

November - December 2012

RECREATIONAL FLYER

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



Ross Somers' Homebuilt
HERCULES





From The President's Desk

Gary Wolf

NASA Tech Briefs Engineering Award

Every year NASA's Tech Briefs magazine runs their Create the Future design contest to encourage engineering innovation. Since its inception in 2002 there have been over 8000 applicants in the various categories. In 2012 the winner of the medical category is David King, the RAA Regional Director for BC Interior. David designed a device to improve the attachment of a prosthetic arm or leg, a silicone rubber sleeve with a toroidal chamber filled with silicone fluid. In the case of a prosthetic leg, the walking action continually pumps the fluid to keep the attachment snug, and to provide tactile feedback to assist the wearer in relearning how to walk. Dave has won an HP work station which will be awarded to him at the annual banquet in New York. Congratulations David!

TSB MGL fuel flow warning

In July 2012 an Aula powered by a Rotax 582 took off for a test flight after servicing. After 18 seconds of climbout the rpm reduced significantly and the pilot attempted to turn back to the strip. The plane stalled and hit the ground, and the pilot suffered fatal injuries.

It appears that this was a test flight after service to the fuel system, and the TSB

report singles out the MGL Enigma EFIS fuel flow sensor which is of the venturi type. In this installation all fuel had to flow through a 1 mm orifice. Bob Robertson conducted tests to determine the cause of the power drop and his report is in this issue of the Rec Flyer.

There are a couple of questions here – why would a manufacturer specify such a small orifice when it cannot flow enough for the engine's full throttle requirements? And why would a pilot not first tie the tail down and run the engine at full throttle for a period, rather than testing the fuel system on climbout?

...why would a manufacturer specify such a small orifice when it cannot flow enough for the engine's full throttle requirements?

Retiring RAA Regional Director

Laura Drinkwater has for several years been the Regional Director for Saskatchewan, providing liaison with RAA members in her province. Laura has a young family that is occupying most of her time and she has recently submitted her resignation. We would like to thank Laura for having given her time to the RAA membership, and we are asking Saskatchewan members if one would like to become the new Regional Director.

Chapter elections

This is the time when many chapters hold
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A Champ personifies personal aviation as it lifts off from Chaptree 85's Delta Heritage Airpark. On the cover: Ross and Marie Somers' incredible Hercules replica.



*I felt that a combination of renting to fly while literally building ownership in my own plane would be an interesting way to stay involved in aviation. This approach also had to allow for working and family activities so the realization was firmly in place that this was **not** going to be a quick process.*



by Peter Whittaker

I had previously owned a Piper Cherokee PA28-140 for 12 years and close to 350 hours of flying on it, mostly around Sudbury and North Bay, Ontario. My co-owner and I decided to sell it after our combined annual number of hours flown dropped off below 20 per year and expenses for the annual inspection kept rising. I was still very interested in flying and had some limited experience with wood working (around the house stuff) so the idea gelled around having a go at building an all metal aircraft and continuing to rent hours in order to stay in the air. I felt that a combination of renting to fly while literally building ownership in my own plane would be an interesting way to stay involved in aviation. This approach also had to allow for working and family activities so the realization was firmly in place that this was not going to be a quick process. The other consideration which is crucial to completion of this project was the idea that I had better be content to make parts and enjoy making parts, and lots of them, before this undertaking would begin to even look like an airplane. The big carrot at the end of it all was that I would have a “new” airplane with up to date components compared to a 1974 Cherokee.

The project got started in 1998 and fourteen years later I am at the point of “Final Inspection” !

There are, of course, many kit manufacturers and plans available. My criteria came down to a project that would suit a beginner in sheet metal work, could be managed with common tools with a few exceptions and would be made of durable material for both the weather and flight operations. My selection came down to Zenith Aircraft Company, and having a bias towards low wing aircraft, the 601 series fit the bill and the CH601-HDS was chosen (Fig.1). Zenith regularly sells plans, support has been excellent and it was designed in Canada. Several engine options are available that stay within the weight and balance requirements. I drove from Sudbury to Kitchener-Waterloo in the fall of 1997 to have a demo flight before finally deciding to buy the plans. At the time the plans were hand drawn and the construction manual was basic with a few black and white photos of major assemblies. Autocad drawings and more in depth photo-manuals came later. I spent the first 6 months reading and re-reading the manual and reviewing the pages of plans before finally deciding that this



was something I would start, and start with the idea of finishing.

The first job was to go through the plans, page by page, and build up a materials list for sheet metal, tubing and extruded L angle. All metal in the airplane is 6061-T6 aluminum which is corrosion resistant and has good resistance to work hardening. Rivets are of 2 sizes, A4 and A5, and are AVDEL "pop" type rivets. The main spar is the only part that is built with solid rivets. Most of the metal was ordered through a company in Sudbury that fabricates metal parts and equipment for the local mining industry.

Other arrangements to build the CH601 also involved planning on where and when to build. Our house had a 2 car garage so the arrangement with my wife was that I would work in my half and park outside year round while she kept her half, especially for winter. Since the project can be built in sections on a 4' by 8' work area, this seemed quite feasible. My intended schedule was a few hours on 2 weekday evenings a week plus part or all of a Saturday or Sunday as other plans allowed. Needless to say, this part of the plan ended up being highly flexible. The key is that the project influences others and family need to buy in and be part of it.

