

Issue 3, 2016

# RECREATIONAL FLYER

Recreational Aircraft Association Canada [www.raa.ca](http://www.raa.ca)  
The Voice of Canadian Amateur Aircraft Builders \$6.95





## From The President's Desk

Gary Wolf RAA 7379

### Continental ECI Cylinder AD

Transport Canada has just sent out an FAA-issued AD that affects ECI cylinders on Continental 520 and 550 engines. Cylinder head cracks and separation from the barrel are the reason, reminiscent of the ECI Lycoming cylinder problems several years ago. The AD takes effect Sept 15, 2016 and of course does not have any legal effect on non certified engines, however an owner would be foolish to ignore.

### Aviation Safety Letter

The previous ASL editor's policy was that he would no longer deal with TSB investigations that are at level 5, their lowest category, and the current editor appears to have continued with this. The problem is that TSB rarely investigates non certified accidents at anything but level 5, so there is little chance that you will read anything about non certified safety issues.

At one time we used to get four ASL issues per year, originally in the mail and lately by email. Now we

get one issue per year with little that is useful to the owners of non certified aircraft. The one useful item is the self-paced test that satisfies the biannual recency requirement for your pilot's license. The 2016 test is a review of night flying regulations.

### Minimum Useful Load, Ultralights, and Floats

Minimum useful load (MUL) is a requirement to ensure that an aircraft will have enough payload to carry crew and fuel without exceeding the stated gross weight. Each crew member is assumed to weigh 175 pounds, and the minimum fuel is stated as half the engine horsepower expressed as pounds of fuel, ie a hundred hp engine means a minimum allowance of 50 pounds.

The Advanced Ultralight (AULA) category has a gross weight limit of 1232 pounds, which for a 100 hp engine means that the empty weight can be no more than 832 pounds (1232 - 400). Two skinny people can therefore fly for one hour before running out of fuel.

A problem arises when an owner wishes to add floats to his plane. A set of floats will add 1-200 pounds and some think that there is a float allowance above the 1232 figure, but there is not. Back in the nineties when the AULA limit was under 1100 pounds there was a float allowance that took the gross to 1212, but since the limit was raised to 1232, the category gross weight is the ceiling, no matter what the landing gear.

The Basic Ultralight (BULA) category limit is 1200 pounds and the same category limit applies, so a 100 hp 2 seat BULA can weigh no more than 800 pounds, even with floats.

If you are considering adding floats do your homework before buying or installing. Weigh your plane and then take along the scales when looking at a set of floats. Some manufacturers understate their weights and if you find out too late that your plane can no longer meet the MUL requirement, every flight will be illegal, even if you fly solo. ☘

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

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### The Recreational Aircraft Association Canada

22-4881 Fountain St. North  
Breslau RR2 Ontario N0B 1M0  
Telephone: 519-648-3030  
Member's Toll Free line:  
1-800-387-1028

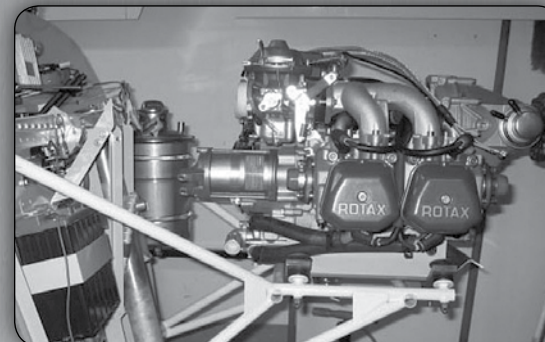


Photo Credit: Barry Griffiths, Aviation Photography Digest

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# Float Your Own

Dan Oldridge and his Zenair Amphibious Float Project / by Dan Oldridge

**E**very complex project has to start with a known reference point in order to ensure the rest of the project gets built straight and level. This applies to large projects like a house where the footings and foundation ensure the rest of the house has a level base to build up from, but how do you ensure that a set of floats ends up straight and true? You build a solid work table 16 feet long and make sure it's straight and reasonably level before even getting started on the floats.

The bulkheads of the Zenair floats all have the same rounded profile since they are actually the top of the float, so, by tracing the rounded edge of the largest bulkhead onto a suitably sized sheet of plywood, you can make the cradles that the floats will be built upon.

I managed to find some 16 ft. 2x4's to form the sides of this monstrous wooden monolith, which occupied far too much space in my workshop over the last couple of years. Being a woodworker by avocation before getting into aircraft, I notched out the 2x4 table side rails and inset the 3/4" plywood into them. I then sanded the whole structure to ensure I wouldn't be getting slivers and scratches

inadvertently once I got going on the floats.

The first step in the actual building process was to join two pieces of 6061 to form one piece that was 15 feet long, mark the bulkhead positions, drill the centre hole for each bulkhead and place the sheet in the cradle.

The bulkheads all have the same profile, but are different heights depending upon their position in the float. They all had to be drilled at one inch centres around the edges of the bulkheads, so I made a drilling jig from a strip of metal with holes one inch apart. By placing the bulkhead and guide on the table, I was able to use clecos and work my way around each piece keeping everything correctly spaced and in alignment. There were a total of 30 bulkheads to drill.

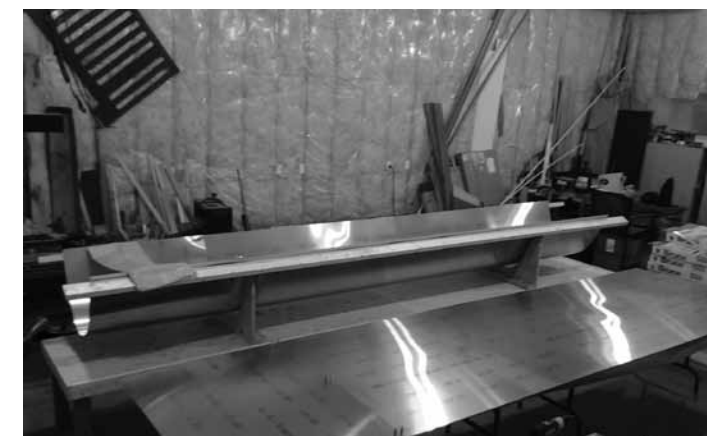
Much of this work is done for you in the pre-drilled kit, but I built mine from the undrilled kit, which saves a bit of money but requires significantly more effort to complete.

The undrilled kit comes with a bunch of 8 foot aluminum extrusions that need to be cut and drilled to allow the wheels and pickup tubes to distribute their forces safely throughout the floats. Fortunately, my neighbour has a CNC machine and for a fee of \$600, he was able to manufacture all of the parts I needed from the extrusions. Although \$600 sounds like a lot, there are 40 pieces that needed to be made.

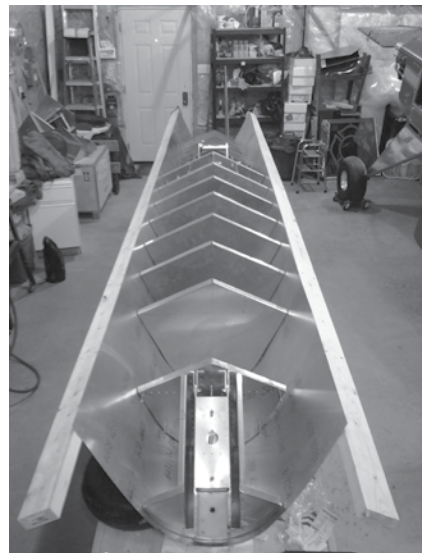
After placing each bulkhead into position, they can be clecoed in place and the skins drilled to pull the bulkheads in tight to the structure. In this photo you can see I have started to put the wheel assemblies together and assembled the wheel well side panels to the bulkheads.

During final assembly of the wheel wells, all of the mating surfaces were sprayed with Zinc Chromate paint, using a VOC mask and protective gloves, etc. After at least 24 hours of drying time, the parts were assembled with 3M 5200 marine adhesive sealant. In addition all of the rivets were coated with a small dab, in spite of the fact that they are sealed rivets. Here the wheel well is set into position, but the skins had not been sprayed yet for assembly.

There are so many rivets to install on a set of floats; I can't image building a set without the use of a pneumatic rivet gun. Here you can see one of the float pick-up tubes on the left side of the picture. These are



The first challenge is building a 16 foot long work table to cradle the floats as you start construction. At 15' long, the Zenair 1450# floats require a 3' long piece be fastened to a standard 4x12' sheet of 6061. The bulkheads share the same profile, but vary in height.



a challenge to install, but once aligned they become the fastening point for the finished floats; one fore and one aft on each float. There are several internal extrusion brace points that the pick-up tubes get fastened to inside to ensure rigidity in the rigging.

Once the top skins have been fastened on with sealant and rivets, the bottom skins can be started. Keep in mind that the floats are being built upside down so the bottom skins go on the top of the float during assembly. Below are a few of the bazillion clecoes I borrowed from a local chapter member.

Trimming the side panels to the shape of the floats leaves a couple of very sharp and sometimes jagged edges. It's a good idea to file this edge smooth right away to avoid injury.

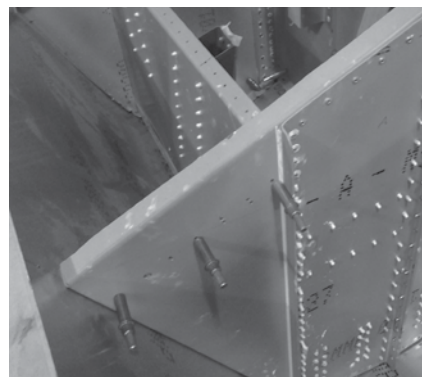
While building the first float, there are points one reaches where it seems obvious that by duplicating a part or process, the second float will be faster

to build, so occasionally I was able to use the first one as a template to make parts for the second one.

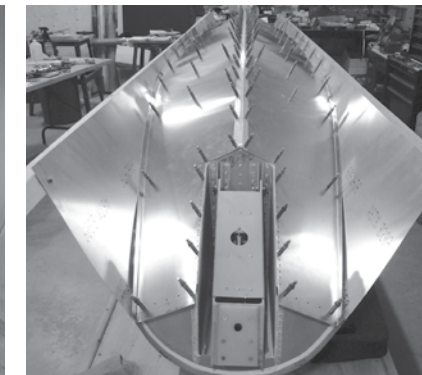
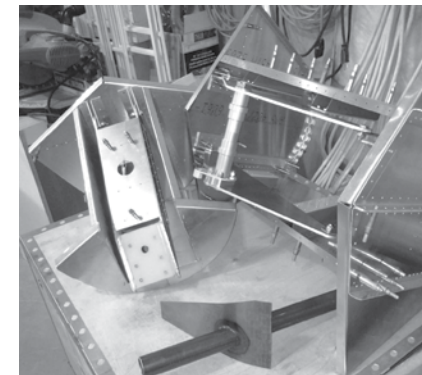
The bottom skins cannot be permanently fastened to the float until the keels are fastened first to the bottom skins. The following picture gives a pretty good idea of how that's accomplished.

Besides a keel on the front and back of each float, there are doublers that protect the float around the wheel wells. Like everything else in the undrilled kit, getting everything lined up and drilled correctly is key to a great installation.

At several points during the process, there are moments where you have to stop because of paint or sealant drying before you can move on. At times like those, I tried to get other jobs done. The photo on page 9 shows the walkway that gets installed on the top of the float once it is flipped over. The sides look a little wowed here because



Once the bulkheads are fastened into position with clecoes the float starts to take on a familiar shape. Zinc chromate (bottom left) makes the adhesive stick to aluminum



The wheel assemblies can only be fastened into position after the internal extrusions and braces are drilled, aligned, glued, riveted and sealed in place.

The joined sheets are clearly visible in this photo and the excess zinc chromate has been wiped off. I can't imagine doing a float project without a supply of at least several hundred clecoes!

the bottom skins are not riveted on yet and protective sponsons are not installed yet either. Installing those was easier using a rivet squeezer I borrowed from another member of our local RAA chapter.

Cleaning up the excess sealant is a breeze on bare aluminum; simply rub it with a crepe block. Cleaning up the excess sealant on an area that has been treated with the zinc chromate primer is another story. A bit of acetone helps, but mostly it takes a lot of elbow grease; if you can even remove it.

Once the sealed compartments of the floats are done, they still need to be pressure tested. I used a portable infla-

tor and a small valve to control the volume of air entering the float compartments. This essentially allowed me to adjust the pressure to about 2-3 psi regardless of any leaks that might exist. As I sealed up each leak, I adjusted airflow to hold at 2-3 psi.

One of the compartments was leaking air like crazy and it took a moment to realize that I hadn't sealed up the pickup tubes. I managed to find some corks with just the right diameter to seal them up nicely. I added a bit of sealant and drove them in with a rubber mallet.

I wanted to get a nice looking and streamlined fit to the spreader bars on the floats, so I angle cut the spreader extru-

## Regulatory Requirements for Float Installation on Amateur-built Aircraft

Unlike building an amateur-built aircraft, there is no requirement to register your project with the Minister or delegate (MDRA) before you start, but don't think you are free to do whatever you wish. There are a number of steps you must take before you will be issued a revised CA on floats.

