parts.com 800-668-6362

www.sdsefi.com is the site for Simple Digital Systems engine management systems, with many photos of installations.

Stampe / continued

instruction flight is given by Ultralight-Concept to demonstrate the various flying and landing characteristics of the SV4-RS. By mid 2017 fifty-two SV4-RS kits have been sold to clients in Belgium, Germany, France, Poland, Czech Republic and Lithuania.

The future SV4-RS flyer and builder is on average in its early/mid-sixties and the planned 'from scratch to first flight-building time of about.1.000 manhours (depending on the Kit-selection), the first SV4-RS replica-biplanes may well take the air in 2019.

Future aircraft options are the availability of a SV-4B-model close canopy and a glider-tow connector underneath the aircraft. Later on two additional engines will be certified on the SV4-RS.

The current (and steadily increasing) operating cost of PPL-general aviation flying and new more stringent national regulations (especially. medical evaluation) may well see a shift on present and future 'weekend flyers' to the microlight segment. Time will tell if Ultralight-Concept of putting an '100% scale vintage aircraft'-replica into this market, occupied by young pensioners with a budget and some handiness will be an overall success. The successfull marketing and sales of fifty-two SV4-RS may well be a hint for the ultimate answer....'

RAA Chapters and Meetings Across Canada

The following is a list of active RAA Chapters. New members and other interested people are encouraged to contact chapter presidents to confirm meetings as places and times may vary.

ATLANTIC REGION

HAVELOCK NB: Weekly Sunday morning get together year round, all aviation enthusiasts welcome. Havelock Flying Club - 25 mi west of Moncton. Contact Sterling Goddard 506-856-2211 sterling_goddard@hotmail.com

QUEBEC REGION

COTE NORD (BAIE COMEAU): Meeting times to be advised. Contact Pres. Gabriel Chouinard, 418-296-6180.

LES AILES FERMONTOISES (FERMONT): First Sunday 7:30 pm at 24 Iberville, Fermont. Contact Pres. Serge Mihelic, 418-287-3340.

MONTREAL (LONGUEUIL): Chapter 415, Meeting in French second Wednesday at 8 pm, at CEGEP Edouard Montpetit 5555 Place de la Savane, St. Hubert, PQ. Contact president Normand Rioux at NRIOUX@lapresse.ca or J-F Alexandre info@raa415.ca

OUATOUAIS/GATINEAU: Every Saturday 9:00 am to noon at the restaurant l9Aileron in the airport terminal. Contact Ms N.C. Kroft, Gatineau Airport, 819-669-0164.

ASSOC DES CONSTRUCTUERS D'AVIONS EXPERIMENTAUX DE QUEBEC (QUEBEC): Third Monday 7:30 pm at Les Ailes Quebecoises, Quebec City Airport.

ASSOC AEROSPORTIVE DE RIMOUSKI: First Saturday at 9:00 am, La Cage aux Sports, Rimouski. Contact Pres. Bruno Albert, 418-735-5324.

ASSOC DES PILOTES ET CONSTRUCTEURS DU SAGUENAY-LAC ST JEAN: Third Wednesday 7:00 pm at Exact Air, St Honore Airport, CYRC. Contact Marc Tremblay, 418-548-3660

SHERBROOKE LES FAUCHEURS de MARGUERITES. Contact Real Paquette 819-878-3998 lesfaucheurs@hotmail.com

ONTARIO

BARRIE/ORILLIA CHAPTER 4th Monday of the month at 6:00 PM at the Lake Simcoe Regional Airport for the months of June, July & August (BBQ nights) For other months contact Dave Evans at david.evans2@sympatico.ca or 705 728 8742

COBDEN: Third Thursday of the month at the Cobden airfield clubhouse 20:00 hrs. Contact Bob McDonald 613-432-8496 or bobkim.mcdonald@gmail.com

COLLINGWOOD AND DISTRICT; The Collingwood and District RAA, Chapter 4904, meets every first Thursday of every. month, at 7:30 PM except July and August, at the Collingwood Airport or at off-site locations as projects dictate. The January meeting is a club banquet held at a local establishment. For more information contact Pres. Skip Reeves 705-429-5154

FLAMBOROUGH: Second Thursday 8:00 pm at Flamborough Airpark. Contact Pres. Karl Wettlaufer 905 876-2551 or lazykfarm@sympatico.ca

KENT FLYING MACHINES: First Tuesday 7:00 pm at various locations. Contact President Paul Perry 519-351-6251 pkperry@teksavvy.com

KITCHENER-WATERLOO. Meetings are on the second Monday of each month at 7:30pm upstairs at the Air Cadet building at CYKF except during the summer months when we have fly-ins instead.
Please contact Dan Oldridge at kwraa@execulink.com for more information or visit our newly expanded website at http://www.kwraa.net/.