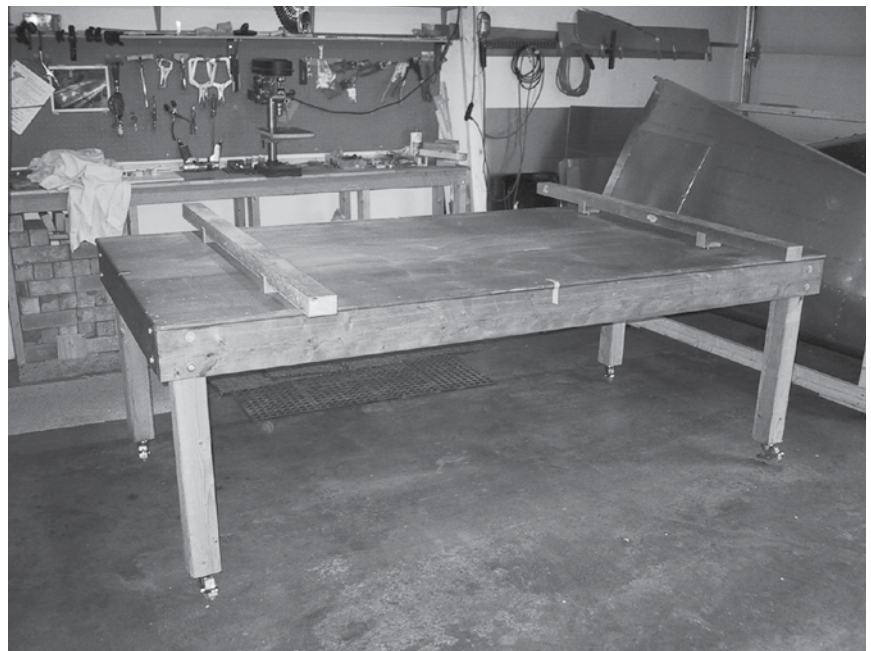
A flat work table is essential to producing components that end being square and true. The recommended size was 4' X 8' and this accommodates the wings, centre section wing

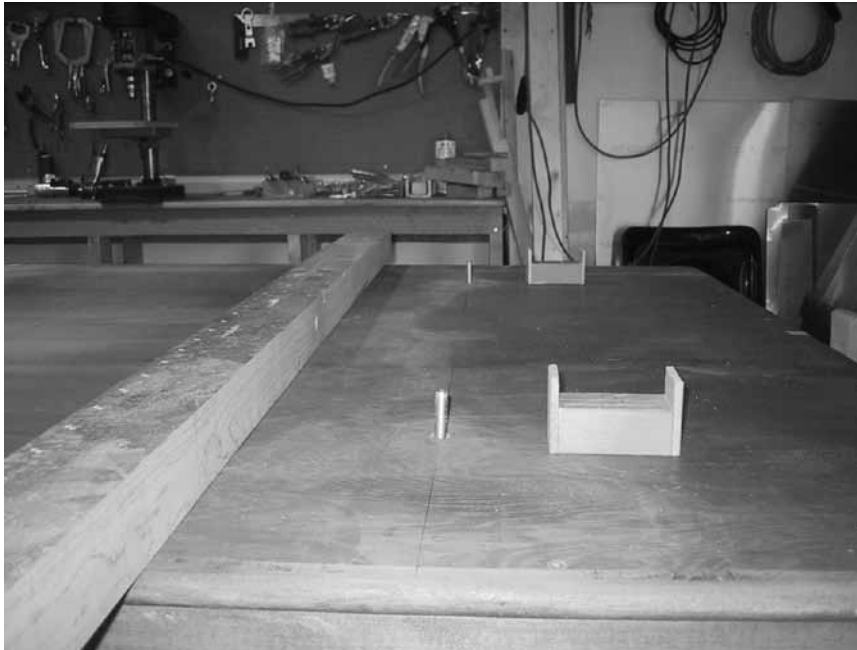
and fuselage. All of the airframe components can then be made on a surface built from a sheet of plywood and some 2 X 6. A square frame was built from 8' 2" X 6" kiln dried spruce and selected to be straight. Legs were made from 4" X 4" spruce and everything assembled with lag bolts and screws (Fig.2). Locking castors were placed under each leg so the table could be easily moved.

When working on wings and the centre section it is necessary to get underneath the structure so they cannot always lie flat on the table top. These components were raised and adjusted for level by using levelling beams. These were adjusted for height and level by installing bolts through the table top and into holes in the bottom of cradles that held

the beams (Fig.3). Nuts for each bolt were set into holes in the table top and secured with epoxy. The levelling beams need to be straight and true to begin with. In my case, I sourced a section of 3" thick laminated hardwood laboratory bench top and cut two 2" wide beams, each 5' long. By adjusting the table bolts, it was possible to raise a wing off of the table top, adjust for level and then have access underneath.