Document the changeover as you will need a copy of the logbook entry when applying for the new CA. The logbook should of course be dated and state that floats were installed. First, outline the primary work that was done and any checks or testing that was done including taxi tests. Second, state that the W&B has been amended in accordance with CARS 571 Appendix C (Show new empty weight and CG). Third, state that a dual inspection

was completed on the water rudders, cables, pulleys, turnbuckles and cable ends in accordance with CARS 571.10. (...and of course have it signed off by a second party). In my own logbook, I also stated that there were no issues with the installation (no deficiencies found). Safety is the number one consideration so there may be an inspection required by Transport Canada, however by following standard aircraft construction practices like having all bolts in, down or back with 1 to 3 threads showing, safety wire on turnbuckles, correct torque on nuts, etc., the inspection should be quick and simple. Having things like heat shrink tubing over the cable ends and nico-press sleeves, shows the inspector that you have taken the time to make sure everything is done right and an indicator of quality workmanship to the inspector. The most important thing though is to have all of the paperwork in order for the change-over to floats.

Under Canadian Aviation Regulations Part Five of the Airworthiness Manual Chapter 549 - Amateur-Built Aircraft

governs the construction of amateur built aircraft and any changes to the construction or configuration of the aircraft fall under that part of the regulation. Although it may be questionable whether floats fall under this part of the regulation, following the same airworthiness standards is good practice.

### 549.21 Aircraft Weight and Balance Control

In accordance with the requirements of Chapter 571, section 571.211, a Weight and Balance Report is required for each aircraft configuration.

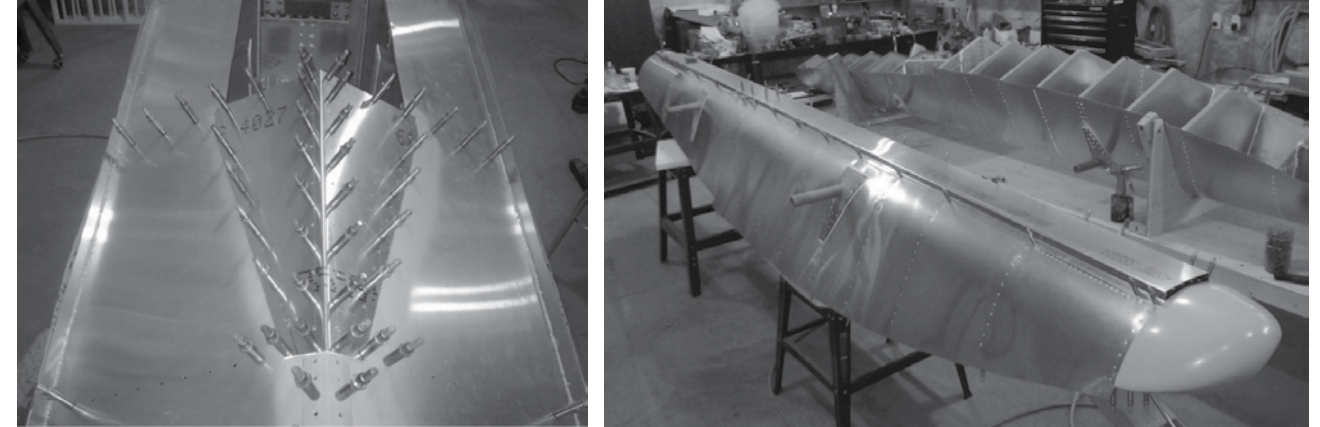
It is clear from this, that you must complete a new W&B with the aircraft on floats. If the balance point of the floats is kept close to the normal operating CG of the plane, the W&B will only change by the weight of the floats and rigging minus the gear being removed, while the CG will change very little. Still it is best to weigh the aircraft with the floats installed and calculate the W&B based on the moment arm for the front and back wheels and the actual weight at each of the wheels.

A printed copy of the new W&B will be required with the rest of the paperwork submitted to Transport Canada, so make at least 2 copies of the revised W&B so you can also place one in your aircraft with your Logbook and other documents. Keep the old one as you will likely need it if you change back to wheels in the Fall.

You will be required to pay a small fee to process your application for a flight permit to conduct a climb test. If you are also looking to increase the gross weight of the aircraft on floats, you will also be required to submit a fee for a flight permit to conduct a flight test at the new gross weight. Many of the planes with LSA weight restrictions of 1320 lb. can fly safely at 1430 on floats, but you will have to apply for that increase in maximum gross weight and pay the small processing fee for a revised CA at the new weight. If you are increasing the gross weight beyond 1430 forward a letter from the manufacturer of the aircraft authorizing the increase. (ie: 1550 lb. was approved for my Highlander)



Top left: Once the bottom skins are positioned and held with clecos, the side skins can be trimmed back to reveal the true shape of the floats. Lower left, once the first float was finished to a point where it could be safely moved, I started the second float. Right: since the keels take most of the abuse when a float touches the bottom of a lake or river, they are made from a heavy extrusion that protects the float skins.



Above, the doublers are seen installed behind the mains on the rear keel. Right, it's definitely starting to look like a float!

sions to match the side profile of the floats and pick-up tubes. To accomplish this, I built a jig for my band saw that held the tubes in the correct position as I ran them through slowly.

Luckily I had another fuselage I could use to set up the float rigging rather than suspend my plane for an extended period in a precarious position.

In spite of all of my efforts to line things up with the fuselage suspended, I had to keep repositioning things and re-measuring to try to

keep everything aligned. I had spent a fair amount of time determining exactly where the step of the floats was relative to CG envelope of the plane and where the balance point would fall, so every time things shifted, I was forced to re-measure. My solution was to make a wooden jig that held the fuselage in a fixed position over the floats.

I later rebuilt the jig so the support members under the longerons were moved to run laterally just inside the longerons so as to not

interfere with the rigging process.

On page 11 is a photo of the supports installed on the floats in the correct position to fit onto my Highlander. I will now be disassembling the rigging and finishing the hydraulic and brake lines ready for assembly onto the Highlander. At that point I will also be installing the brace wires and all of the rigging for the water rudders.

There are a number of different theories on how to rig a plane up on a set of floats. The most common ones

### 549.23 Design Changes and Repairs

[Design changes and repairs affecting structural integrity, geometry, performance (e.g. change of c.g. limits) and maximum permissible take-off mass will require an inspection by a DOT representative, and may invalidate the Special Certificate of Airworthiness for amateur-built aircraft. Following a design change or repair:]

(a) A new Weight and Balance Report and Climb Test Report may be required,

[(b) Changes or repairs shall be annotated in the Aircraft Technical Records, including the Journey Log book; and]

[(c)] The Minister may request a new Special C of A application or inspections.

[Information Note:

[(a) Changes which will invalidate the Special C of A for amateur-built aircraft, and require a new Weight and Balance Report and Climb Test include:

[(1) A change in the type or model of the engine. This does not include engine changes within the same series.

[(2) A change resulting in a mass (weight) exceeding the maximum permissible stated on the special C of A for amateur-built aircraft.

[(3) An initial change in landing gear from wheels/skis to floats or floats to wheels/skis.

[(b) A change from wheels to skis or skis to wheels will only require an amendment to the Weight and Balance report.

[(c) Changes which will require an inspection by a DOT representative include:

[(1) Any change or major repair affecting structural integrity; and

[(2) For aerobatic aeroplanes, changes to control surfaces.]

From this you can see that the initial change from wheels to floats will require a new W&B report and a climb test. But before the Civil Aviation Safety Inspector can prepare a revised flight authority, he/she will ask for you to submit a fee for a Specific Purpose Flight Permit to conduct a climb

test. (\$45 reference code 9K08) and a fee for an Approval of an Amendment of Operating Specifications (\$35 reference code ? )

Fortunately this can be done over the phone using your credit card and the flight authority can be issued the same day with a copy sent to you via e-mail. Your inspector will advise you what phone number to call to submit the fees on-line.

Before conducting the climb test, read the instructions on form number 24-0091 thoroughly. Record the temperature and the altitude displayed when the altimeter is set to 29.92. Follow the instructions on the form and record the information on it. Use the Appendix B graph to calculate the minimum climb your aircraft must achieve based on the current density altitude.

Submit the Climb Test Report (form 24-0091) along with a copy of your Log book entry for the installation of the floats as stated at the beginning of this article, and a copy of your new weight and balance report. I use an

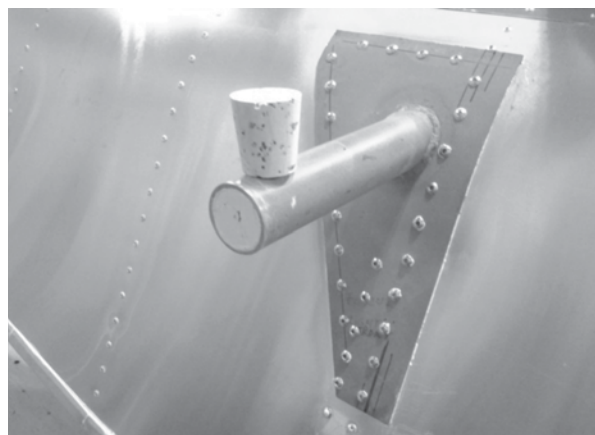
Excel spreadsheet for this, but there is no specific format required by TC.

If you built your own floats, there may be a requirement for data plates on each of the floats. A recent Transport Canada decision indicates that there is a need for them to track the origin and location of each float individually. I'm not really sure of the intent here, but just be aware that data plates may be required. Mine were started and constructed before this requirement was in place so they do not fall under this new rule.

Adding floats to your aircraft opens up a whole new world of flying opportunities and the regulatory requirements are fairly straight forward. Make contact with the TC Civil Aviation Safety Inspector in your area and he will guide you through the process outlined in this article.

If you are considering adding floats to your aircraft, I hope this information helps you with the process.

Dan Oldridge



all seem to indicate an overall difference of about 4 to 7 degrees between the floats and the chord of the wing.

Underpowered planes should have higher angles in order to get off the water, but top speed suffers as the float tops are dragged through the air in an effort to keep the wings in flying attitude.

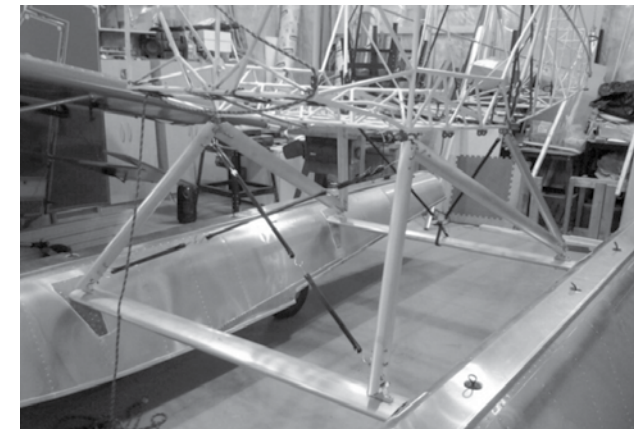
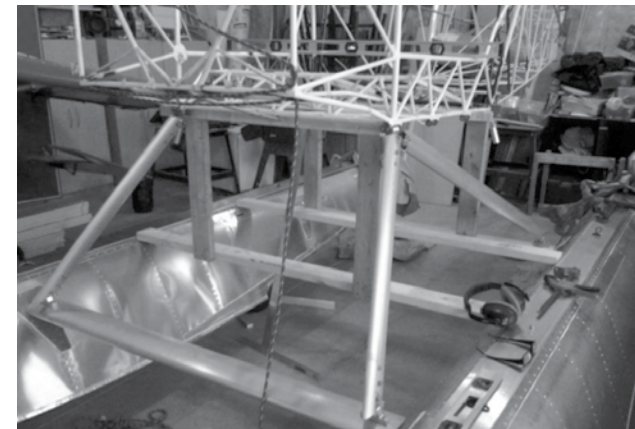
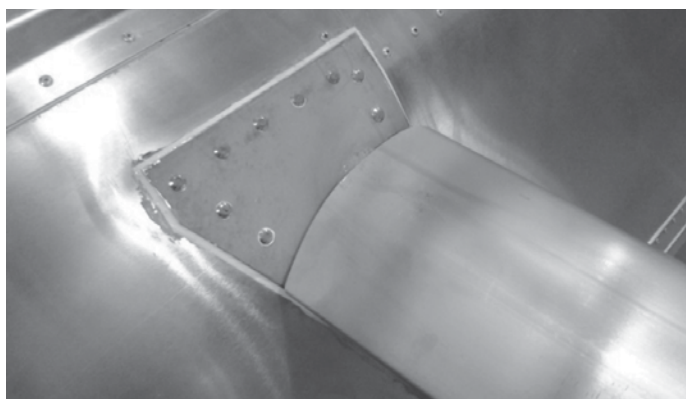
Planes with a higher power to weight ratio can get away with lower angles, which allow for higher taxi speeds on the step and higher flight speeds as the floats are more closely aligned with the longitudinal axis of the aircraft and wing chord. The higher power / weight ratio also provides quicker acceleration, which often allows them to get off the water as quickly as their higher-angled counterparts.

Luckily, the Highlander falls into the latter category, so I have kept the angle in the lower part of the range with about 4 degrees overall. In order to achieve this, the rigging is set at 2.5 degrees from the longitudinal axis. The under-camber of the Highlander wing makes up for the other 1.5 degrees.

