RAA
RECREATIONAL AIRCRAFT ASSOCIATION
RÉSEAU AÉRONEFS AMATEUR CANADA

The Leading Edge

Monthly Newsletter of the Kitchener-Waterloo RAA

- January 2016 -

Due to a family emergency, the scheduled guest speaker was unable to attend the January meeting, so I showed a number of photos of my Zenair float project and provided a few highlights of building them.

President's Message

Happy New Year everyone!
2016 started with an unscheduled presentation on Zenair float building at our January 11th meeting. The February meeting will now be our annual opportunity for recurrent pilot training with Fred Grootarz. Sorry for any confusion caused by the last minute cancellation by Fred, but a few of the guys mentioned that my presentation was good and timely too, since a number of our members may be building floats in the not too distant future.

Details of the March meeting are still being finalized, but April will be Air Cadet night. One of their recent graduates is now instructing and will join us to explain more about the program from both perspectives. We are hoping to get access to the flight simulators for the night to do a couple of scenarios with them.

Other events and topics carried forward and being considered this year include:

- An ATC Tower tour and presentation
- Auto engine conversions and PRSU's
- Shoestring budget aircraft projects
- Aircraft paint and covering systems
- CYKF update and future plans
- Gliders and Ultralights
- Show and Tell night
- Aviation Movie Night

We are always looking for input from the members regarding ideas and topics for the monthly meetings. Bring your ideas forward!

The executive will be meeting again in late March or early April to continue the chapter building process. We met late in 2014 to develop a chapter strategic plan, presented it to the members at the regular chapter meeting on March 9, 2015, where it was adopted. We hope to make things even more interesting, educational and fun for all of our members and their families. We trust that our cooperative approach to working with CYKF, COPA and other aviation groups will allow KWRAA to continue to grow and prosper in 2016.

2016 is going to be a great year for KWRAA!

\- Dan Oldridge

What's the Deal with Recurrent Training?

The *Canadian Aviation Regulations* (CARs) tell us that, in addition to having a valid licence or permit and a valid medical certificate, there are some things that pilots need to do every five years, every two years and every six months if they wish to exercise the privileges of their licences or permits.

Every five years, pilots must fly as pilot-in-command or co-pilot at least once in a category of aircraft for which they are licensed. Pilots who do not meet this requirement must successfully complete a flight review with an instructor and pass the Student Pilot Permit or Private Pilot Licence for Foreign and Military Applicants, Air Regulations (PSTAR) examination.

Every two years, pilots must complete a recurrent training activity. *In order to satisfy this requirement, pilots can choose one of the following activities:*

- *complete a flight review with an instructor;*
- *attend a Transport Canada safety seminar;*
- *participate in a Transport Canada approved recurrent training program;*
- *complete the self-paced study program available each year in the Aviation Safety Letter;*
- *complete a training program or pilot proficiency check (PPC) required by Part IV, VI or VII of the CARs;*
- *complete the requirements for the issue or renewal of a licence, permit or rating; or*
- *complete the written exam for a licence, permit or rating.*

Every six months, pilots who wish to carry one or more passengers must complete at least five takeoffs and five landings in the category and class of aircraft in which the passenger is carried. "Category" refers to whether the aircraft is a glider, airplane, helicopter, balloon, gyroplane, etc.; "class" refers to whether the aircraft is meant for land or sea, whether it is single-engine or multi-engine, etc.

Pilots wishing to carry passengers at night must complete five takeoffs and five landings at night every six months.

Glider pilots have the option of completing two takeoffs and landings with an instructor.

Although balloons are not allowed to land at night, if part of a balloon flight carrying passengers is to take place at night (in other words, if the flight departs just before dawn with the plan to land in the daylight), the pilot must have completed at least five takeoffs during the day and five takeoffs at night in a balloon during the last six months.

For more details about these specific requirements, visit Transport Canada's website http://www.tc.gc.ca/eng/civilaviation/regserv/cars/part4-standards-421-1086.htm#421_05.

Join us on February 8, 2016 for the recurrent training, which falls under the third bullet point above; a Transport Canada approved recurrent training program.

Dan's Zenair Amphibious Float Project

As most of you know, every 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?