The first steps involved more wood work than metal work, making the forming blocks for wing ribs and fuselage bulkheads for the top skin had to be made. The plans provide the layout measurements from which a grid is drawn to layout the shape of a rib or bulkhead. The main centre section ribs are have a constant chord





Zenith regularly sells plans, support has been excellent *and* it was designed in Canada

Opposite: a 4 x 8 workbench is essential to producing components that are square and true. Above, sometimes you have to get under the project; to that end, adjustable leveling beams were installed on the table. Right, plywood forms reinforced with aluminum were used to form the ribs. Crimping grooves were filed into the plywood. Below, Peter's homemade press was used with flanging dies to complete the ribs.

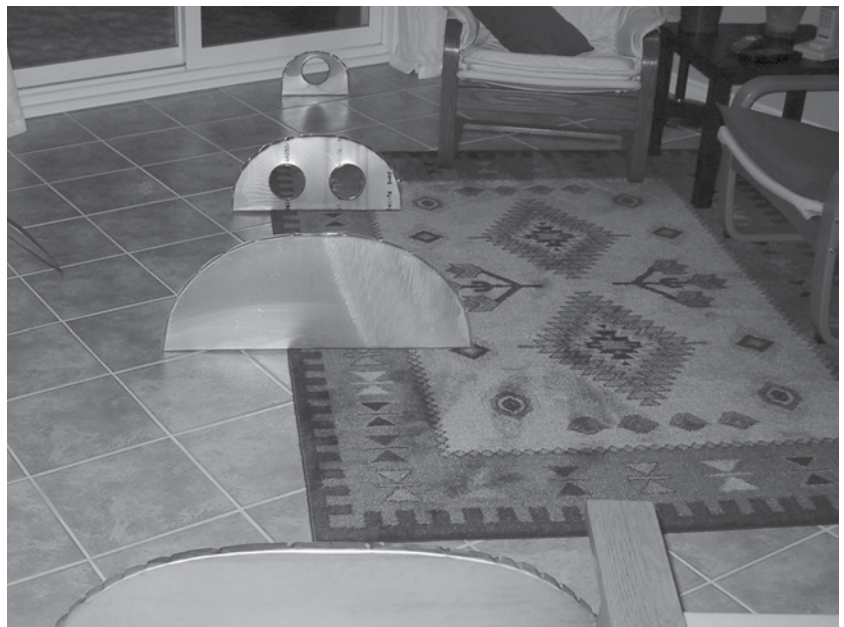
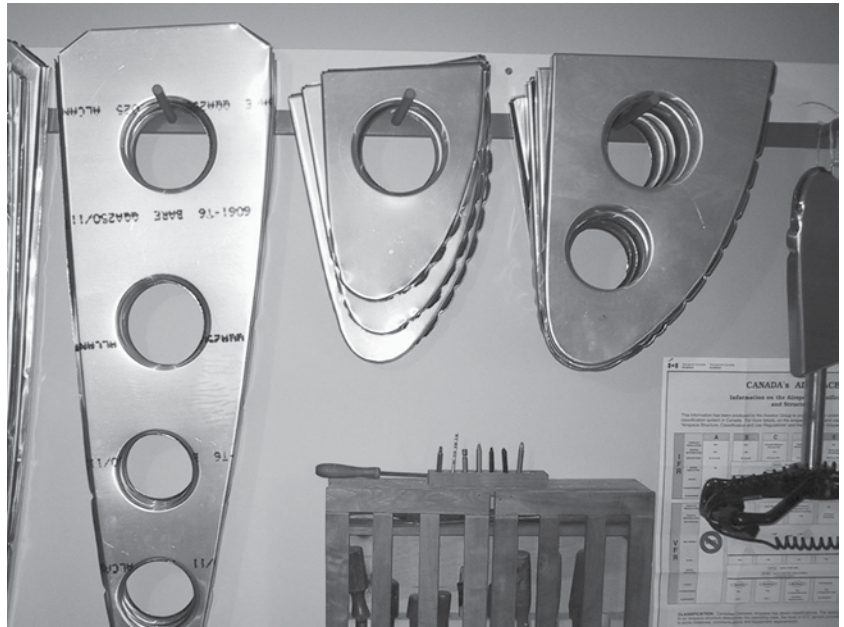


and multiple ribs are made so these forms were reinforced with 1/8" sheet aluminum (Fig.4). Crimping grooves are measured off and filed into the plywood / aluminum forms to allow the rib flange to be bent over and crimped as the curved edges are formed. Once a rib blank is formed, lightening holes are cut out and then flanged using a homemade flanging press. Making the lightening holes in the wing ribs and fuselage top skin formers involves just 2 hole sizes. These were made using a hole cutter driven by an electric hand drill and then the holes were flanged using a "homemade" press and flanging dies courtesy of my father-in-law (Fig.5). The press operates by squeezing the dies together using a heavy bolt turned with a large wrench, not fancy but very effective.



Finally a collection of centre section ribs and wing ribs (Fig.6) was produced and stored for later assembly. The fuselage top skin bulkheads were laid out for a first impression of the rear fuselage length (Fig.7).