The step is positioned about 2 inches aft of the most rearward CG and the weight balance point of the floats falls almost directly under the most used CG, which should mean that the

Top down, left:

- 1) A portable inflator, low pressure gauge and small valve helped to control the leak testing process.
- 2) I opted for aluminum pump-out cups and rubber plugs from Lake and Air rather than use the cheap plastic side caps supplied with the float kit. I removed the rope and inserted a fitting for leak tests.
- 3) Corks work well for plugging the pick up tubes and add less weight than filling the tube with sealant
- 4) A wooden jig with a built-in guide rail controls the feed direction for cutting spreader bars at an angle.
- 5) Below, a nicely tapered spreader not only looks good, but cuts down on the air turbulence and resultant drag.




The weight of the fuselage held the whole assembly from moving on the wooden jig I used for rigging. Well cut and nicely fit spreaders and supports make for a clean installation and lower drag. The bungees were used to temporarily hold things under tension. Wire bracing and turnbuckles will of course be used during the final rigging on the Highlander.

flight characteristics on floats should not vary drastically from that on wheels ... well, that's the theory anyway.

I managed to get my float rating last fall thanks to an enormous amount of help from Lee Coulman, so I'm anxious to get flying!

I still have a ways to go, and hope to do another short article on some of the final rigging, but now there is a light at the end of the float-building tunnel. I fully expect to be

flying on floats this spring and really will be looking forward to many summer float flying adventures and fly-ins! 

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



## RAA Chapter 415 at Les Faucheurs

RAA Chapter 415 presented at the June 25-25 Les Faucheurs event at Sherbrooke. We set up a full composite training and demo session about the resin infusion process. Many had a try at the process and discovered this new technique. Also there were many aviation questions such as: how to build your own airplane in composite. This was a great weekend for RAA, and more events with chapter 415 Saint-Hubert will be presented in upcoming months. More info at [jfairplane@gmail.com](mailto:jfairplane@gmail.com) and I will also post video of the session on the JFAirplane.com site. / Si vous avez des questions pour votre construction ou la maintenance de votre appareil, venez à notre réunion du 2ième mercredi de chaque mois au cégep ENA.

-JF Alexandre, Chapter 415

# Rattle and Hum

The Hard Starting Rotax 912S / by Gary Walsh

I BOUGHT MY KITFOX IV ANPHIB back in 2000, and it came with a brand new Rotax 912S engine. It's a great engine, but has always been hard to start. At idle with full choke it would bang and rattle, and more often than not flood. Thanks to one of the many forums out there I came up with a procedure that seemed to work. Crank it for 15 seconds at idle with full choke and the ignition off. Let it sit for a full minute, then with the choke off and the throttle cracked crank it and flip the ignition on when the blades are spinning. It would usually fire up immediately. That worked fine for the summer, but in the spring or fall if the temperature was below 7 deg C it was a hit and miss proposition. It was best to just forget it and don't go flying that day or run the risk of cracking the exhaust, which has now been welded so many times it looks like something out of Mad Max.

My starting procedure served me well for more than a decade, and ball joints helped save the exhaust, but the last couple of years it was becoming a bear to start even on warm summer days. It was weird. It would start if you caught it just right then be fine for the rest of the day. More often than not it would bang and rattle and flood, but if you took the plugs out and looked at them and then put them back it would start on the first blade.

I surfed the forums and YouTube and

found I was not alone. Often the threads would suggest the problem was a damaged or contaminated sprag clutch. This would throw the timing off making it almost impossible to start. Removing the engine to change the clutch was not going to be fun, and I was thinking about instead going for a better battery with more cranking power than the cheap motorcycle variety I had been using. If that failed, which it did, the next step would be replacing the original black starter with the heavy duty upgrade that would turn the prop faster. With the Kitfox, there is little room behind the firewall, so that would also mean removing the engine as I would have to add an indent to accommodate the longer starter.

I talked to the good people at Rotech Research, and sent them a video showing what it was like to try and start my engine. To see it, got to <https://www.youtube.com/watch?v=oAJDDcPvqQ>

They concurred the issue was most likely the sprag clutch. Each time the engine fired the piston would be at the wrong position, almost stopping the prop or at least taking away most of its momentum. They also had several other suggestions.

I was pretty sure the HD starter and new battery would help, but I wanted more than a band aid solution. I wanted to

ensure this would not happen again a few years down the road, and if I was going to have to pull the engine to change the starter and modify the firewall I wanted to do it right.

Rotech suggested several other options. One was a "soft start modules" for the 912s, one from Rotax and another from a third party called BullyHawk (<https://www.youtube.com/watch?v=koUsBqTQJ5I>). Rotech carried both, but the Rotax version was extremely expensive, and BullyHawk had gone out of business and that cheaper variety was getting hard to find. Even if I could source one Rotech advised me that my ignition module connectors were the old style and the wiring would have to be modified which would push the costs even higher.

Rotech also suggested the upgraded flywheel that Rotax has incorporated on newer engines. This causes the engine to fire at 3 degrees AFTER top dead center in the retard start-up mode. This would make it much easier to start, and prevent damage to the new clutch.

Over the past few years my wife

*The result was impressive. Now when the engine starts it feels like the ignition ramps in, resulting in a smooth start without the nasty jolts I have been living with for so long.*

has begun to enjoy flying with me. Sitting with her on a remote lake with an engine that would not start was not going to continue that trend, so I opted for the full court press. New sprag clutch, new HD starter, upgraded flywheel and a new Odyssey battery.

The result was impressive. Now when the engine starts it feels like the ignition ramps in, resulting in a smooth start without the nasty jolts I have been living with for so long. The HD starter spins the prop so fast I think I could almost taxi with it. It was not cheap, but now I have confidence that the engine is going to start no matter what the temperature is, and my sprag clutch is not going to have to be replaced again in a few years' time.

Big shout out to the folks at Rotech Research. I ran into a few issues along the way and they went above and beyond the call of duty. They also provided the suggestions mentioned above and also ones like reversing the manifolds to get the center of mass closer to centerline to reduce vibration. I did not do that since it would need a new motor mount. They also provided instructions on how to modify the Rotax HD starter for airplanes like the Kitfox where you do not have much room at the back of the engine (you have to cut the tabs off the back). There are cheaper sources for parts out there, but having people who know what they are talking about can save you more money in the long run. 🙌



*Life member Jack Steele of Brockville Ontario sold his Tailwind and immediately donated the proceeds to RAA Canada. This will pay for the printing of three issues of the Recreational Flyer magazine. Jack has a three digit membership number and he has been a supporter of your Association since the early days. We thank Jack for his generosity.*



## MOUNTAIN FLYING LESSONS

BARRY MEEK

"IMPROVE PERFORMANCE OF EVEN A C-150 by using heat and turbulence to your advantage".

Barely 100 feet from the side of the mountain, I held the controls with both hands. It took both to ride the turbulence. The hot wind was quartering from about my 8 o'clock position, blasting against the rock to the right of the Cessna. The battle required counter inputs, left aileron, right rudder.

But the lift! Whoa, what a ride. Like an elevator. Twelve, fourteen, even eighteen hundred feet per minute on the VSI. Quite impossible for a 150 at full gross.

In the passenger seat, John was leaning toward me as he stared out the right side at the wall of granite. In his best "cool" voice he remarked "You like to keep it in tight to the mountain don't you" I think he was a bit concerned.



The departure westbound from the grass at the Hope airport was almost directly into the gale. With a mere 200 feet under the wheels, I swung to the left, and quickly picked up the mechanical lift against the mountain on the downwind. Predictably, we shot up to a thousand feet in less than thirty seconds, and we kept climbing.

"It makes sense to use the wind and thermals as best I can in this airplane". John was listening, but still concentrating his attention on the rock and trees right outside his door.

Flying against the mountains, cruising the tops of ridges and getting under the cumulus clouds is glider pilot mentality. I've never flown a glider, but have learned a lot from the people who do. The Vancouver Soaring Association is active at the Hope B.C. airport in summer, and for two seasons, I flew their tow-planes, Cessna L-19's, the bird-dogs. Leftovers from combat duties in Korea and Vietnam, many L-19's have found retirement with operations such as the VSA. They're powerful, agile, and tough. Bulletproof tough. Some of us pilots with low tailwheel time can be thankful for that.

Towing gliders takes concentration, and sometimes sheer determined nerve. Keep the speed at 75, on takeoff, climb and descent. It's especially critical in the climb with a glider tied on the back. The

L-19's wingspan is about half that of the glider, so don't expect the poor glider pilot to enjoy the same manoeuvrability. He also has no control over his speed being at the mercy of the pilot more than 100 feet in front of him. Sometimes over my headphones would come the excited command, "Slow it down would ya!!" Other times it was, "Take it in closer ..... CLOSER!"

Mountain flying was quickly, albeit unofficially, becoming part of my piloting skills, whether I liked it or not. Flying lessons from the masters of taming the thermals. Glider pilots always amazed me. They routinely soared to the flight levels, cruised incredible distances for many hours at a time, then returned to the same 400 feet of turf they started from, all without an engine. Full bladders and empty stomachs more often than not dictated the length of their flights.

As the mechanics of lift and sink began to make sense to me, I experimented with my own aircraft. My Renegade ultralight with a 53 horsepower engine needed all the help it could get in the climb. I discovered plenty out there, even following the hawks and seagulls to the best rising air.

A hang glider pilot taught me "ridge running" while flying through the mountains in my 150. Soon it became second nature to take advantage of what

*continued on page 34*



The pilot side of the cockpit

## IFR on an iPad

JC Audet

MUCH HAS BEEN WRITTEN on the new electronics in the cockpit in general, including on the use of the iPad, and many of you already know my position on the subject. Despite my admitted disdain for this new stuff, I did give-in some time ago, and acquired an iPad for use in the cockpit. My thinking was that an iPad with ForeFlight would give me all the information I need without the cumbersome paper we have grown used to over the years. I selected the iPad-mini because of its reduced size, and I got ForeFlight Pro. And the information costs a lot less than buying from NavCan. My iPad incorporates a GPS engine. I very quickly discovered that this tool was extremely practical for all aspects and types of flying, be it IFR or VFR. It is extremely easy to obtain all the info you need to plan and file a flight, as well as obtain a real time feedback as to the progress of your flight. I subsequently added the Stratus 2 to my cockpit tools. The combination, let's call it "My Kit" for now, is simply amazing.

Eventually, I started wondering about the use of that iPad/ForeFlight/Stratus 2 combination for IFR. This set-up is obviously not sufficient for TCCA to approve your airplane for IFR flying, but nonetheless,

did you ever wonder how accurate such an installation might be? I had the opportunity to test this set-up in flight, all the while visually correlating the performance on My Kit to that of the aircraft systems. I have been thoroughly impressed and this is the subject of this article. OK, the punch line is yes, from a performance perspective, it is accurate enough to do IFR, but with some serious caveats so read on till the end, don't get in the muck just yet. Certification issues and considerations are another facet of the topic.

I work as Chief Test Pilot for a major avionics manufacturer and thus have access to some rather sophisticated equipment. We operate a Piper Chieftain extensively modified for these missions. Essentially, our aircraft is a two-into-one platform. The left side of the cockpit is a perfectly normal, very well equipped aircraft for full IMC. The pilot has a typical instrument panel (photo 1) with HSI and autopilot, two Garmin 430WAAS, an Avidyne FlightMax EX500, and an assortment of other nice tools. The right side of the cockpit replicates an airliner cockpit from the perspective of navigation and other sensors. For flight testing purposes, and for use by the test pilot occupying the right hand seat, the aircraft is also equipped with a nice navigation suite: a Litton INS, two Collins DMEs, two Collins VORs, and two CMC 5024 GPS receivers, all of these feeding into up to three FMSs. This navigation suite is Part 25 standard for heavy transport aircraft such as airliners for instance. This equipment is used by the evaluation pilot occupying the co-pilot seat and a flight test engineer working at the avionics flight test station. Photo 2 shows this sensor installation.



Navigation Sensors

On a recent flight test mission, I had the opportunity to perform some of my own evaluation: how accurately does My Kit perform in the real world?

Although space limitations preclude me from presenting all the photos I would like to show, I can still present a few that will demonstrate what I observed on that mission.

When using My Kit, the selected chart can be sent or overlaid on the map with a depiction of the aircraft, providing a real time navigational performance feedback. This is a feature of ForeFlight Pro with geo-referenced charts. We will look at a short flight segment from CYHU to CZBM for an RNAV approach to runway 23. We will focus on the approaches as this is of higher importance than a transit or navigation leg.

Photo 3 shows the aircraft a few minutes after departure from CYHU and about to enter the approach chart for RNAV 23 at CZBM which we will fly via OBTID. Photo 4 shows the aircraft inside the approach plate

and closing in on OBTID, the initial point of the RNAV 23 approach. The runway is off the right wing tip. The Stratus information is now displayed on the left half of the screen. Photo 5 shows the aircraft initiating its left turn at the flyby point ELBES for final. Note the depiction provided by Stratus and the position ribbon at the bottom of the screen. Note that the vertical accuracy (1 m) shown on that ribbon is generated by Stratus, as indicated. Photo 6 shows the position of the aircraft a few seconds before touchdown. In this case, we are a bit high as we simply performed a low and over.