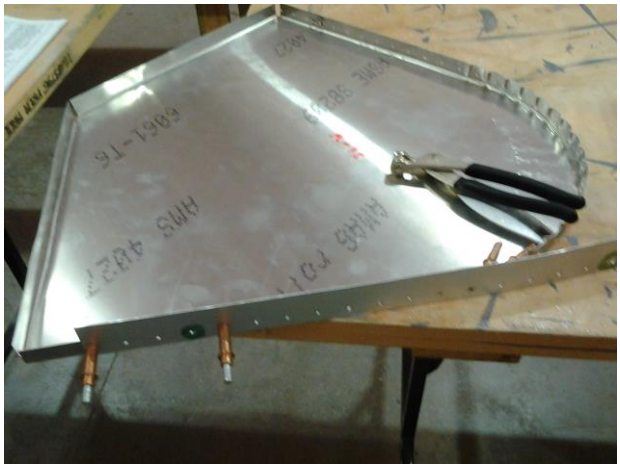
You build a solid work table 16 feet long and make sure it's straight and reasonably level before even getting started on the floats. The bulkheads all have the same rounded profile since they are actually the top of the float. By tracing the rounded edge of the largest bulkhead onto a suitably sized sheet of plywood, you can make the cradles that the floats will be built upon.

The first challenge is building a 16 foot long work table to cradle the floats as you start construction.

I managed to find some 16 ft. 2x4's that formed 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 side rails and inset the ¾" 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.

At 15' long, the Zenair 1450# floats require a 3' long piece be fastened to a standard 4x12' sheet of 6061.

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.



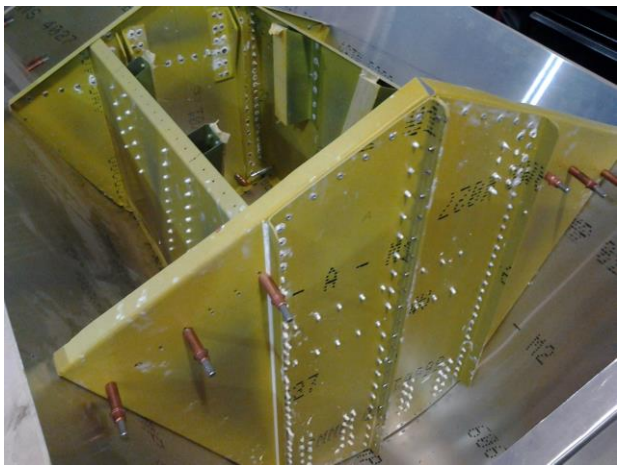
The bulkheads all have the same profile, but are different heights depending upon their position in the float. They all had to be drilled at one inch centres around the edges of the bulkheads, so I made a drilling jig from a strip of metal with holes one inch apart. By placing the bulkhead and guide 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.

Once the bulkheads are fastened into position with clecoes the float starts to take on a familiar shape.

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.

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 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.



Zinc chromate makes the adhesive stick to aluminum

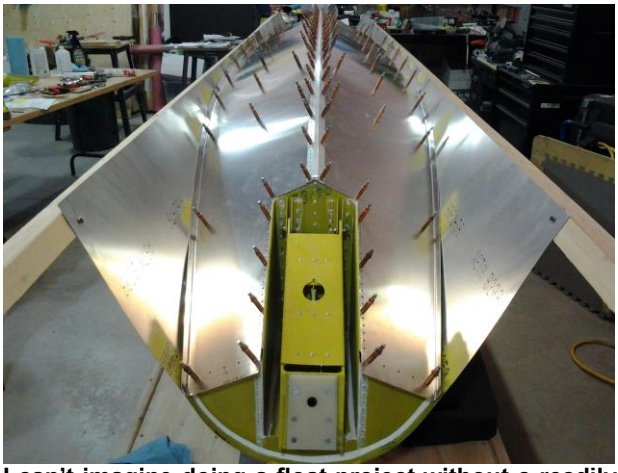
During final assembly of the wheel wells, all of the mating surfaces were sprayed with Zinc Chromate paint, using a VOC mask and protective gloves, etc. After at least 24 hours of drying time, the parts were assembled with 3M 5200 marine adhesive sealant. In addition all of the rivets were coated with 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.

The joined sheets are clearly visible in this photo and the excess zinc chromate has been wiped off.

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 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 brace points made from the extrusions I previously mentioned that the pick-up tubes get fastened to inside.

A pneumatic riveter and some occasional assistance from the better half are priceless when float building.

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 Steve Gale when he finished his RV6 project.



I can't imagine doing a float project without a readily available supply of at least several hundred clecoes!

Once the bottom skins are positioned and held with clecoes, the side skins can be trimmed back to reveal the true shape of the floats.

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.