LONDON/ST. THOMAS: First Tuesday 7:30 p.m. At the Air Force Association building at the London Airport. Contact President Phil Hicks p.hicks@tvdsb.on.ca 519-452-0986

MIDLAND/HURONIA
Meetings: first Tuesday of each month, 7:30 pm, at the Huronia Airport terminal building (CYEE). Contacts: President Rob MacDonald - 705-549-1964, Secretary Ray McNally - 705-717-2399, e-mail - raamidland@gmail.com E-mail – raa.midland@gmail.com .

NIAGARA REGION: Regular meetings occur the second Monday of every month at 7:30pm in the CARES building at St. Catharines Airport (CYSN). During the summer months though, June-September, meetings take place the second Monday of those months at 5:30pm in Hangar #4 at Welland Airport (CNQ3). Contact Elizabeth Murphy at murphage@cogeco.ca, www.raaniagara.ca

OSHAWA DISTRICT: Last Monday at 7:30 p.m. at Oshawa Executive Airport air terminal, ground floor, 1200 Airport Boulevard. Contact President: Jim Morrison, 289-675-0660, jamesmorrison190@msn.com Website raaoshawa.blogspot.ca

OTTAWA/RIDEAU: Kars, Ont. 1st Tuesday. Contact: Secretary, Bill Reed 613-858-7333 bill@ncf.ca

SAUGEEN: Third Saturday for breakfast at Hanover Airport. President: Barry Tschirhart P.O. Box 1238 27 Ridout Street Walkerton, Ontario. Home: 519-881-0305 Cell: 519-881-6020. Meetings are held every second Tuesday evening, at 7:30pm. Location(s) Saugeen Municipal Airport, Kincardine or Port Elgin. All interested pilots are welcome. Email: barry.tschirhart@bell.net

YQG AMATEUR AVIATION GROUP (WINDSOR): Forth Monday, 7:30 pm Windsor Flying Club, Airport Road, Contact: Kris Browne e_kris_browne@hotmail.com

SCARBOROUGH/MARKHAM: Third Thursday 7:30 pm Buttonville Airport, Buttonville Flying Clubhouse. Contact Bob Stobie 416-497-2808 bstobie@pathcom.com

TORONTO: First Monday 7:30 pm at Hangar 41 on north end of Brampton Airport. Contact: President Fred Grootarz - Tel: (905) 212-9333, Cell: (647) 290-9170; e-mail: fred@acronav.com

TORONTO ROTORCRAFT CLUB: Meets 3rd. Friday except July, August, December and holiday weekends at 7:30 pm Etobicoke Civic Centre, 399 The West Mall (at Burnhamthorpe), Toronto. Contact Jerry Forest, Pres. 416 244-4122 or gyro_jerry@hotmail.com.

WIARTON: Bruce Peninsula Chapter #51 breakfast meetings start at 8:30am on the second Saturday of each month in the Gallery of Early CanadianFlight/Roof Top Cafe at Wiarton-Keppel Airport. As there are sometime changes, contact Brian Reis at 519-534-4090 or earlycanflight@symptico.ca

MANITOBA

BRANDON: Brandon Chapter RAA meets on the second Monday of each month at the Commonwealth Air Training Plan Museum at 7:30 PM except in the months of July and August. Contact Pres. John Robinson 204-728-1240.

WINNIPEG: Winnipeg Area Chapter: Third Thursday, 7:30 pm RAA Hangar, Lyncrest Airport or other location as arranged. Contact President Ben Toenders at 204-895-8779 or email raa@mts.net. No meetings June, July & Aug. RAA Winnipeg info also available at Springfield Flying Center website at http://www.lyncrest.org/sfcraac.html.

SASKATCHEWAN

Chapter 4901 North Saskatchewan. Meetings: Second Tuesday of the month 7:30pm Prairie Partners Aero Club Martensville, Sk. info at www.raa4901.com. Brian Caithcart is the chapter president. Contact email: president@raa4901.com.