Upon returning to CYHU, we carried out an RNAV 06L via PIDRI. In this case, I defined an active leg from our present position (PPOS) at that time to PIDRI. This active leg is shown as the magenta line on the screen in photo 7. When an active leg is defined, a very accurate CDI is displayed on the Stratus side of the screen. Photo 7 shows us half-way through the right hand turn at PIDRI

*To a qualified IFR pilot, My Kit could provide an excellent back-up system. All of that at a very low cost.*

and the CDI shows the relevant deviation from the active leg. Note how accurately the Stratus AHRS depicts our situation. Later in the approach, I defined a similar active leg for the final and photo 8 shows the aircraft on runway 06, on the roll out, with the CDI centered and overlaid on the runway centerline.

During the whole exercise, carried out in VMC, the PIC was flying with the typical attention and precision required of a typical flight in IMC. Throughout this exercise, I was frequently monitoring the pilot's displays and indications for comparison purposes. At all times, the guidance and the information provided by My Kit correlated perfectly with the guidance and information provided to the PIC by the certified systems. This exercise has demonstrated to my personal satisfaction that My Kit is capable of providing me with excellent and accurate guidance at least equivalent to any certified non-precision IFR instrumentation out there.

From a performance perspective, I noted three elements of concern:

1 - The lateral navigational accuracy is somewhat limited because of the width of that magenta line relative to the small size of the aircraft icon. Defining the lateral position of the aircraft with good accuracy then becomes sort of a guessing game. While this is probably not an issue on a long navigation leg, as long as the pilot keeps the aircraft

icon squarely on the magenta line, it does become more important on an approach, particularly on final when one wants high lateral accuracy. That magenta line should be thinner when displayed on the plates but the CDI is available at that time. On the other hand, removing the active leg removes the magenta line and makes it easy to position the aircraft accurately on the approach path (thin line), but it also removes the CDI. So, one can have either the CDI with the magenta line, or just the plate by itself, where the flight path line is thinner.

2 - The information displayed on the iPad screen is very comprehensive and accurate but it is not integrated in the same fashion as the PIC instrument panel presents to the eye. This means that the pilot flying My Kit is required to do a lot of integration in order to have a very accurate situational awareness. I believe that an experienced pilot could overcome this with practice, in VMC of course.

3 - The features of the iPad are not as suitable to IFR flying as those of a 430WAAS, for example. Just think of entering some unplanned waypoint because the controller modified your route. Again, I feel one can learn to handle that easily with practice.

How about certification you say? Although NAVCAN recognizes the iPad with ForeFlight as adequate for en-route IFR (but they don't make the rules, do they?), I am not holding my

breath for the full IFR approval of My Kit. 'Nuff said on that.

I am absolutely not advocating that one should launch into solid IMC relying only on My Kit, or something equivalent, for navigation and situational awareness while airborne. Doing so would be highly risky, not to say illegal. However, knowing and understanding what My Kit can do, such a system could be used to improve the panel equipment at the disposal of a VFR pilot, thus providing significantly improved navigational and situational awareness, particularly when flying less familiar areas of our beautiful country for instance. My Kit could also provide a good source of information or guidance to a pilot who might be unsure of his/her actual position due to a variety of circumstances. To a qualified IFR pilot, My Kit could provide an excellent back-up system. All of that at a very low cost.

Finally, I do carry a Sporty's SP-400 hand-held on board when I fly. I acquired this one specifically because of its ILS capability. I tested its performance on this same flight and it is very accurate. Not certified, but it will bring me down safely if this is all I have left. ☘

**JC Audet** holds a MSc in Physics with a Bachelor's degree in Education. He qualified as an Aerospace Engineer and pilot with the RCAF and subsequently worked with Bombardier, Fairchild-Dornier, Israeli Aircraft Industries, CAE in Montreal and as a consultant for the Air Force and Transport Canada. He later formed his own company to design, test, and certify special purpose aircraft modifications. JC is currently the Chief Flight Operations and Chief Test Pilot at CMC Electronics. He holds an Airline Transport Pilot License and has accumulated more than 1000 flying hours as a Flight Instructor.



## EDENVALE

## ADVENTURE

ROLAND KRIENING (AS SUBMITTED TO THE SLIPSTREAM NEWSLETTER)



**A**S THIS WAS the second full year the plane has been flying, I wanted to attempt a longer trip. I wanted to go to an event somewhere at least 1.5 hours away so I could spend some quality time with my Rebel and get to know her even better. The Edenvale Classics event seemed like a good one to try... not too far, but far enough to test her legs. People had warned me as to how busy it was, air traffic wise, but I actually look forward to these types of challenges.

The day started off fairly non eventful – gas in the tanks, check the oil, walk around and double check the weather. All seemed primed for a fantastic day in the skies. I had debated taking a passenger with me, but finally decided I needed to do this one alone. I came to realize later that this was a good decision on my part

So off I went, in my trusty Rebel.

Scattered clouds at 3000ft, and a stiff wind out of the north. OK, so I had planned on taking longer to get there. More time to re-read the arrival instructions and enjoy floating above the cloud tops. I quickly made it up to 5500ft and was cruising along at 80mph. Smooth as glass and fantastic scenery.

At 20 miles from Edenvale I tuned to the frequency. There was no, and I mean NO break in the position calls from arriving aircraft. (I'm sure that the instructions said to stay off the radio – so much for that.) Every size of aircraft seemed to be in the circuit, a challenger ultralight, Harvard, 172, and B25 Bomber. My excitement was building... this is going to be very cool! The instructions were to be 2000ft over Minesing, then turn to follow highway 26, dropping to 1700 and cross the field. I felt obligated to announce my presence as well, so

a quick call resulted in me being in front of a group of four arriving ... did I luck out. I had no trouble maintaining the 80 mph required airspeed, but I am sure the others behind me were S turning to avoid chopping my tail off. Separation was a mere 2-3000 feet, or so it seemed. Now with the wind coming off the lake I expected some bumps, and there were many – some intense enough to knock your headset off.

Final approach was interesting to say the least – bumps, traffic, gusts, more traffic, bigger bumps and then the call to extend my landing to past the mid-point so as not to hold up the traffic behind me. Happy to say that after quite a few wing tip to wing tip banking I finally touched down almost at a fast running speed. With what seemed to be a few hundred eyes on you ready to hold up score cards, I surprised myself with an almost perfect three pointer. So I

made it, nothing bent or broken, not even my pride. 2 hours flight time. The Rebel performed admirably and made me look good.

The Edenvale event is one that everyone should attend at least once. No airshow, but watching arriving and departing aircraft is a show in itself. Lots of displays, vintage aircraft and cars. Yes there was even a pipe band. Within 10 minutes of parking the Rebel I already had a couple of people asking me about the plane, the engine, my trip, etc. Met an 85 year old pilot who still flies his Luscombe from a farm strip nearby. Had some lunch, talked to a few more people, looked at more planes and cars, then time to start preparing to return.

At this point the skies became a lot more slightly broken than previously scattered and although the cloud base seemed to have only increased a bit, the cloud tops had grown considerably. My original plan was to

get above the clouds to get into some smoother air, but that was looking more challenging as time progressed.

With a 12:32pm departure I started my return trip.

Now this is where I have to digress a bit and provide some backstory as to why I took up flying in the first place. Many, many, many years ago I was the kid who got sick in the back of the car on the way to the lake every weekend. Sure if the road was flat and straight (as most are in Manitoba) I was fine, but once we entered the Canadian Shield the road started to twist and heave, and I turned green. When my older brother started flying, he took me up on the odd occasion and as older brothers normally do, tried to make me sick. To say he was successful is an understatement. (He is now a captain with Lufthansa)

After that I never liked flying of any kind, and never set foot in a small plane again, until 1992 when I was

determined to overcome my fear and took flying lessons. I clearly remember a few times the instructor looked at me (and my very pale pasty skin) and said we better call it quits for today. Apparently (or so I have been told), the fluid in my inner ear is not as viscous as it should be and thus makes me more susceptible to motion sickness. Damn genetics.

So now back to the Edenvale trip...

As I climbed out of Edenvale it was extremely gusty and obviously due to the time of day very bumpy. Again my original plan was to get on top to avoid the bumps and have a nice flight back. That was not to be! Cloud base at about 4000 and tops (best guess) were 5-5500ft. Based on my aversion to continuous uncontrolled three dimensional motion, I was determined not ride it out for the

*continued on page 35*

FLYING THE  
**PERFECT**  
ERCOUPE



**J**ohn Huthart and Jack Smith are two pilots who like many took their flight training in their forties and then decided to buy a shared plane instead of renting Cessnas an hour at a time. They investigated many planes and in 2003 settled on their 1946 Ercoupe C-FTSS when it became

apparent that many were undervalued and they were low time, because unlike Cessnas they were not being used in flight schools. Their Ercoupe was a certified Model CD that looked solid, and they flew it all over Ontario for two years, enjoying their \$100 hamburgers at fly-ins.



Jack Smith (left) and John Huthart (right)

In 2005 they allowed an AME to use a flushing oil to clean out their engine and on the way home found that there was no oil pressure, but fortunately they found a strip for a landing. Replacing the oil restored the pressure but there were concerns with the C-85 so they had some decisions to make.

The cost of having the engine rebuilt was onerous and since Jack was a heavy equipment mechanic capable of doing the rebuild himself, they decided to deregister the plane and convert to Owner Maintenance or Amateur Built. Owner Maintenance was definitely an easier route but they did not want the limitations – the plane could be maintained but not modified, and they wanted the freedom to make changes. Also the FAA had just ruled that O-M aircraft could not use US airspace, so that category was a non starter.

The Amateur Built category has always required the builder to perform 51% of the work and in 2005 the

interpretation of what constituted work was somewhat more generous than now. John and Jack dismantled the plane, removed the wing and tail skins, and called for a 51% determination. The plane qualified so they were on their way.

When Jack dismantled the C-85 engine he found that it was going to need a crankshaft. They located a good .020-under O-200 crank and rods and Jack rebuilt the engine with all new bearings and a new oil pump, plus a C-90 camshaft and lifters to give a better power curve.

The fuselage had been painted white with red stripes but it was getting tatty, so Jack and John had several months of work with chemical paint stripper and wood scrapers to get down to the bare metal. Paint and filler can hide a lot of dents and there was some metal bumping to do. They made many specially shaped wood and metal dollies and slappers, and took turns carefully tapping out dents and scrapes. Some pieces like

the wing root fairings were taken to Paul Grove, a master metalworker who used his English Wheel to gently massage them back to smooth. They decided to make new sides for the engine cowlings and these too were shaped by Grove on his wheeling machine.

The wings were completely dismantled, with all ribs being numbered before removal. Every part was inspected and treated with zinc chromate before being riveted back in place. In the wing walk area there had been some exfoliation and these ribs were repaired using the techniques in AC 43-13. They cut out new alclad wing skins and riveted them in place, paying attention to the subtle cusp in the underside, just behind the leading edge.

The horizontal stab needed a new skin so again they made their own. One of the rudders also needed a skin, and because of the step in the trailing edge they bought a replacement from Univair.

When all the metalwork was finished they bought a double head Cyclo polisher and used the Nuvite system to bring everything up to a full polish. The plane now has a show quality gleam and if ERCO were to start up again this plane would be the display model.

Besides the aluminum work, John and Jack went through the entire plane replacing parts to bring all systems back to new condition, something that would have been onerously expensive had they chosen to do this with a certified plane.

New landing gear pivot bushes were pressed in and reamed in place. The oleos were rebuilt with seals to replace the o-rings, so that motorcycle fluid could be used as the damping medium. The entire stack of suspension donuts was replaced on each main gear damper to restore the original ride height and landing characteristics. The brakes received new seals and hoses and the “ink can” reservoir was replaced with a new aluminum part. All three wheels received new bearings, and the nose gearleg was sent out for hard chroming and finish grinding by a spe-



The fuselage was laboriously cleaned of paint with stripper and wood and plastic squeegees.

## Sourcing an Ercoupe for conversion

If you wish to do the conversion of an Ercoupe to either the Owner Maintenance or Amateur Built categories, you will be looking for two very different animals. Owner Maintenance is for pilots who want to do their own maintenance while staying close to the original type definition. To enter the category it is necessary that the logbooks show that all AD's have been complied with, and the plane must have a fresh annual. Essentially you will bring the plane up to the best it has ever been and then deregister it so that you can do your own maintenance.

Transport will require that the prop and engine have an X stamped next to the serial number as a means of identifying that these have not been maintained by an AME. Before buying any plane to be changed to O-M or doing any X-ing it would be advisable to contact your local TC office with logbooks in hand, and ask if your particular plane meets the requirements. Once you have deregistered the plane and X'ed the prop and engine there is no returning to the Certified category. The O-M plane will no longer be eligible to travel in US airspace but you will be able to do your own maintenance and you can make any STC-ed changes without having to purchase the STC. The O-M category allows all maintenance and annuals to be signed by the owner who is a pilot. Of the 136 Ercoupe variants on the TC registration database 25 have already been changed to the Owner Maintenance category.