I had basic hand tools and power tools that can be found in most home workshops. For wood working projects I had a 93" band saw which I fitted with metal cutting blades. This proved to be very useful for cutting some of the thicker pieces of 1/16" and 1/8" aluminum. I purchased an air compressor and with it air powered metal shears, pneumatic rivet puller and drill. Having at least 2 drills available is a great time saver when you can set up 2 different drill bit sizes. Essentially all of the rivets and thus drill bits required centre on A4 and A5 rivets. The main spar and spar caps require solid rivets so finding someone with bucking bars and a rivet gun is needed for this stage. A bending brake is useful to have, for this project I got by with an 18 inch benchtop brake which worked for most parts. There are a few longer bends of 6 to 8 feet (wing trailing edge spars for example) and for these I found that a local sheet metal fabrication shop was quite willing to do the bends in return for a donation to their Tim Horton's coffee fund. ♣



The Zenith ribs awaiting installation on the wing, top; below, the fuselage top bulkheads laid out on the family room floor. Construction of the Zenith is straightforward and designed with first time builders in mind.

Cartercopter Progress Update

Carter Aviation Technologies, LLC, working in conjunction with Carter Aerospace Development, LLC, has made significant progress as performance

flight-testing of its current Slowed-Rotor/Compound (SR/CTM) prototype, the Proof of Concept demonstrator (the "POC"), continues. The POC is a variant of the company's four passenger vertical takeoff and landing ("VTOL") aircraft, known as the SR/CTM 4-Place PAV.

The POC is continuing to expand the high speed / slowed rotor envelope. During November, performance flight-testing yielded the following results:

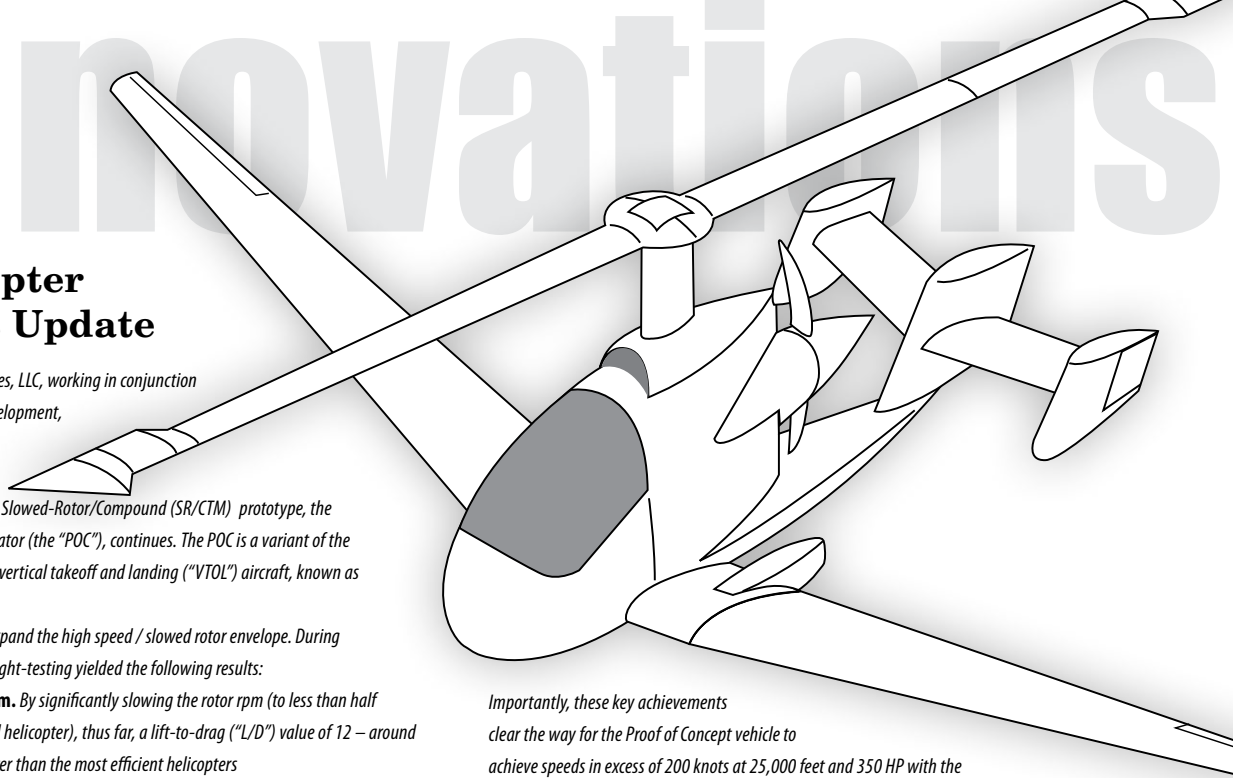
Rotor slowed to 106 rpm. By significantly slowing the rotor rpm (to less than half that of a comparably-sized helicopter), thus far, a lift-to-drag ("L/D") value of 12 – around two-and-a-half times better than the most efficient helicopters L/D is a measure of the efficiency of an aircraft (lift or weight divided by drag or thrust). Higher L/D ratios are directly related to enhanced speed, fuel economy, climb performance, and glide ratio.