ALBERTA

CALGARY chapter meets every 4th Monday each month with exception of holiday Mondays and July & August. Meetings from 19:00-21:00 are held at the Southern Alberta Institute of Technologies (SAIT) Training Hangar at the Calgary Airport. Join us for builder discussions, site visits, tech. tips, fly out weekends and more. Contact President Dennis Fox dennis77fox@gmail.com or Secretary Bruce Flach o2fly@yahoo.ca

EDMONTON HOMEBUILT AIRCRAFT ASSOCIATION: meets second Monday - Sept. to June. Contact Pres. Roger Smeland - 780-466-9196 or Jim Gallinger 780-242 5424. Website www.ehaa.ca

GRANDE PRAIRIE: Third Tuesday, (September to April), 7:30, 2nd floor boardroom of the Grande Prairie Terminal Building. Summer events on an informal schedule. For more information contact Lee Merlo at 780-518-4254 or e-mail arniesusanmeyer@gmail.com

BRITISH COLUMBIA

DUNCAN: Second Tuesday 7 pm members homes (rotating basis). Contact Pres. Howard Rolston, 250-246-3756.

OKANAGAN VALLEY: First Thursday of every month except July and August (no meetings) at the Mekong Restaurant.1030 Harvey Ave. Dinner at 6:00pm, meeting at 7:30pm Contact President, Cameron Bottrill 250-558-5551 moneypit@uniserve.net

QUESNEL: First Monday/ Month 7:00 p.m. at Old Terminal Building, CYQZ Airport. Contact President Jerry Van Halderen 250-249-5151 email: jjwvanhalderen@shaw.ca

SUNCOAST RAA CHAPTER 580: Second Sunday 13:30 pm Sechelt Airport Clubhouse, sometimes members homes. Contact Pres. Gene Hogan, 604-886-7645

CHAPTER 85 RAA (DELTA): First Tuesday 7:30pm, Delta Heritage Airpark RAA Clubhouse. 4103-104th Street, Delta. Contact President Peter Whittaker pwhitt@telus.net Website www.raa85.ca.

VANCOUVER ISLAND AVIATION SOCIETY (VICTORIA): Third Monday 7:30 pm Victoria Flying Club Lounge. Contact Pres. Roger Damico, 250-744-7472.

THOMPSON VALLEY SPORT AIRCRAFT CLUB: Second Thursday of the month 7:30 pm Knutsford Club, contact President Darren Watt 250-573-3036

ALASKA HIGHWAY: meetings held every third Thursday of every month (except July & August) at the Taylor Fire Hall at 7:30 p.m. For more information call Gerry at 250-782-4707 or Heath at 250-785-4758.

Chapter executives, *please advise of changes as they occur. For further information regarding chapter activities contact RAA Canada, Waterloo Airport, Breslau ON N0B 1M0 Telephone:* 519-648-3030 *Member's Toll Free line: 1-800-387-1028*

Emails can be sent to President Gary Wolf at: **garywolf@rogers.com** *and George Gregory at* **gregdesign@telus.net.**

Classifieds

To submit or delete a classified ad, please send to raa@raa.ca and place "RAA ad" in the subject line.

The Recreational Flyer is pleased to offer you colour advertising within the magazine. Previously limited to the back cover, we have added 4 new colour pages which will be available with limited space for your advertising needs. Our rates for both black and white and colour ads remain very competitive and you reach a captive and qualified audience. Emails can be sent to President Gary Wolf at: garywolf@rogers.com and George Gregory at gregdesign@telus.net

Deadline for submissions is the first of the month preceding date of issue.

Artwork: Rates apply to camera ready artwork. Digital files are preferred and should be sent as email and in .txt format, PDF, JPEG, MS WORD, Photoshop or other common file types. Advertising is payable prior to printing of magazine unless other arrangements have been made. Payment is in Canadian funds. 10% Discount applies to one year (6 issues) insertion paid in advance. Commercial Classified ad rates 1/8 page minimum.

Advertising Policy: The Recreational Flyer Publisher reserves the right to refuse any or all advertising for any reason stated or unstated.

The Recreational Aircraft Association Canada does not assume responsibility for advertisements, but does exercise care to restrict advertising to responsible, reliable individuals.

Please note: Ads running more than 3 issues must be renewed to guarantee continued display in the magazine.

Recreational Aircraft Association Canada
President: Gary Wolf / Treasurer: Wayne Hadath

Recreational Flyer Magazine

Registration Mail Publication No. 09869

Contributing Editors: Gary Wolf, Don Dutton, George Gregory, Wayne Hadath, Tom Martin
Art Director and Layout: George Gregory.
Printed by Rose Printing Orillia, ON

The Recreational Flyer is published bi-monthly by the Recreational Aircraft Association Publishing Company, RAA Canada 22-4881 Fountain St. North Breslau RR2 Ontario N0B 1M0 . Toll Free line: 1-800-387 1028

Purchased separately, membership in RAA Canada is $35.00 per year, subscription to Rec Flyer is $35.00 per year; subscribers are elegible for reduced membership fees of $15.00 per year. Rec Flyer to have a single issue price is $6.95.