To enter the Amateur Built category it is first necessary to call MD-RA to do an evaluation to show that you would be performing 51% of the work to create a new plane. Points are awarded for each action in building the plane, including for fixturing. The chart is available on the [www.md-ra.com](http://www.md-ra.com) website. Removing wing or fuselage skins and then riveting the same parts back in place does not gain any points, but making new skins and installing them does. Once the 51% determination has been performed you would then proceed to fabricate and assemble to the pre-cover point and have another inspection. After passing this inspection you may continue to build until the plane is ready for final inspection at the airfield at which it will be based for its 25 hours of restricted test flights.

If you wish to go into the A-B category you will be looking for a very different airplane from the one that would qualify for O-M. It does not matter if the AD's have not been complied with because you would be building a new A-B aircraft and you would be the manufacturer. You could sell off the wings and tail and interior, plus whatever else is necessary to be constructed to meet the 51% requirement, and then build new parts yourself. Once the 25 hour restrictions have been removed the plane will have the same privileges as any other A-B aircraft, including flight into US airspace.

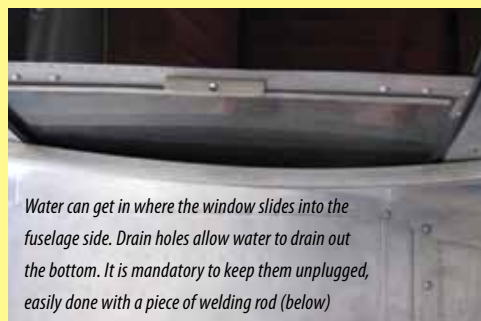
There is a deal breaker for all Ercoupes, that being the wing centre section. There have been several AD's to cut inspection holes and perform inspections of the main and rear spars plus the ribs in the wing walk area. The problems are caused by accumulation of rain in the belly of the aircraft, rain that entered alongside the cabin in the curved area beyond the side windows. Rain is supposed to wash down to the centre of the cabin floor and exit through drain holes just ahead of each cabin bulkhead. Unfortunately the drains can become plugged by dirt and leaves and then the area under the floorboards fills with water that will seep by capillary action between the spar caps and the shear web. In warm areas there will be intergranular corrosion and in our climate

the water will freeze in winter and separate the caps and ribs from the web. When I was looking for an Ercoupe I found one with three inches of water in the belly and it was November. Freeze damage was in its future.

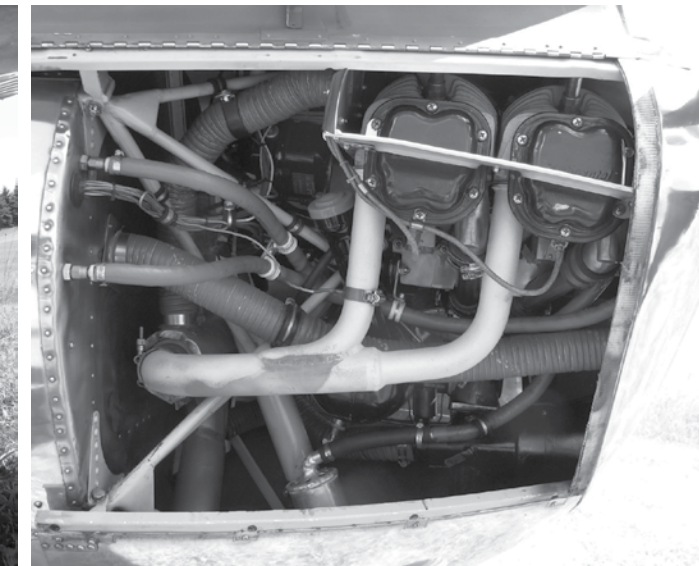
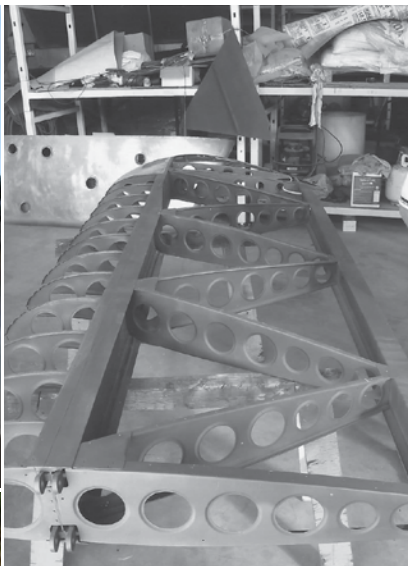
Take along a foot of 3/16" welding rod when inspecting an Ercoupe and reach underneath to poke all four centerline drain holes to see if water runs out. If it does, then lift the wood floorboards and the metal seat pan to have a closer look. If the owner will not allow this, just walk away. The centre spar and its proprietary caps are curved to give the dihedral angle so replication by amateur constructors would be difficult. Univair can supply for the postwar models but not for the few that were built before the US entered the war in 1941.

The AD list is available by googling Univair AD List. The 2002 and 2003 AD's are for the spar inspections and the "swiss cheese" holes to accomplish this. The most recent is the 2012 AD to inspect play in the ailerons, and to verify the accuracy of the airspeed indicator to ensure that the plane does not go past the 144 mph Vne and encounter aileron flutter. This requirement may be satisfied by a three leg flight test to compare to a GPS, or it may be accomplished by having an instrument shop check the calibration, coupled with a pitot static test.

Whichever category, you should join the Yahoo Ercoupe-tech group to view their files. On this list there are several life-long Ercoupe owners who are experts who have dealt extensively with the FAA on Ercoupe issues.



Water can get in where the window slides into the fuselage side. Drain holes allow water to drain out the bottom. It is mandatory to keep them unplugged, easily done with a piece of welding rod (below)

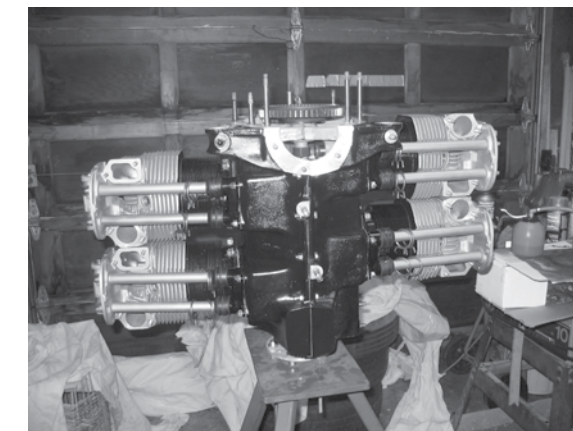
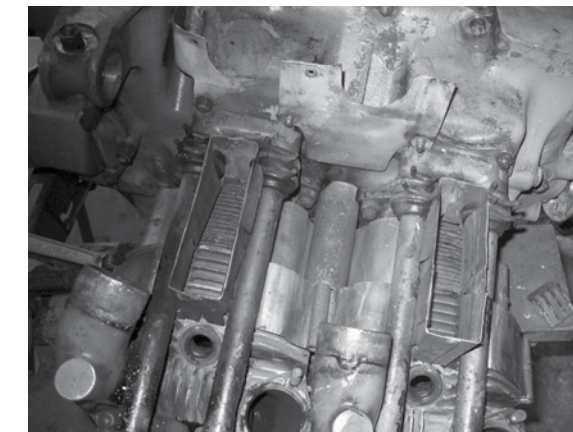


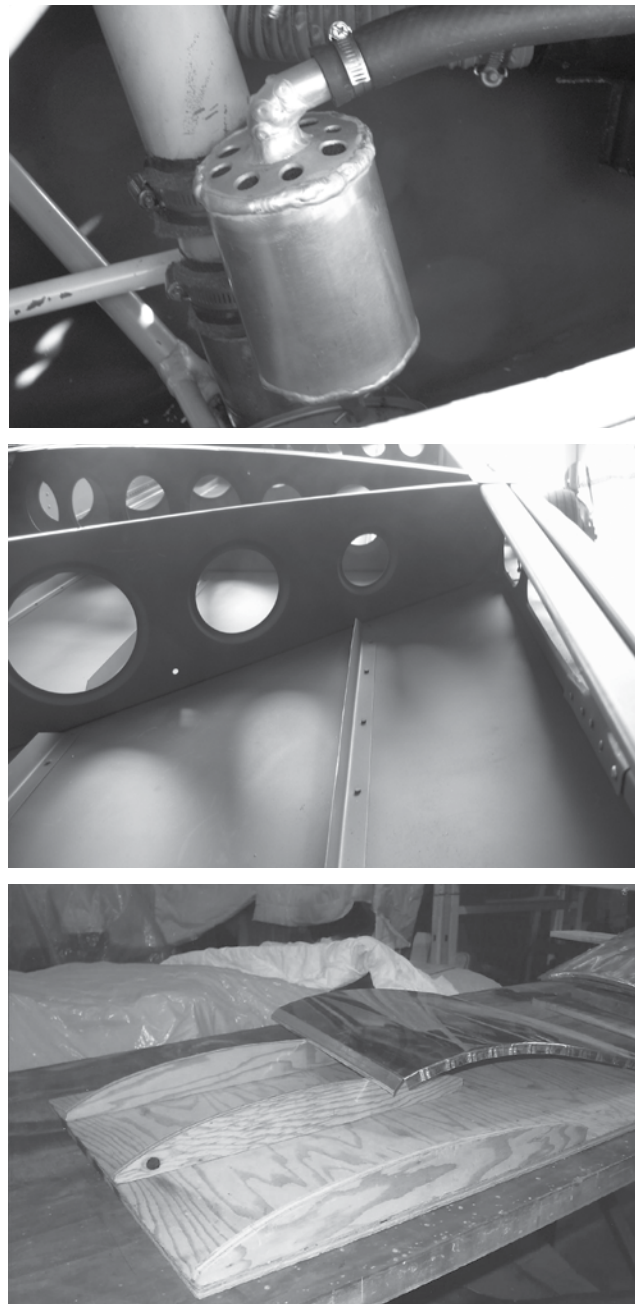
Left: the Ercoupe's unusual diagonal wing ladder eliminated the need for drag/antidrag bracing, shown here after priming and assembly. Centre, the main landing gear has a long travel trailing link suspended by an oleo with rubber pucks for suspension. Above right, the clean engine compartment with properly firesleeved fuel lines. Right, before and after pictures of the engine.

cialty shop that understood how to prevent hydrogen embrittlement. The yokes received new swivel joints and the column was rebushed with new parts from Univair. Control cables and pushrods were replaced with new parts too, and when they were finished John and Jack had essentially a brand new Ercoupe airframe. The seats had been recovered earlier so these remained. The day VFR panel got a new ICOM radio, while a Narco Mode C transponder keeps the airliners informed of their presence when they are flying in the vicinity of Toronto Airport.

The fellows made new side panels for the cockpit and painted the footwell. The firewall was insulated with fiberfrax and leather, and John made new wood floorboards. He also made a new rear storage area from Baltic Birch with a hatch for access to the new lightweight Odyssey sealed battery, finishing all wood in clear lacquer.

The plexiglass windshield was polished to new condition and the slider windows were replaced with lexan. Ercoupes never had shoulder belts, and because of the cost of the STC to add them many still have only lap belts, but in the Amateur category there is no need for the STC. John and Jack fitted shoulder belts to the rear cabin bulkhead and reinforced that bulkhead with Baltic Birch.





Top: Jack welded up a collector can for the crankcase breather. Centre, the reassembled wing structure looks new after cleaning and priming; and bottom, new cowl sides were shaped by Paul Grove to fit the wood buck that John had made

The engine compartment was refitted with new mounting rubbers, control cables, and hoses, and the original oil tank was replaced with a larger one from a Cessna 150. Ercoupe carbs frequently have their mixture control wired to full rich because pulling to lean does nothing, but Jack found that lapping the two mixture plates to each other restored the rich/lean function. The original prop and exhaust system were retained, but with a fresh finish.

The Weight and Balance shows an empty weight of 920 pounds which against the original gross of 1400 gave a payload of 480 pounds. Later Ercoupes had the same structure but since they came with the C-90 engine they had a gross of 1450 pounds. John and Jack registered C-FTSS at 1450, giving a very useful payload of 530 pounds. Maximum fuel load is 24 US gallons, so with full fuel tanks C-FTSS can carry 386 pounds of crew.

C-FTSS has performance similar to a Cessna 150; on grass at gross weight the roll is 1000 ft. and solo it is 750. Rotation is at 60 mph and climb at gross is 500 fpm, while solo it improves to 800. Cruising the C-90 at 2350 rpms produces 105 mph, and a lethargic cruise at 2150 makes 95 mph. Vne is 144 mph and maneuvering speed is 108. Maximum structural cruise speed is 114 mph. With only 9 degrees up elevator there is really no stall but the plane mushes at 45-50 mph. Lifting the nose and pulling back to idle produces a sink of nearly 1000 fpm. If the pilot needs more he can perform the "falling leaf" maneuver in which he rolls left and right while the nose is high, and the plane drops like a stone.

Circuits are at 2100 rpms for 90 mph on the downwind, and pulling back to 1500 for base and final results in a 500 fpm descent at 80 mph. Over the fence at 65-70, the flare is at 60-65 and the rollout is short.