Thus far, an advance ratio of 0.85. The advance ratio is calculated by dividing the forward airspeed of the aircraft by the tip speed of the rotor. As the rotor rpm (i.e., the tip speed) is reduced, the advance ratio increases. As the advance ratio increases, drag on the rotor decreases dramatically (resulting in increased efficiency).

Importantly, these key achievements clear the way for the Proof of Concept vehicle to achieve speeds in excess of 200 knots at 25,000 feet and 350 HP with the current test weight of 3,950 lbs.

Additionally, the POC has proven its VTOL capability, achieved speeds in excess of 140 knots on 200 HP and has been flown to 12,000 feet.

The company will continue to expand the high speed/slowed rotor envelope at ever-increasing altitudes, and will gather more data on flight efficiencies under those conditions. A video showcasing Carter Aviation's progress is available at, <http://www.youtube.com/watch?v=cB29pFKa4Lo&feature=youtu.be>.



Switchblade Scale Flight Testing Complete



Samson Motorworks has wrapped up their flight testing with the quarter-scale prototype, having achieved 90% of their test flight objectives for this prototype. The testing has accomplished the following:

- Validated lift from wing and aileron control
- Validated ducted fan performance
- Validated effectiveness of rudder and vertical stabilizer
- Validated good stall characteristics

They are presently focusing on dashboard design again, as there continue to be improvements in avionics that changes the layout of our panel. A final review of the vehicle is being conducted prior to starting structural engineering; then they plan to start carving wing molds and making parts while continuing the process of establishing and securing the parts needed for lighting, wheels, brakes, carpeting, etc. for the prototype.

This just in: Samson has reached a milestone by securing the funding required to build and test the flying prototype!

This is another big step accomplished by the Samson Team. For more information:

<http://www.samsonmotorworks.com>



Some Serious Alpine Flying

*Further Adventures on the Rebel
Ramble / By John Davidson*

Walter keeps track, roughly, of the order in which the various alpine lakes thaw. The actual date varies, from year to year, depending on how severe the previous winter was, and how early, warm and sunny the spring weather was. But the order is usually the same as determined by altitude, latitude, and orientation with respect to the surrounding topography. Since this was my first trip into an alpine lake, and he'd never really seen me fly before, he decided to take me to Fire Lake first. This is a relatively long lake at modest altitude, so it was a good choice for my inaugural run.

To get there we flew up the western shore of Harrison Lake, then followed a valley a bit further north. The mountains were spectacular, the air was calm, and apart from some difficulty keeping up with Walter, all was heavenly.

It was early enough that the wind was still coming down off the peaks, so we landed pretty much straight in. Actually, I stooged around a bit while Walter landed, just to see how a more experienced pilot handled it.

After a bit more fishing, we ate some lunch and just soaked up the beauty of the surroundings.

The flight out was straight forward with

favorable wind, a long lake, and low terrain at the outlet. Flying back to Langley, we again flew past Thomas Lake, which was still frozen.

Apparently, Walter was satisfied with my abilities, and over the next week or so we flew almost every day, touching down in spot after spot of absolutely breathtaking beauty.

Trouble at Tyaughton

The objective for Tuesday was to fly from Langley, up Indian Arm, cut over past Squamish and carry on beyond Whistler to Pemberton. At Pemberton we would meet Ray Mason, another Rebel owner and pilot, and then carry on to Tyaughton Lake for lunch at a very posh resort.

The scenery was again eye-popping, keeping up with Walter was again a challenge, and the weather was again excellent. Passing Whistler, I managed to reach my son Duncan on the telephone, and he looked up and saw us passing.

After landing at Pemberton we met Ray and had a look at his plane. Ray uses a modified Subaru in his Rebel. He was having a propeller problem so he joined Walter for the trip from Pemberton to Tyax Lodge for lunch.

While climbing up the Pemberton Valley toward the Hurley Pass, I raised my landing gear



Opposite: Flying up Harrison Lake. Left, the Rebel at Pemberton Airport, and below, a clearing a ridge of mountains that proved to be less of a problem than anticipated.

in the usual way. A little later I gave the pump an extra little stroke to check that the gear was fully up and suddenly, it gave. Total loss of pressure! The cabin filled with the smell of hydraulic fluid. Not good.

A look out the side window confirmed my suspicions. The front wheels were up, but the mains had drifted down when the hydraulic pressure was lost. This presented a dilemma. With the front wheels up and the mains down but not locked, landing on land would be possible but likely to result in significant damage. Landing on water could be ok. I'd heard that Rebels can

survive a "fronts up/ mains down" landing, but I couldn't, for the life of me, remember from whom I'd heard it, or if I trusted the source.

Walter visually confirmed my predicament and on the radio we discussed the pros and cons of the options. He was great. He didn't try to sway me in either direction, just helped me make sure all options were considered. I decided to carry on to Tyax and take my chances on the water. Walter and Ray flew ahead to check the landing conditions and warn the lodge to get a boat ready in case I needed rescuing.