The Recreational Flyer is devoted to the aerospace sciences. The intention of the magazine is to promote education and safety through its members to the general public. Material in the Flyer is contributed by aerospace engineers, designers, builders and restorers of aviation devices and vehicles, used in an amateur capacity, as well as by other interested persons, publications and organizations. Contributions to the Recreational Flyer are voluntary and without remuneration. Opinions expressed in articles and letters do not necessarily reflect those of the Recreational Aircraft Association Canada. Accuracy of the material presented is solely the responsibility of the author or contributor. The Recreational Aircraft Association Canada does not guarantee or endorse any product offered through articles or advertising. The Flyer and its publisher welcomes constructive criticism and reports of inferior merchandise or services offered through advertising in the publication.

"CLEANING OUT THE HANGAR" Best Offer: New Fly Baby fuselage and vertical tail/rudder. Thorpe 18 fuselage, gas tank, lots of small parts and front landing gear. Call or email for photos and information 705-653-4525 davidcarlaw@prototyperesearch.com

O200 L/H muffler (CESSNA) rebuilt by Acorn Welding. $450. 28 VDC voltage regulators, 2 ea. Kelly Aerospace, P/NVR500-0101 (Cessna 337)$150. ea.

Piper Pitot static tester adapter,P/N PS56620M2-4-4, with hoses and case. $650.

From the back of the Hangar.

24 volt starter, electro System p/n MHJ-4003SR, o'haul/2000. $350.00

24 volt starter prestolite, p/n MHJ-4003S serviceable. $300.00

24 volt alternator Delco Remy 50 amp. p/n 1100747 $300.00 Oil filter adapter kit Mod. BC700 for all Lycoming 235, 320, 360, 540, 720. $500.00

Cessna 172 nose cap cowling p/n 0552019-new. $100.00 Stabilator tip fairing p/n GF95620-07 Piper PA-200/220 $150.00 McCauley Propeller p/n 1A101GCM6948 bolt pattern 4 3/8in. $800.00 Prop spinner 10in.dia,. 12in. tall bolt pattern 4 1/2in $125.00 Cantact len Kennedy 506-622-0105, cell 506-623-8162 email - lenpat@nb.sympatico.ca Miramichi NB .

BELITE FUEL PROBE SYSTEM 1/8" A.S # 10-05866 never used $180; Sky Tec Solenoid A.S, # 07-03562 never used $50. Aerovoltz battery charger $80 Ask about 16 cell Aerovoltz lithium battery + shipping
Mike 519-762-3910 or mtyit@start.ca

AME / homebuilder retiring and selling a lifetime of collected parts - Beech Sundowner prop and exhaust, C-150 starters, Lycoming starters, ring gears, flywheels. Lots of control cables including from an RV-6 kit. Brand new Gill 35 battery. Spinners, props, you name it and it is probably here. The hangar has been sold so everything must go. Ron Fleet at Hanover airport, Ontario. fleetair@wightman.ca

New engine cooling baffle kit for a Lycoming 0-320 – Van's part number BAF-320 $300.00 CDN OBO New 13" spinner kit (includes spinner cone and backing plates) – Van's part number FP-13 $225.00 CDN OBO New aileron trim kit – Van's part number AIL-T6 $45.00 CDN OBO Well-made wooden jig for RV 6/6A fuselage construction – open to offers Call Bob Stewart 204 853-7776 stewart@mynetset.ca

Basic Ultralight project for sale, all metal low wing tail wheel, not registered. Asking $8000.00 OBO, also have an EA-81 with belt redrive, willing to take trades, 701 or 750 Project or side by side 4 wheeler. Email billdonig@hotmail.com 705-842-0801.

Maranda project on gear, at precover stage with all woodwork completed to a high standard. Includes engine mount for Lycoming. The Maranda is a spacious STOL with folding wings. The builder has passed on so I am selling for his family but now I need the space and it must go. $5000. OBO. Project is located in Erin Ontario. Please contact Brian at 519-806-8560 or brianoates@hotmail.com

SKIS FOR SALE Aluminum/Teflon skis for home built. Used one season on a Challenger, also suitable for Chinook. Full harness. Very good condition. $300 OBO. Call J.J. @ 778-684-0411. ALUMINUM WINGS Built at Edmonton factory for Griffin MKII. Wings are 136 sq. ft. for 1600 lbs. Finished with gas tanks installed. Can be used on high or low wing with modifications. $500 OBO. Call J.J. @ 778-684-0411.