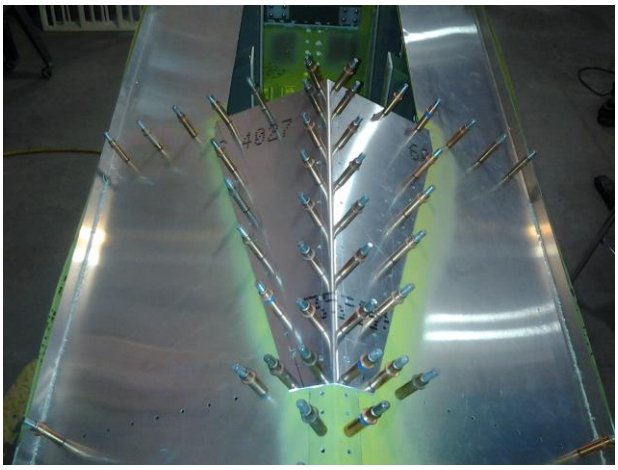
Once the first float was finished to a point where it could be safely moved, I started the second float.

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.

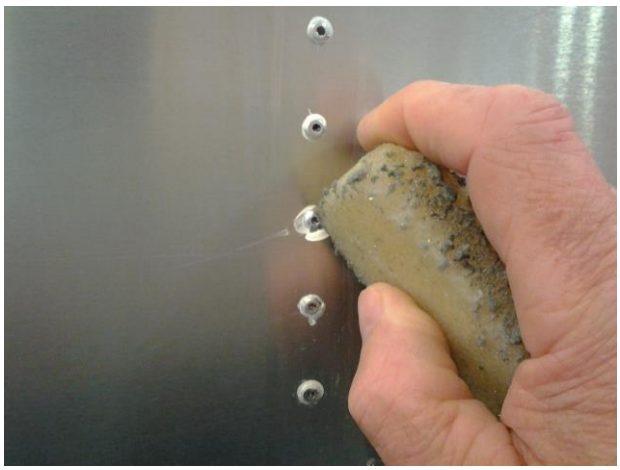
Since the keels take most of the abuse when a float touches the bottom of a lake or river, they are made from a heavy extrusion that protects the float skins.

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 below 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 the bottom skins are not riveted on yet and protective sponsons not installed. Installing those was made easier with the rivet squeezer I borrowed from Gunter Malach.

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.



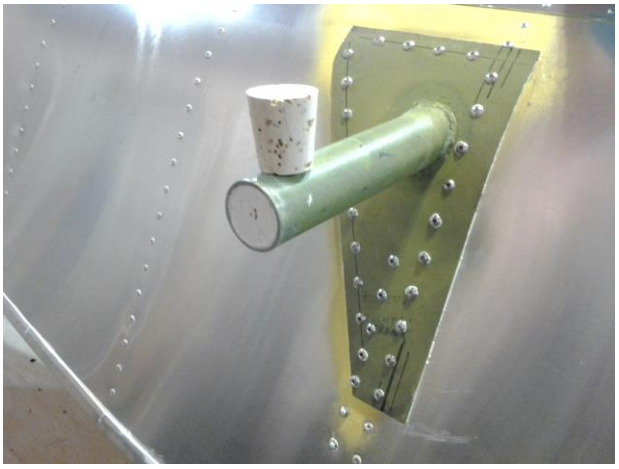
Once the sealed compartments of the floats are done, they still need to be pressure tested. I used a portable inflator and a small valve to control the volume of air entering the float compartments. This essentially allowed me to adjust the pressure to about 2-3 psi regardless

of any leaks that might exist. As I sealed up each leak, I adjusted airflow to keep 2-3 PSI.

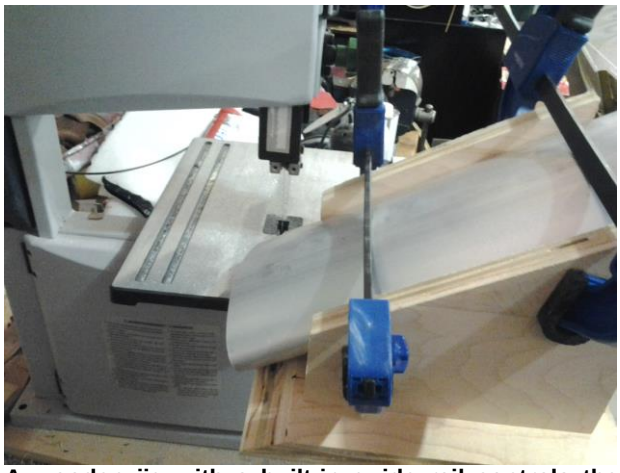
A portable inflator, low pressure gauge and small valve helped to control the leak testing process.

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.