I spent a bit of time trying to fix the ruptured connection, but finally had to face the music. Before landing, I made sure all loose stuff in the cabin was stowed, tightened my life jacket and seat belt, and popped the door latch. I took it in nose high and with lots of power to control the descent rate. Easing it in, the right float and wheel touched first and pitched the plane to the right. When the left float and wheel hit, I could feel the plane wanting to flip to the left. Fortunately I managed to regain control and all was well. The run-out was about two plane lengths, and the deceleration was quite dramatic. It took a long time to taxi in to the dock, with the

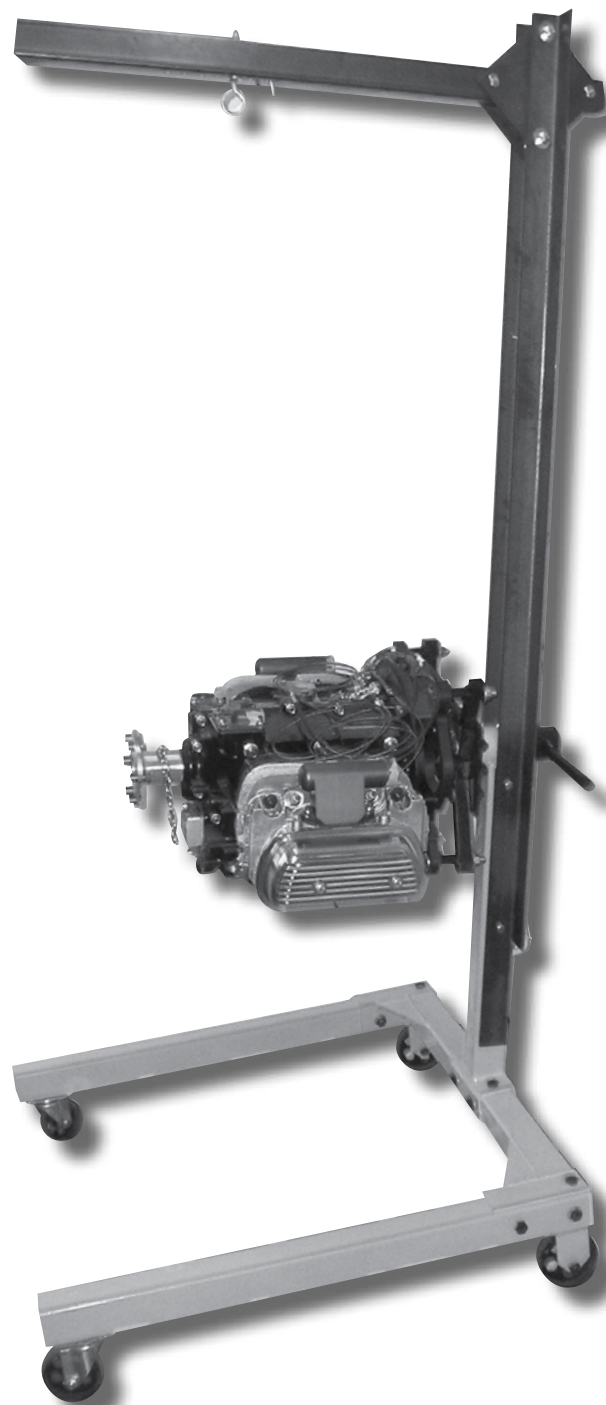
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Heavy Lifting

...Well, Relatively Speaking / by Graham Luckhurst

The time had come to mount the VW engine to my Sonex. Guessing where to locate the gascolator, battery, oil cooler, oil separator etc. without the engine in place was just getting too risky. There was no option but to assemble that VW kit from all the boxes of parts. As I prepared the components, it quickly became apparent that this thing was going to get really heavy as the parts came together. Some assistance would be necessary so an engine stand was procured from a local auto outfit at a reasonable price. Progress was much better and a lot safer. Being able to flip the engine to any angle with ease is a real plus. Once the engine was complete, the next task was to install it onto the airframe. An engine hoist was the obvious answer. However, I really did not want to spend the money on another piece of equipment I would rarely use, but I did want to have available on occasion in the future. Borrowing is an option, but not necessarily reliable as 'Murphy' would dictate your friends are out of town or their hoist is in use for some indeterminate time just when it is needed. Besides, I do not like to keep hitting on my friends for a loan, especially as being a first time builder I do not have a lot to return as favours. Therefore I decided to build my own hoist using the engine stand as a base. My ability to work with steel is very limited, and I have no welding experience or the equipment. Cutting steel is a real effort, again without the right tools, but I am great at drilling holes. Fairly small holes! 3/8" holes into steel are about my limit. A steel 3/8" bolt has approximately 5500 pounds shear strength so I did not see any issue assembling the hoist with them since my engine weighs about 160 pounds. What was nice about a combined engine stand and hoist is that you can lift the engine directly