After completion of my RV7 (not for sale) I have a few brand new project left overs that I want to sell them:

1- One (1) Trio Avionics Gold Standard servo with wiring harness and RV mounting bracket (brand new).-Original price US$850.00 Asking US$400.00

2-One (1) Van's Aircraft trim cable CT23V42-DF-2-181 / Tuthill Corp (brand new)-Original price US149.00 Asking US$75.00

3-Three (3) control cables ACS-CT-A-740BL 0720 BLACK / 6 FEET (brand new)-Original price US36.50 eachAsking US$18.00 each

4- Two (2) landing lights 100W/ 12V each with reflectors only, from Duck Works (brand new) Van's complete kit sells for US$115.00 each -Asking US$50.00 for both.

5-One (1) Kuntzleman Electronics Round Tail Light with strobe and white positioning LED lights, 25 feet cable and connector (brand new still in the box). -Original price US$240.00,Asking US$80.00

Jose Lins jlinsjr@shaw.ca 778-998-2718

SAITEK Flight Simulator Controls Yoke, Rudder Pedals and engine controls All setup software available, as well as a set of x-plane 9 disks A suitable computer is also available. $280.- Open to reasonable offers.

Garmin 295 with April 2017 Database. Includes mounting hardware, some extra hardware and cable $280.-

AvMap EKP IV with panel dock and WX receiver Unit measures 7"x4 ¾ "x 1 ½ " In original case with manual $675.-

Various sets of wheel pants from C150, C172, PA-28. Condition varies from being ready to use to work required. Anywhere from 20 to 100 Bucks a pair

Delcom 760 channel handheld. Ancient but working. Batteries shot. Will work with aux power from cigarette lighter or power adaptor. $60.-

Electric Turn Coordinator, with wiring Harness, Altitude Indicator. Both removed in working condition by AME. $120.- for TC, $80.- for AI

Bunch of push to talk buttons and Telex intercom Various flight training tools (plotters, whiz wheel ect). Engine Manuals (Lycoming, Continental, Corvair). Various aircraft POH and Parts and overhaul manuals C150) Call for pricing or make a reasonable offer.

Early C150 landing gear legs, tagged. $350.- OBO Sitka Spruce, stored indoors for several years. Some spar material (1x8x14'), ¼" sq. stock for ribs, 4 ½" rear spar material and more. Aircraft and military grade 1/16 plywood, 5x5 sheets (cost over $100.- per sheet) Wood is now stored in Lindsay. $1500.- buys all. Partial sale possible. Call 705 821 3884 or Rudy for more details (519 648 3006)

Smyth Sidewinder Project. Rare Taildragger version. Wings are off for storage. 600 hrs TT, Franklin Sport 4 cyl. Engine, 130 HP, Sterba prop. Terra 760 radio and Mode C Transponder. $12,000.- or best offer
Rudy Hane 519 648 3006 rudyhane@gmail.com

ROTAX 503, 2 Carburetors, mounts for Challenger or Chinook. Runs very well. Electric and/or pull rope starter. Mechanical prop reduction. $500 OBO. Call J.J. @ 778-684-0411.

Lycoming O-235C 100 hp with a mount for a Volmer. Little history but believed to have had a top overhaul. One mag and flywheel starter and carb. $2200 Hamilton Ont. 905-662-7111

Ads run for a maximum three issues depending on space available and then must be renewed for continued display. Please direct all classified inquiries and ad cancellations to: garywolf@rogers.com and place "RAA ad" in the subject line.

Classifieds On The Internet:
http://tvsac.net/BS1.html - more ads from our Kamloops chapter
http://www.lyncrest.org/sfcclassifieds.html - more ads from our Winnipeg chapter

Issue 2, 2017

Lyncrest/Vimy Flight

Larry Ricker, foreground and Will McEwan on right wing over Lyncrest.