John Huthart and Jack Smith have enjoyed their "Aerocoupe" immensely, flying all over Ontario and putting it on display at airshows. My own Ercoupe is in bare metal but their plane looks so fresh and shiny that if I see their plane at a show I park mine far away.

Life changes and Jack has lately moved to another city, too far to remain in the partnership. John is now restoring an early series Austin Healey and Jack is riding motorcycles. The cost of hangarage in the Toronto area is high so the partners have reluctantly decided to sell their baby. If you are looking for a beautifully restored piece of aviation history, their ad is in the classifieds of this issue. **R**

## Ercoupe History



Imagine an aircraft manufacturer setting up three shifts to produce over ten airplanes per day, and actually selling them. These days a manufacturer's design is a success if it sells one or two hundred over a ten year production run. Engineering Research Company (ERCO) did these numbers by the second week of every month of 1946. Aviation was the buzzword, military pilots were just back from the war, and optimism abounded. Unfortunately by the end of that year the market was saturated and the boom was over, but by that time some 4000 Ercoupes had rolled out of the factory. 1947 marked the end of the Golden Age of Aviation.

The Golden Age of Aviation began with Lindbergh's 1927 flight across the Atlantic and exploded from there. In the Thirties the US government was encouraging the development of air travel, new die stamping techniques were being introduced, and high strength 2024 aluminum became available. Biplanes were quickly replaced by modern all metal cantilever designs, and streamlining became a science, aided by the work that Fred Weick and others at the NACA wind tunnel at Langley. Douglas built their DC-2 and -3, Boeing created the 247, Beech built their 18, and Lockheed did the 10 Electra that was chosen by Amelia Earhart for her trans-Pacific record attempt. Anything to do with streamlined aircraft was magic, so automobiles, buildings, and even toasters

and radios affected the Streamline Modern fashion.

In the Twenties the National Advisory Committee for Aeronautics (NACA) had hired Fred Weick to set up a wind tunnel devoted to propeller development, and from this work he wrote the standard textbook on propeller design. He also developed the NACA cowl for radial engines, dramatically reducing drag while improving cooling and airspeed. Weick next turned his attention to the design of a "safety airplane" that incorporated a pusher prop, twin tail booms, and tricycle landing gear, building several successful examples.

Engineering Research Company (ERCO) had been set up in the Twenties to produce tooling for aircraft and propellers and they hired Weick to continue his work on safety aircraft after he left NACA. He was put in charge of a project to produce an all-metal airplane that anyone could fly without fear of spinning. Test examples were built and evaluated, and stamping dies and production tooling were made, but then the war began and everything was put on hold. With aluminum being in short supply a few examples were built from wood during the war to continue testing. The original engine was an ERCO-designed inverted inline four cylinder but when Continental announced its A-65 the firewall forward was adapted to this flat four.

When the Ercoupe was conceived, the typical light aircraft

manufacturer was fabricating wood or welded tube fuselages with wood wing spars and ribs, everything covered in fabric and dope. This was a very bitsy, labour intensive (read expensive), and slow method of getting a plane out the factory door. After the War many manufacturers resumed building their prewar designs. By contrast ERCO jumped in with both feet to use the lessons learned from wartime production to build an aluminum everyman's plane, and they followed up with innovative marketing that included selling the planes in Macy's men's department, and advertising in mainstream magazines.

Fred Weick designed the Ercoupe to be "characteristically incapable of spinning" and to be so simple to fly that any car driver would quickly feel at ease in the pilot seat. He used a lot of dihedral to give positive roll stability,

and he eliminated the rudder pedals, instead coupling the rudders to the differential ailerons, which resulted in no adverse yaw, and a flat cockpit floor with just a brake pedal near the firewall. The upward travel of the elevator was limited to prevent a stall, and if the plane could not be stalled it could not spin. There was no need for flaps because full up elevator at idle power resulted in a mush of some 800 fpm. He incorporated tricycle gear at a time when almost everything else was a taildragger, and his long travel trailing link main gear turned even carrier landings into greasers. The telescopic nose gear was steered by the yokes, so when taxiing the pilot just turned the "steering wheel" right and left, as he would in a car.

The design requirements had been met but the postwar boom was a bubble that burst, and at the end of 1946 the company was sold to Sanders Aviation, but sales were low. Ownership of the type certificate bounced around half a dozen times and even Mooney built examples, initially with a twin tail and eventually with the distinctive single Mooney tail. Eventually Univair bought the rights and they are now the manufacturer of a range of replacement parts for the ERCO, Forney, Alon, and Mooney M 10. The US Light Sport category allows the earliest, lightest models to be flown on the Sport Pilot license so those planes have become a hot commodity. An STC increases the gross weight of C and CD models to the category limit of 1320 pounds, much more useful than the original 1260.

#### LIVING WITH AN ERCOUBE

An Ercoupe is about as simple as an

**These days a manufacturer's design is a success if it sells one or two hundred over a ten year production run. Engineering Research Company (ERCO) did these numbers by the second week of every month of 1946.**

aircraft can be, and many ultralights are more complicated. The Ercoupe's controls are light and effective, with positive stability in all axes. If an Ercoupe has rudder pedals it can be flown on rudder, elevator trim, and throttle; it is even possible to do circuits this way. One of the nicest features of an Ercoupe is the side windows that slide in tracks to meet at the top, completely enclosing the cabin for cold days. On warm days the windows can be slid down so that the crew can fly elbows-out. On a calm evening flight the pilot and passenger can take turns sticking out a hand to induce a turn, and if they do this simultaneously they can even generate a sink rate of a couple hundred feet per minute. An Ercoupe is a lot of fun.

Rollover protection is well addressed in the Ercoupe's cabin. The windshield and backlight are framed by two parallel roll bars made from stamped aluminum sections. The sides of the cabin have

external curved longerons, and the skins are formed in double curvature to give a strong monocoque. All bulkheads are curved, so corner-induced stress risers do not exist. The main wing spar is under the knees of the crew and the curved floor is well supported by lateral and longitudinal bulkheads.

Most light planes of the period had cowl fuel tanks, and the Ercoupe is no exception. However Weick used a header tank of only six gallons that supplied fuel by gravity to the carburetor. Supplementing this are two interconnected leading edge fuel tanks that are continually replenishing the header tank via an engine mounted mechanical pump, with an overflow tube to convey excess fuel back to one of the tanks. The left hand wing tank has a mechanical gauge and the header has a sight tube with a float. Until the wing tanks run dry the float will show that the header is full, and when it begins to descend there is still over an hour of fuel available. With this gravity and mechanical fuel system plus two magnetos, an electrical system failure means little as long as there is enough battery steam to make radio calls.

The twin aluminum tails are the defining part of the Ercoupe. Walter Mitty types enjoy a glance out the rear window to imagine one's self as the tail gunner in a Lancaster. Oval in shape, these can be made only with dedicated press tooling, something that manufacturers cannot afford to have nowadays. Positioned at the ends of the horizontal stab, they were originally actuated from the aileron bellcrank that is on the floor behind



*The famous "Lancaster View"*

the seats. They can be small because they are well into the breeze, and each has 20 degrees of outward travel and only 3 degrees inward, to prevent contact with the elevators. ERCO introduced an optional rudder pedal kit to uncouple the rudders from the ailerons, and my own certified example has this, but if I had my druthers I would remove it and regain the lost legroom. I have tried cross controlling, pushing one rudder pedal fully and then cranking in as much aileron as possible without traveling laterally, but all this produces is 250 fpm of sink and a bit of a side view.

One might think that with so little rudder a crosswind landing would be difficult. Fortunately Weick designed in enough dihedral that an Ercoupe, even with aileron-coupled rudders, can handle more crosswind than a Cessna 150. The pilot merely banks

into the crosswind, and when the inside wheel touches down he loosens his grip on the yoke, allowing the plane to straighten itself out. There is an oft-repeated story that Ercoupes have castering main gear but this is just a myth.

With rudder pedals I have tried the common "bank into the wind and straighten with rudder" procedure and it improves the crosswind landing a bit but not much, again because there is little rudder area. I have even tried leaving my feet flat on the floor so that the rudders are in trail, and the Ercoupe handles a crosswind almost as easily. Fred Weick designed in some very safe handling characteristics.

The Ercoupe wing was revolutionary in its day and it is still innovative. The aluminum spars are built up conventionally with aluminum shear webs and caps, but the centre section

is curved to produce the dihedral angle. The centre section is 8 ft wide and holds the main landing gear and the leading edge fuel tanks. Main wings are bolted to the centre section and incorporate full length aluminum ailerons. There are no flaps, so very simple. The strength of the wing is in the riveted D-cell construction with an aluminum nose skin and parallel aluminum ribs on 9" centres. Behind the main spar the ribs are zigged and zagged on 36" centres to give good drag-antidrag and compression without having to use tubing or x-wires. Early examples had the wing covered in doped fabric wrapped from the trailing edge, around the d-cell, and back to the rear spar again. Later the factory offered riveted aluminum skins, but at a weight penalty of some thirty pounds.

Servicing the Ercoupe is simple because there are few systems and lots of space around the engine. Only a few had the A-65 and then they went to the C-75. Most of these became uprated to 85 hp by substituting a larger diameter carb adapter, allowing more rpms. The increased performance allowed the gross to be raised to 1400.

The only servicing pain is the master cylinder which is underneath the floorboards just behind the firewall. If red fluid is seen oozing from the most forward belly drain it is time to unscrew the floorboards and get upside down in the hellhole. It is not unusual to spend an hour with the 3/8" wrenches to fish out the master cylinder for a shaft seal or a hose replacement. Other than the master cylinder, all maintenance chores are easy.

## Riveted Joints Part 2 of 2

by Chris Heintz

This article is part 2 of the article that was published in the April edition of the Slipstream. This is an excellent explanation of rivets and their use in aircraft by designer, Chris Heintz.- ed.

IN THE FIRST PART of this article we examined the advantages (i.e. reliability and durability) of solid "bucked" rivets as well as their disadvantages (i.e. need for expensive equipment, required skill level, noisy operation, and accessibility). Blind rivets have been developed to overcome the disadvantages of solid rivets, and some of the blind rivets now available have retained virtually all the advantages of solid rivets. Let's look at blind rivets in some detail.

First of all, let us understand that a "pop" rivet is a blind rivet, but a blind rivet is not necessarily a pop rivet. ("Pop" rivet is a brand name manufactured by USM - United Shoe Machine - and obviously a "shoe" rivet is not ideal for aircraft use.)

As a typical example, we will use the Avex rivet (see Note at end of article).

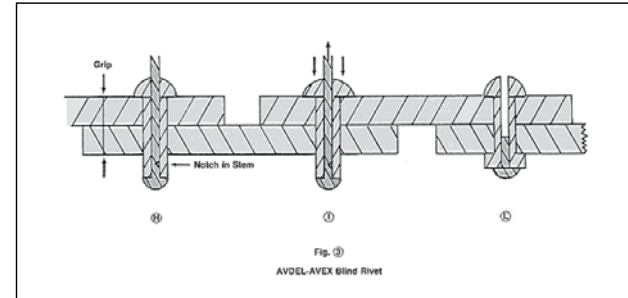
When setting a blind rivet we first drill a slightly over-size hole so that the rivet can easily be inserted (see item H, Figure 3).

A special hand rivet puller (hand rivet gun from a local hardware store - at \$15 to \$50, depending on quality) is used to pull on the rivet stem and the reaction is applied to the rivet head. The stem has a special head which compresses the rivet tube and makes it grow and fill the hole (see item 1, Figure 3) pulling further. The rivet can only grow outside the parts until the rivet and stem head create a good formed head resting well on the part and squeezing the parts together. At that stage, the stem breaks in tension at the notch. (The set rivet is shown in item L, Figure 3.)

When we examine this blind rivet and compare it to the solid rivet discussed in Part 1 of this discussion, we find some of the same advantages:

1. The rivet is manufactured under adequate quality control, which guarantees you the quality. (Again, see note at the end of this article.)

2. The rivet fills the hole completely preventing any relative motion.



3. Original and formed heads seal on and compress the parts together (no corrosion, the engine vibration loads do not fatigue the rivet because they are transmitted by friction.)

There is one prime disadvantage to blind rivets. The rivet, being tubular, has a section that is obviously smaller than that of a solid rivet. This means one blind rivet is not as strong as one solid rivet of the same diameter. The designer needs more blind rivets, a larger diameter rivet or a stronger material.

Many designers seem to like the "monel" (stainless steel type) rivets which are stronger, but they may forget that there is a corrosion problem involved with stainless steel. As mentioned in an earlier article, as the aluminum corrodes away, the aircraft owner has no choice but to replace the rivet with a larger diameter rivet later on. Or, if using stainless steel rivets, the builder has the messy burden of dipping every single rivet in zinc-chromate (ZnCr) primer before setting it in the hole ... and this is all beside the fact that there is no "good" stainless steel blind rivet readily available on the market!

Going to larger rivet diameters is a limited choice as the large blind rivets are so hard to set by hand that a very expensive and cumbersome tool is required. In my opinion, this defeats the purpose of these rivets in the first place.