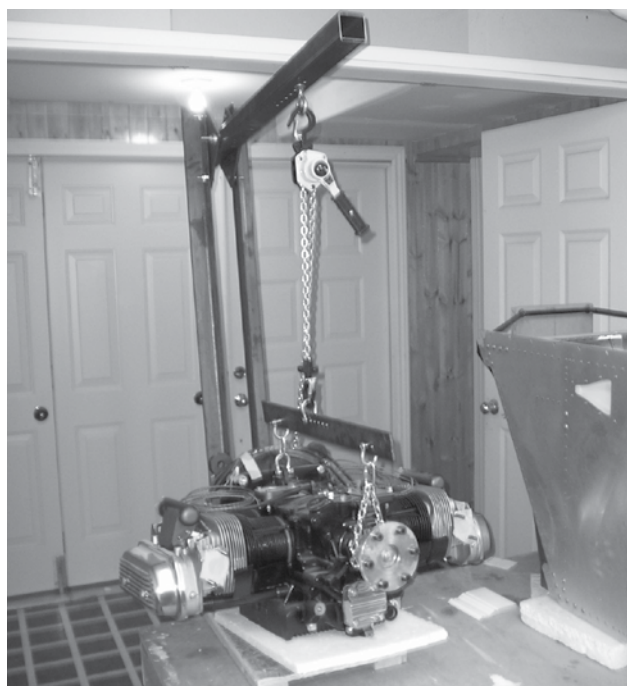
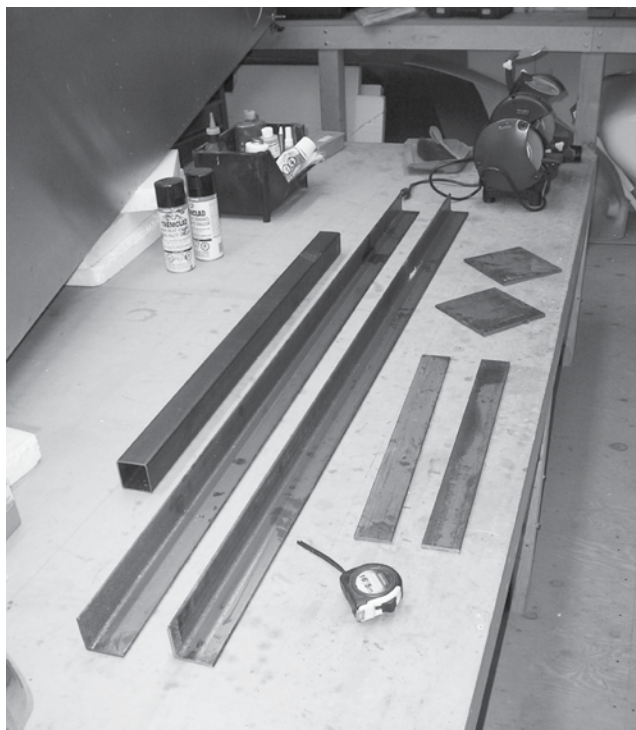
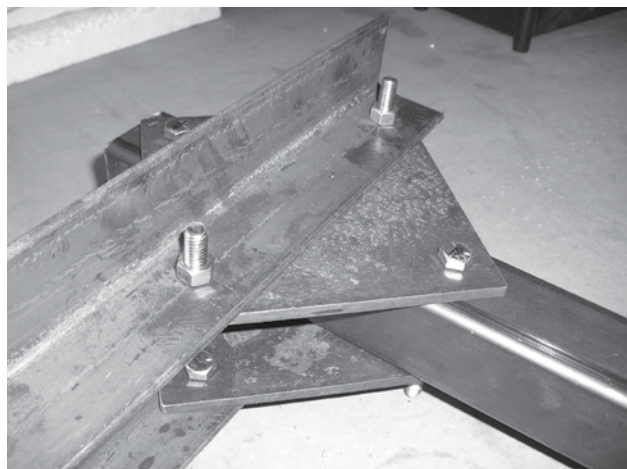


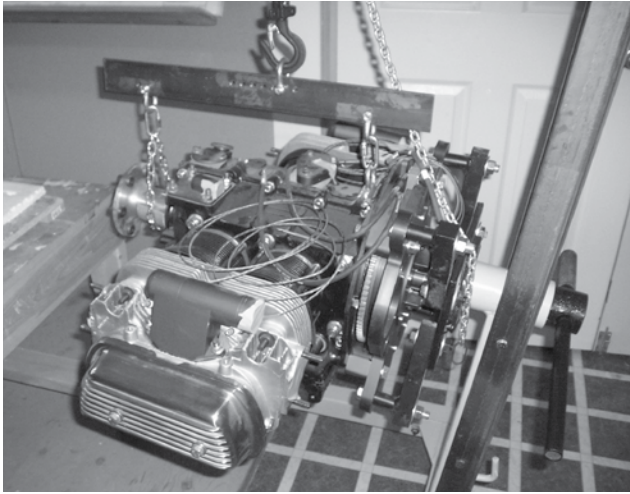
from the engine stand's fittings to the airframe, which minimizes the amount of manoeuvring, a definitely a plus in my small workshop.

The hoist framework was fabricated from two 60"x2"x2"x1/8" angles for the vertical support, a 36"x2"x2"x0.090" square tube for the horizontal support and two 6"x6"x1/4" plates to brace the horizontal support to the vertical supports. Two 20"x2"x1/4" plates were required as spacers, so the vertical supports would clear the engine stand rotational bearing tube. Using stock material and having the steel supplier cut it to the desired length saved the heavy work of sawing to size at home. All that remained was to clean up the edges and drill the holes. How the pieces go together is best shown in the pictures.