Peter Moodie

Chris Black

Bill Zuk

Left: Chris Pulley (l) and Gord Cooper (r) made and fitted a new surround to the aluminum nosebowl that John Weatherseed had repaired. Above: with everything repaired, Gord Cooper did engine runups prior to shipping the plane to Lyncrest.

new in canadian skies

John Pavanel's Bucker Jungmann

12 YEARS AGO, John Pavanel, asked me "why don't we build an airplane". My answer was "what airplane would you want to build?". At first he said a Stearman, so we ended up looking at a Stearman project. It turned out it was going to need a lot of work to get it back in flying condition and decided against it. I mention that a good friend of mine, Charlie Miller, builds parts for Bucker Jungmanns and maybe this is the plane we should build. And so it began...If I was a writer, I could write a novel on the whole journey but I don't think I will..I'm a builder not a writer.

In the realm of biplanes, many people have said that nothing flies like a Bucker and now I can say the same. The Bucker was a World War II trainer in several countries and we were inspired by the Spanish version, hence the paint scheme, right down to the academy crest on the vertical fin. Although the Bucker is a replica home built biplane, every aspect of the original was incorporated in this build. From an early age, I was always intrigued with the way things worked. I would take my toys apart and put them back together just to see for myself how things worked. I put this same effort into the building of the Bucker. It took many, many hours and more years than we expected but it sure was worth the feeling of accomplishment once it was completed. I must say, that I could not have pulled this off without the help, support and knowledge of so many people that were all a part of this journey. I would like to acknowledge, first and foremost, John Pavanel, the owner of the Bucker and Charlie Miller. Without them, this would not have come to be. Larry Ernewein, Mike Williams, Carl Pfister, Harold Norry and Gary Barber were also instrumental during this build. I am thankful for the opportunity to experience this whole journey and honoured to have the support of the people mentioned. Larry and Karl are both proud owners of Canadian jungmann's, and have been extremely supportive / ***Bruce Paylor***

Backwards Gascolators

Wayne O'Shea

I was changing from an 80 hp 912 engine to a 100 hp 912S Rotax on the original Pegastol prototype and while doing so I noticed that the gascolator had been installed backwards!! Since this was the fifth I have found in seven years I thought I should share the info with others out there to educate builders who might have done the same.

The fuel should flow into the gascolator WITHOUT OBSTRUCTION to the bowl. That is, it should flow directly into the bowl without going through the screen. The outflow from the bowl goes upwards through the screen and then to the engine. When installed properly this allows the water and dirt to settle down to the bottom of the bowl for draining at preflight, which will keep the downstream parts of the fuel system clean.

If the gascolator has been plumbed backwards the fuel flows from the tank to the screen first, before entering the bowl. This is extremely dangerous as any dirt, etc sits on top of the screen and can cause total fuel starvation, as I once saw in a 150 hp Luscombe that was fortunately still on the ground. The Luscombe's tanks had been sloshed, and over time small bits of material had slowly covered the entire screen until it was completely clogged, although the preflight inspections always showed clean fuel. When the gascolator is plumbed backwards the preflight fuel drains will always show clean fuel as the dirt and water cannot get to the bowl.

The other very dangerous thing about fuel going through the screen first is that while sitting, any water that works its way down the system by gravity cannot pass through the screen because of the surface tension of the water. Also, water has a higher specific gravity than fuel so it will sit on the screen with the fuel above it. On climbout at a high power setting the high fuel flow and vibration help to draw the water through the screen, and if you are lucky the engine will just cough instead of dying completely.

Now that I have you all going out to have a look at your installation, while you are under the cowling also have a look around for any exhaust leaks!

President's Message / continued from page 2

while the non-National members get what is essentially a free meal.

Imagine that your chapter decided to go monthly to a restaurant and all guests ate free but only the National members paid for their own meals and for those of the guests. How long do you think that would last? This is the situation we have when chapters allow non-Nationals to become permanent guests in the chapter. Eventually something has to give, and if this is satisfactory to you, continue on current heading. If not, please get your houses in order.

MAGAZINE MATERIAL

It is likely that you have noticed the dearth of Rec Flyers in your mailbox, and the reason is the lack of material sent in by members. It would be simple to fill the pages with photos of pilots eating hamburgers while standing near airplanes but this does not make a magazine. At one time members used to have more energy for writing and we received good technical material, so editing a magazine was straightforward. Since that time we have had to become reporters, going out to get the stories. This time is taken from family time and work requirements, so this must necessarily be limited.

RAA's greatest asset is the skills of its members, and we have a responsibility to pass these skills along to the new members who view building an airplane as a daunting task. Your strength as a lobby group is in the number of noncertified aircraft flying or being built, and we need a next generation of builders. Please roll up your sleeves and begin writing. We are not looking for War and Peace here, just first person experiences, and if you wish you may even write in point form. Style does not matter – content does.

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