Consequently, then, if the decision is made to go with blind rivets as opposed to solid rivets, the builder/designer is left with little choice other than increasing the numbers of rivets. A good rule to be used is that the number of blind rivets needs to be increased roughly in the proportion of 5 blind rivets for 3 solid rivets. In actual fact, this is not a consideration either on light airplanes as most rivets are used on the skins, which need a relatively small rivet pitch (spacing between rivets) anyway in order to prevent waviness in the skin panel. So, the designer is stuck, solid or blind rivets, not with the strength, but with choosing a pitch which provides a nice finish (for aerodynamic and aesthetic reasons).

We have given the example of the Avex blind rivet

because this is the only reasonably priced "good" blind rivet readily available (see note). Cost of these blind rivets is just a fraction of the "Cherry" blind rivet (and, remember, you need 4,000 to 8,000 rivets per aircraft). One other very determinant factor for selecting these blind rivets is that they are "grip" insensitive. The standard Avex rivets will join from grip 0 to grip 1/4" (6 mm) with the same rivet. (This compares to four different lengths for the Cherry type). This is a very important factor to prevent errors and must bear heavily on the designer's decision to make construction as easy and reliable as possible for the builder.

There is one other objection to blind rivets. The rivet is okay for corrosion, but what about the stem? The stem is steel and phosphated, which is the correct protection, but, obviously, where the stem breaks there is no protection. Will this rust? Any galvanic corrosion protection (such as phosphating steel or zinc chromating aluminum) has a reach of about 1/8" (3 mm) beyond the protected area. With

these blind rivets the broken part is only 1/16" at the most, and extensive experience has confirmed that this is not a problem. (Zenith CH 200 / 300 aircraft assembled with blind rivets still look like new after more than three decades, with outside storage.)

In this article we do not give any specific shear strength, just some relative values. It is the responsibility of every designer to obtain the values he or she feels can be consistently achieved by the builders (and this takes into account many things, such as basic design philosophy, materials to be jointed, working conditions, etc.)

Nevertheless, I feel impelled to warn some experimental designers that the shear values given by the blind rivet manufacturers in catalogues are to be looked at with some common sense as well. The manufacturer is not a liar, but he does present his product in the best possible way. For example, when they make tests they use very thin sheets so that the stem is long enough to fill the rivet (see figure 4), which is the reason why the individual shear strength is

higher than an aircraft solid rivet (the steel stem participates). But on our aircraft, this is relatively seldom the case. As a rule of thumb, a reliable shear value should be 1/2 the catalog specification. But again, the designer should make tests. (Just as an example, when I do blind rivet tests, I knock the stem out before the test, just to be on the safe side!)

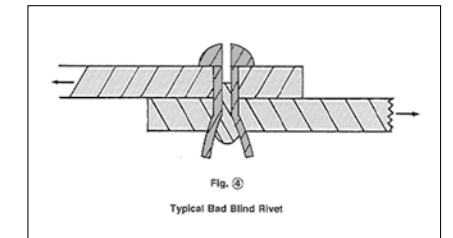


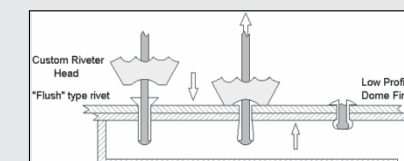
Figure 4 shows a bad blind rivet (a standard hardware "pop" rivet). Note that the rivet does not fill the hole and that there is not a nice, formed head (just the tube is opened); the stem will fall out after some vibrations.

Use the right rivets and you will be very pleased with the results! 🛠️

## Further information about Zenith rivets

It is obvious that the notch depth in the stem is directly related to the breaking load. In previous years we used to recommend the Avex (brand) rivets, but outsourced manufacturing made it difficult to obtain the desired consistency. Zenith Aircraft now sources the rivets independent of brand name and makes a systematic test on every lot received to guarantee the correct quality, and supplies the blind rivets to customers worldwide.

The FAA type-certificated ZENITH CH 2000 aircraft uses these same rivets.



Designer Chris Heintz has developed a unique method for setting Zenith blind (or pull) rivets: Using a "flush"

type blind rivet (as opposed to a "dome" type), the rivet head is formed into a low-profile dome finish in the riveting (pulling) process, as illustrated above, with the use of a custom machined (concaved) rivet puller head. This simple process sets the rivet head tightly against the top skin while providing a low profile finish. More on blind riveting can be found on EAA's "Hints for Homebuilders" Video Series.



**MOUNTAIN FLYING  
WAS QUICKLY, ALBEIT  
UNOFFICIALLY, BECOMING  
PART OF MY PILOTING SKILLS,  
WHETHER I LIKED IT OR NOT**

*Barry Meek / continued from page 15*

the weather gods provide to improve the performance of the aircraft. I practice regularly.

My friend John, is quite unaccustomed to reading and flying the thermals. He has no reason to since his plane has a turbocharged engine, and no shortage of horsepower. He regularly cruises above 10,000 feet, and has no trouble getting there. Like so many pilots, myself included before exposure to the glider fraternity, John hadn't even considered there was help for his horsepower in the thermals and turbulence. Horsepower rules! The rule most pilots live by

I'm not ashamed to admit to never having an approved mountain flying lesson. There are dozens of very competent, well qualified instructors who could show me a thing or two about it. And maybe someday I'll step up to that plate. So far so good though, and I owe much of what I know to the sailplane and hang glider pilots I worked with. You have to admire guys like that. They're guys, and women too, who challenge the laws of gravity, and win. They put nature to work, controlling the gift of lift that's there for the taking. We powered pilots can do it too, just not to the same extent. Getting a cruise speed of 130 out of a Cessna 150 tickles me right up the ASI.

There's no sense being in a hurry since my flying is pretty much all for recreational reasons these days. The journey is the destination. Time spent in the air, flying, is like savouring the chocolate cake or a glass of cold, sweet wine. Why would you want it to end. The trends today are for more horsepower, more speed, more avionics. It all comes with a price, and so far has priced too many people out of flying. Remember when Arlington and Oshkosh were gathering places for simple, experimental, homebuilt, fun aircraft? Today we see only remnants of that era there. But some of us remain, the diehards, who enjoy and prefer the old ways, the old days. I'll always be excited about getting more from my Cessna 150. But it's a bigger kick when it comes free. We just need to follow the simple rules of nature. 🦋

*Edenvale / continued from page 21*

1.5 hour flight back, so I made the decision to find a break in the clouds and get on top. So, up I went at 500 fpm. Seemed the higher I got, the worse it got. Finally up to 3500ft and suddenly a strong gust turned me on my side... no, not 45 degrees but almost 90. I recovered, a bit unnerved, then a drop of what felt like 100 feet, followed by another gust and back to 90 degrees bank. Enough of that... back down to 2500ft for a bit, gather my wits and try again. Two more attempts followed with similar results. The Rebel handled everything with grace and style, but I was definitely worse for wear.

So I had given in to the fact that I would be flying under the deck all the way home. First airport on my way home was Stratford... only an hour away. Now remember I said I was thankful I did not have a passenger. I am sure that no one's stomach could take the abuse, including mine. So here I was again, in the back seat of my parent's car, facing the uncontrollable and nauseating pitching and rolling. But this was obviously different, I had to fly and feel sick at the same time. *Great!* For all you glider pilots, you know what happens under those puffy clouds – you go up really fast, then you go down. So the whole flight back was a continuous rollercoaster for *one whole hour!* That combined with the 40mph gusts kept my white knuckles firmly fixed to the controls. The Rebel got a real good workout!

By the time I got near Stratford, I was spent – exhausted, white as a sheet, and dripping sweat. Did the best carrier landing I could... one wheel, then the other, then the back

*Home field was a welcome sight  
and I put her down as quickly and  
softly as I could, after all she did  
her job very well and kept me safe.*



and finally down on all three. Taxied to the fuel pumps faster than I should have to be greeted by the airport manager, who took one look at me and said, "pretty bumpy up there isn't it – go help yourself to some water in the fridge and sit for a while."

After 30 minutes, the pale and pasty guy got back in the Rebel for the last 40 minute flight to Warren Field. Somehow knowing that I was close to home made this part of the trip a bit more tolerable. Home field was a welcome sight and I put her down as quickly and softly as I could, after all she did her job very well and kept me safe.

So I learned a few things on this trip:

- 1) Never again
- 2) Never again
- 3) And never again.

But seriously, I know many of you

have flown in these types of conditions and think nothing of it, but for me this was like running a marathon (while having the stomach flu). I guess I am more of a fair weather flyer, and am more than happy with that.

So here is what I really learned...

- 1) during hot summer – fly early in early morning or late at night
- 2) if you must fly in the summer, make sure you can fly on top
- 3) wind gusts at any altitude are not your friend
- 4) airport managers have seen everything and are your friend
- 5) fly to your comfort level, you're not a fighter jock
- 6) Gravel and fresh air are your friends
- 7) Keep your eyes outside
- 8) Expect the unexpected
- 9) Flying should not be uncomfortable .... Right?

So all in all, I now have 170 hours in my log book with 90 hours on the Rebel and have been flying at least twice a week. OK, so for the next two weeks maybe no flying until I get my sea legs back. 🦋

**Roland Kriening** is an RAA member and the builder of a *Murphy Rebel*.



# 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 FERMONTaises (FERMONT):** First Sunday 7:30 pm at 24 Ibergville, 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 19 Aileron in the airport terminal. Contact Ms N.C. Kroft, Gatineau Airport, 819-669-0164.

**ASSOC DES CONSTRUCTEURS 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 lazyfarm@sympatico.ca

**KENT FLYING MACHINES:** First Tuesday 7:00 pm at various locations. Contact President Paul Perry 519-351-6251 ppperry@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:** Second Monday at 5:30 pm in the orange hangar at Niagara Central Airport June to September. Contact Pres. Elizabeth Murphy at murphage@cogeco.ca, www.raaniagara.ca

**OSHAWA DISTRICT:** Last Monday at 7:30 PM at the Oshawa Airport, South side, 420 Wing RCAF Assoc. Contact President: Jim Morrison, 905 434 5638 jamesmorrison190@msn.com

**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 Canadian Flight/Roof Top Cafe at Wiarton-Keppel Airport. As there are some-time 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/sfcrac.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](http://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 19:00-22:00 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 Bob White 403-472-1035 pittsflyer111b@gmail.com

**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](http://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: jjvvanhalderen@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](http://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 NOB 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](mailto:garywolf@rogers.com) and George Gregory at [gregdesign@telus.net](mailto:gregdesign@telus.net).

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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](mailto:garywolf@rogers.com) and George Gregory at [gregdesign@telus.net](mailto: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.

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

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

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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.

SENENICH PROPELLER M76 AM-2-54 with Saber bolts and includes spinner. \$800 CDN OBO. Conical style motor mount up to 150 hp but from unknown plane. \$350 OBO Gary Johnson 705-879-4696 Kindsay ON

LYCOMING IO-540 A1A5 wetsump; this is a certified engine with logs, includes injectors and 2 mags, timed out at 1200 hrs but running condition. No starter or alternator or ring gear. Great core for rebuilding. \$6000 OBO 519-331-9760



REBUILT GROB 102 GLIDER, all fibreglass, modified to motorglider with Rotax engine, 190 hours, flew from Lindsay Airport. Trailer is included. Please contact Ronald Lohr (519) 824-9230 for more information.

Lycoming O-235 dismantled for inspection. One mag, no carb, includes ring gear but missing bellhousing. \$900 millfly@sympatico.ca 519-822-6693

Full Lotus 1220 floats with new aluminum stiffener tubes, \$800. EDO 1400 certified floats asking \$10K. 519-2898-5792

Acro Sport 2 project for sale, close to first inspection, O-320 motor fresh rebuild, wings on plane. For more info contact morrison-peter42@gmail.com for pictures and price, good deal lots of work done.

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upgrade to 3 blade on IO540, last overhaul 600hrs. TT1200hrs. passed all AD's And SB's. \$2,500.



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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.

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10in.dia., 12in. tall bolt pattern 4 1/2in \$125.00 Contact len Kennedy 506-622-0105, cell 506-623-8162 email - lenpat@nb.sympatico.ca Miramichi NB .