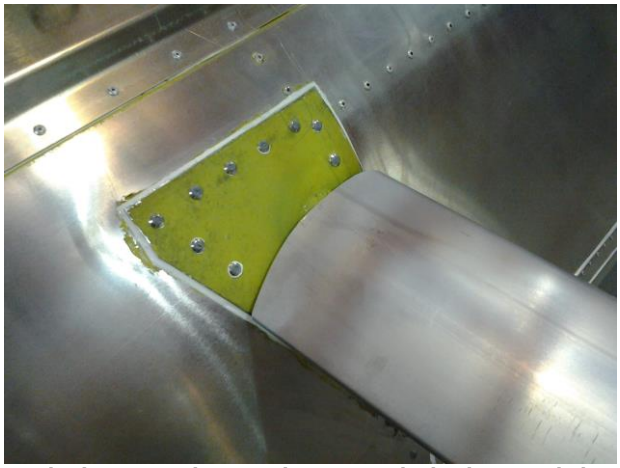
One of the compartments was leaking air like crazy and it took a moment to realize that I hadn't sealed up the pickup tubes. I managed to find some corks with just the right diameter to seal them up nicely. I added a bit of sealant and drove them in with a rubber mallet.



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



A wooden jig with a built-in guide rail controls the feed direction for cutting spreader bars at an angle.



A nicely tapered spreader not only looks good, but cuts down on the air turbulence and resultant drag.

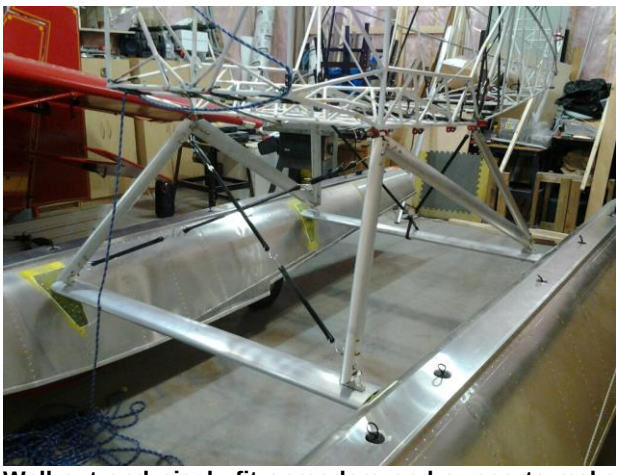
Luckily I had a fuselage I could use to set up the float rigging rather than suspend my plane for an extended period in a precarious position. In spite of all of my efforts to line things up with the fuselage suspended, I had to keep repositioning things and re-measuring to try to keep everything aligned. 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.

The weight of the fuselage held the whole assembly from moving on the wooden jig I used for rigging.

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.

Below 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.



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 be used during the final rigging on the Highlander.

There are a number of different theories on how to rig a plane up on a set of floats. The most common ones 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 wing spar centre line. The under-camber of the Highlander wing makes up for the other 1.5 degrees.

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

What's happening in February?

Join us February 8, 2016 for our annual recency training with Fred Grootarz … always educational, informative and often entertaining. At the end of the meeting, Fred will issue stickers for everyone's pilot logbook. Don't miss the **February 8, 2016** KWRAA meeting!

Put it in your calendar now… and be there!

Upcoming Events in 2016: (Highlighted lines are KWRAA Events*)

February 8	-	February Meeting at 7:30 in the Cadet building at CYKF
March 14	-	March Meeting at 7:30 in the Cadet building at CYKF
April 11	-	April Meeting at 7:30 in the Cadet building at CYKF
May 9	-	May Meeting at 7:30 in the Cadet building at CYKF
June (TBA)	-	KWRAA Fly-In at Cam Wood's in West Montrose (Tentative)
July (TBA)	-	KWRAA Fly-In at Mike Shupe's (Tentative)
July 25-31	-	Air Venture Oshkosh in Wisconsin
August (TBA)	-	KWRAA Fly-In at CPR3 in Teviotdale/Palmerston (Tentative)
August 19-21	-	UPAC Convention – Lubitz Field, Plattsville ON
Sept 3-5	-	Canadian International Air Show – CNE Grounds
September 3 (TBA)	-	KWRAA Fly-In at CMZ2 – Metz/MacPat Field in Arthur (Tentative)
September 12	-	September Meeting at 7:30 in the Cadet building at CYKF
October 17	-	October Meeting at 7:30 in the Cadet building at CYKF
November 14	-	November Meeting at 7:30 in the Cadet building at CYKF
November 25 (TBA)	-	KWRAA Christmas Party in lieu of a December meeting

* KWRAA events are fly-in and/or drive-in (Please advise the host in advance if you plan to attend whenever possible.)

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Reminder: If you haven't paid your 2016 KW-RAA Chapter dues, pay Mike at the February meeting!

Be sure to check out the KWRAA website regularly for the latest information regarding KWRAA events and more chapter information and classified ads. www.KWRAA.net