CONTINENTAL A75-8 ENGINE. Approx 30 hours SMOH. Stromberg NA-S3A1 carburetor, Slick mags. Was mounted on my Pieterpol. Am selling because I bought a Continental 0-200 instead - wanted an electrical system ! \$6000 OBO. Located in Ontario. contact Pat pjb@ornithopter-pilot.com 519-925-3639

MOVING AND CLEANING OUT:

Continental A65-8 with logs, #1166018. TT930, 130 STO H - \$3000. 4 cylinder BMW motorcycle engine - \$150

Project, a McDonald S21, single seat all metal low wing. 1st inspection done. No engine, \$1000 Metal prop for Continental with 43 hrs, 74 x 45. \$600 Bendix mag, 4 cyl. New style. \$495 A-B project Aeronca S-7EC. Complete overhaul of airframe 2010, Lycoming O-290-G 125 hp with 90 hrs. Zero time metal 74-52 prop. 1500 Federal skis and 1800 PK floats. 600-6 wheels. Intercon and ICOM radio, xponder, cyl temp and exh temp gauges. Make an offer. Beechcraft LH landing gear assy - \$100 Beechcraft RH landing gear assy - \$100 Lycoming oil pan 150 hp rear mount carb TO 320 81A One set NEW 500-5 wheels and brakes \$600 2 used Goodyear brake wheel cylinders, complete with axle. \$375 600-6 4 ply tires (used) 6 available, \$20 ea. 600-6 6 ply tires (used) 6 available \$25 ea. Lycoming O-435 case and crank assy, complete with mags \$500 Lycoming O-435 prop hub for splined shaft \$50 Hartzell 76" adjustable prop, fits Lyc O-435 \$100

Stinson 10A LH and RH gearlegs complete with tires and brakes. Both \$400 Pair of NEW Cleveland wheels and brakes, 500-5 with 1-1/4" axle \$650 Prop governor McCauley 762092, \$50

NEW aerobatic carb, Ellison EFS-4, serial # 1061, \$500 NEW, 3 pieces 600-6 x 15 tires 6 ply, \$150 each Aluminum shrinker and stretcher,

\$40 each 2 available, 600-6 4 ply Goodyear wheels, brake cylinder and discs, \$450 pair Piper nose bowl mould for fibreglass, \$90 8 x 3 tailwheel assy \$250 4" tailwheel assy \$350 Lycoming GPU 4 cyl O-290G 125 hp, no mags \$400. Differential cylinder tester \$50 400 running ft of square tubing 5/8" .035, \$200 the lot 50 running ft of square tubing 7/8 x .035, \$25 the lot. Several Lyc O-290 cylinders and several Franklin 350 cylinders, Make an offer Stinson 10A fuselage static display only, \$100 Fleet Canuck fuselage static display only, \$160 Jodel D11 fuselage and wings, static display only, \$200 1 set seaplane floats-to-fuselage rigging, J3 Cub to EFO 1400, \$500 Contact Lawrence Shaw, Orillia Ontario. Phone/fax 705-325-8017

ZENITH 300 PROJECT - all new drawings, and most welded parts are finished. The ribs and spars are all ready, and the tailplane and centre section bulkheads have been built. There is enough sheet metal to complete the aircraft. Buy it and just start putting it together. \$5000 OBO. 519-843-2221 (Ontario)

SONEX PROJECT on gear with fitted canopy. First MDRA inspection completed. Jabiru 3300 engine brand new with Aero carb and original carb included. Panel is analog for flight instruments and electronic for engine monitoring. \$27K OBO. 705-493-0112 leave message and I will return your call. Located in Sturgeon Falls ON

ZENAIR CH 200 A (aerobatic - built by Zenair staff members) Total aircraft time approx. 1006 hrs. Fresh Annual inspection was done: Aug. 06 2016 Lycoming O320 A1A 150 Hp .....Compressions are: 78,74,78,75 8 new spark plugs replaced at 1000 h, 3 blade Warp drive prop ground adjustable 121.5 ELT, Transponder (with new antenna), Hand held radio linked to intercom, LED landing light Auto pilot, Pilot III GPS, Front

gear in aircraft is "Cessna type", Additional "long range" tanks in wings.

Also included with this aircraft: Spare electric Ivoprop (magnum) inflight adjustable, spare LED landing light, Spare new light weight canopy bubble Plexiglas, flip radio (to be mounted on control panel) Inverted oil system, Spare pucks for main landing gear, wheel pants for main gear (wheel pan for front gear that requires some brackets to be mounted) Aircraft is based in Brampton airport. Price \$ 18,500 CDN Call Rob (905) 484-0804

40X30 FT, FULL SIZE HANGAR at Burlington Airpark, \$15,000 CDN. Gravel floor with concrete slab for wheels. Manual lifting door with counterweight. Door slides up on rails. Has a 10x8 ft shop with electricity and working bench. Very good structure. Info: Lmistor@hotmail.com, 289 838-9588. Pics on request.

FOR SALE: 0290 Lycoming engine equipped with 6 bolt prop extension. \$7000 CDN. I have the log book and mechanic's manual. For full details call Norm @ 519 496 7971.

RV-7 WING AND EMPENNAGE for sale. Varying states of assembly. Right wing top skin riveted with leading edge installed. Left wing in jig with 20% of top skin riveted, leading edge assembled. Wings set up for conduit. Tanks set up for capacitive fuel quantity senders. Right tank complete, left tank complete but rear not yet installed. Empennage assembly halves riveted. All assemblies primed with Boeing epoxy primer. Included in package is Gretz Aero heated pitot, Mac trim tab servo, RMD wing tip lighting kit, Whelan 650 PR-14 wing tip strobe/back lights and Orndorf assembly videos. Not yet inspected as aim was to complete 50% of riveted sides before inspection. I have personally completed all assemblies.

*continued on page 42*

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

**RAA London/St. Thomas**

As of late spring, Phil's Sonex fuselage is coming along nicely. The rear fuselage is nearly finished and he will soon begin work on the forward fuselage. John Stirling has chosen the Stewart System for covering his Super Cub. It's a water-borne, non-toxic system and is nearly odorless.

Serge Lavoie says he'll be interested in John's experience with the Stewart System. He'll be recovering his Super Cub project soon. Chris Staine's wings are closed. He is currently working on the door fit.

Denny Knott is rebuilding the engine mount on his Wittman Tailwind, and found a very helpful video by Earl Luce on the EAA Home-builder Hints website.

We had a fascinating presentation on Drones by Phil's friend, Jason Uberig. Jason demonstrated several drones that he designed and built himself, as well as a Chroma Quad Copter. Jason demonstrated some of the inflight video capabilities of the drones by flying a very small drone and transmitting the video feed to a tablet and a pair of virtual reality goggles.

The June 4 Fly-in/Drive-in Lunch at Mark Matthys field was very successful, attendance was twice last year's. Many thanks to Roland Kriening, who chaired the event, and to all who helped.

Phil Hicks' work on his Sonex slowed while he was at Oshkosh. However his fuselage is nearly ready to receive the motor mount. Chris Staines has been working on the operation of the landing gear doors on his GP-4 project. Bill Weir is working on the "boat" of his metal KR2.

Chris attended a presentation by the FAA at Oshkosh at which the FAA rep discussed a 2 year joint study by the FAA and the FBI of vulnerabilities in the GPS system. An individual on the West Coast was tracked and caught intentionally jamming GPS signals at several different airports. They have also encountered GPS spoofing – receiving genuine GPS signals and responding with false returns. There was also a report that the North Koreans are developing a wide-area GPS jamming capability.

**Kent Flying Machines RAA #4975**

In April, our group held a joint meeting with the London RAA chapter as we have done for the past several years. A very interesting photo presentation was made by Angus McKenzie who has been flying DH2 Beavers in Northern Ontario. These joint meetings are always a chance to renew friendships and promote upcoming events in our respective clubs. Thank you to the London chapter for hosting this enjoyable event.

Our May meeting was held at Paul Perry's shop in Chatham. Paul has just started restoration of a 1961 PA-22 108 Piper Colt that is registered in the Owner Maintenance category. This Colt has had a previous Univair taildragger conversion and was due for a re-cover and engine rebuild. Paul showed various pieces of the aircraft that have already been restored and ready for covering.

Kent Flying machines also hosted another successful Fly-in Breakfast on the weekend of May 28. The event was well attended with over 70 breakfasts served. Will Boles from

Transport Canada gave an entertaining talk entitled "So You Think You are Smarter than a Student Pilot".

In June, our meeting was the first of our fly-in meetings for 2016. This evening included a BBQ and was hosted by Armel and Carol LeCunff at their airstrip in Stoney Point Ontario (CRML). Armel did the technical talk for the evening and demonstrated magneto timing on his Owner Maintenance Cessna 150. The weather was perfect for this fly-in meeting and 14 aircraft attended.

**RAA Midland/Huronia**

Review of CFK event June 4: Leigh reported that on the June 4 Copa for Kids event we flew 38 kids with 8 planes/pilots participating. Most kids were from local addresses. We still have 55 kids on the waiting list, therefore we might want to hold a second event this year, on September 10. There appears to be no need for advertising for child participants, however plans for future events will be circulated to all aircraft owners based at Huronia, in the hope to attract additional aircraft/pilots.

The lunch catered by Shannon for the volunteers cost \$150.

\$1.00/litre fuel subsidy for participating aircraft came to \$275. Some pilots declined the subsidy.

The Northern Regional fly-in (NRFI) held at CYEE this summer. Wx conditions prevented a lot of flying-in attendees, but drive-in attendance was impressive, indicating a lot of community interest. BBQ sales generated just less than \$650 for the club. Co-scheduled open houses for Huronia Airport and Zenair were successes that were shared on the day.

25 pilots attended the CASARA seminar; CASARA personnel were impressed with the facilities at the airport and the organization of the RAA.

The Lions Club will be significantly supporting our upcoming COPA for Kids event. September 10 is the planned date. Ray to canvas the Collingwood chapter for additional aircraft/pilots.

A local motorcycle club expressed an interest in locating their May 2017 gathering at the airport and having the RAA provide food services. This will be followed up later when an exact date is established.

The \$1.00 per litre fuel subsidy will be again offered to the pilot volunteers.

The Upgrade step on the CH-601 project build is near completion and second wing is under construction. Exciting times!

This year we've continued to make a lot of people in Huronia aware of our combined interests of building aircraft, introducing youth (and not-so-youth) to aviation, and supporting the airport community as a club and as individuals.

**Chapter 85 Vancouver**

Several events and activities have taken place since the spring with continued work on the Zenith 750 Cruzer project, the Annual Delta Airpark Fly-In was held, a Microsoft flight simulator was installed and the summer wrapped up the Chapter 85 Show & Shine fly-in on September 6th. These activities have been sustained with an active and enthusiastic membership which currently stands at 55.

The 750 Cruzer project has advanced to the point of being ready for pre-cover inspection and that is being arranged for later in September, possibly early October. All of the main structures are assembled and riveted on one side leaving one side with clecoes for inspection. Work is progressing on the main landing gear and the nose gear strut has been installed along with the bungee. Various new and used instrument options are being discussed and the main focus is now on the engine. A used Continental O-200 was purchased in the early spring with some known damage to



Top: chapter 85's Eric Munzer discusses aviation next to his restored Dornier. Centre, chapter 85's Zenith has made some great progress; bottom, some of the aircraft that attended the Chapter Show 'n Shine in early September.

Chapter / continued from page 41

the ring gear teeth. Further examination as the engine has been pulled apart has shown deeper and more extensive damage from the broken metal, consequently the engine will either become an overhaul project or will provide a core for a re-build.

The Annual Delta Heritage Airpark Fly-In was held on the last Saturday of June with excellent weather which was a likely contributor to a record turnout. The number of people is not known precisely, however a record 150 pancake breakfasts were served to visitors and volunteers. A total of 55 aircraft flew in, compared to 7 last year when conditions were barely flyable. The Chapter 85 workshop was opened up and the 750 Cruiser project was on display for fly-in visitors. During the summer a group of ten Beavers from Scouts Canada paid a visit to the Cruiser project and were introduced

to aircraft and a look at aircraft building.

During August, a donated Microsoft flight simulator system with 3 monitors and flight controls (rudder pedals and control yolk) was installed in the Chapter 85 Round House. This is intended for use by members to help maintain currency and build proficiency.

The summer wrapped up with many people returning from vacations and the September general meeting was held as the Annual Show & Shine BBQ / Fly-In. Thirty people participated with members flying in from Langley and Pitt Meadows. Eric Munzer flew his newly restored Dornier Do 27, Jim Stunden came in his Osprey and Peter Whitaker arrived in his Zenith 601.

Events over the last several months have involved a tremendous effort from many dedicated members everyone involved deserves a major vote of thanks from the general mem-



Top: some Beavers visited the chapter project last spring. Above: The flight simulator at the Round House was set up by member Peter Murphy who will be co-ordinating any training and use for chapter members.

bership and also from myself as President. None of this would be possible without an involved membership. ✈

Classifieds / continued from page 39

Buyers must arrange their own shipping. Potential buyers welcome to inspect project in southern Ontario Call Tad, 905-627-6901, Asking \$9500 CDN

CESSNA PROP SPACER 3.5" long with SAE 1 and SAE 2 bolt circles. \$125. garywolf@rogers.com

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

2009 Aerocoupe amateur built, 335TT, Metal wings and fully polished airframe. Cleveland

brakes, CHT/EGT, Narco Mode C, Sigtronic intercom, spin on filter, retract shoulder harnesses. Sale includes Cyclo polisher and materials, Bruce custom cover. \$36,500 CDN / US \$28,000. Located in Caledon ON. 416-797-9458 or 519-941-7668.



I have my lathe up for sale and will let it go for \$1500 to anyone in the RAA. \$1800 to anyone else. If anyone in your chapter is interested have them call me at 519 496 7971.

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

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.

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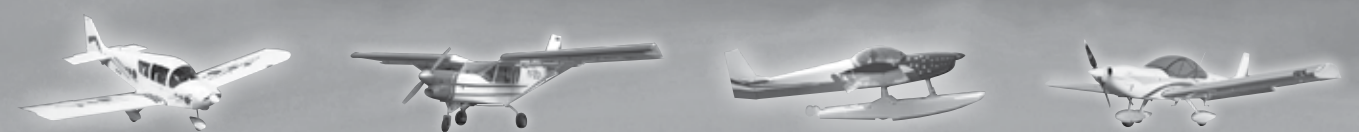
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