Lifting is provided by a 1/4 ton lever hoist which was plenty for what I needed. This can also be used around the garage or garden for other tasks so its cost, though very reasonable, was easily justified. A small length of chain, anchor shackles and quick links were procured from a local hardware store at minimal cost.

Below: the hoist components; top right, brackets supporting the vertical and horizontal supports. Right, using the hoist to secure the engine to the airframe.





The pictures show one more item, a 20"x2"x1/4" bar used between the engine and lever hoist. This 'balance bar' was used to locate the lifting point close to the center of gravity of the engine. It also ensured that minimal forces were applied to the hub which, the only reasonable lifting point at the front of the engine. I checked with the engine manufacturer and they indicated that it would be a safe lifting point. A simple moment calculation once I had the engine level indicated that there was only 60 pound lifting force on the hub. You will also see there are quite a few holes drilled at the horizontal support and balance bar where the lever hoist is attached. These proved valuable when trying to locate the engine close to the engine stand mount and also getting the engine level. The engine CG was much further back than I estimated.

I did ask Don, a local RAA chapter member and good friend, to come around and help mount the engine, but if pressed this could have been safely achieved with one person. With wheels yet to go on the plane, the hoist will be used to move the fuselage/engine combination around the shop as necessary. When transporting the plane, I will also use the hoist to support the engine weight. I have been warned that transporting the engine on the airframe without this precaution can result in the aircraft engine mount being overstressed or even breaking as hitting speed bumps, pot holes, or curbs can exert G forces well beyond design limits. 

Top: some of the connecting hardware; securing the engine to the engine stand; and left, lifting the engine off the bench.



Running on Empty

Fuel Flow Restriction Issues / Bob Robertson

Recently, it came to light that an aircraft powered by a Rotax 582 U/L engine suffered a power reduction on take off that resulted in a fatal crash. The fatality, in my opinion, was the result of a stall/spin at low altitude as a result of the pilot attempting a turn back to the airport.

Whatever the reason for the fatality, it is the unexpected power reduction that needs to be addressed.

First, Rotax states they want NO restrictions in the fuel system. The smallest diameter restriction would be the same as that of the intake on the impulse fuel pump.

The minimum fuel hose size required would be 5mm and the largest restriction would be 4mm as that is the inside diameter of fuel connectors and fuel filters.

The fuel transducer (sensor), the component that measures the flow of the fuel through the system, that was installed on this aircraft uses various sizes of restriction jets to aid in the accuracy of the instrument. In the aircraft being discussed a one (1) mm diameter jet had been installed.

This is a very small orifice for the required fuel to flow through. As a result of this restriction only enough fuel flowed to maintain full power application for 18 seconds before the engine sustained a power loss. There is a video of this accident so times from application of wide open throttle to failure have been fully documented.

The fuel system from this aircraft was duplicated using the fuel transducer (sensor) from the crashed aircraft on a test stand for analysis purposes.

When this system was operated with the 1 mm restrictor jet installed, the failure time was within 1-2 seconds of what occurred in the video. Repeated applications of full power resulted in repeated failures within the same time periods (i.e. 17 to 18 seconds). The engine would oscillate between proper operating rpm and then sustain a rapid drop in rpm repeatedly. If the throttle was reduced during the oscillations the engine would immediately stop. As stated earlier, this test was repeated

First, Rotax states they want NO restrictions in the fuel system. The smallest diameter restriction would be the same as that of the intake on the impulse fuel pump.

several times with the same results. It was deemed that the restriction of the 1mm restrictor jet was responsible for the substantial power reductions at wide open (full power) throttle settings.

A full power static ground run of at least 3 minutes should be completed prior to flight whenever modifications have been made to the engine installation. This will verify that the modification in no way hinders the successful operation of the engine. It has not been determined whether this was done prior to the fatal flight.

The distributor of this fuel flow sensor (transducer) states in their installation instructions that the 1 mm jet would be adequate for fuel flow rates of 0.05 liter per minute to 0.5 liter per minute. The Rotax 582 at wide open throttle has a fuel requirement of 0.45 liter per minute.

According to the instructions the 1mm jet should work. Unfortunately it does not and causes large oscillations in engine power.

The same distributor also states that you should never use a restrictor jet smaller than the main jet in your engine. This is where the water gets a bit muddy as the distributor states that they suggest the two (2) mm jet for use with Rotax engines. They do not specify which Rotax, simply ALL Rotaxes.

The 2mm jet suggested by the distributor has an area of 3.14 mm squared. The Rotax 582 has two jets of 1.65mm each for a total area of 4.2765 mm squared. The two (2) mm jet they suggest IS smaller than the main jet area of the engine. Following their instructions will leave the engine in a deficit fuel flow situation.

The restrictor jets supplied with the sensor have the following areas:

1mm diameter jet =	.7854 mm ²
2mm diameter jet =	3.1516 mm ²
3mm diameter jet =	7.0686 mm ²
4mm diameter jet =	12.5663 mm ²

There are two #165 main jets (1.65mm diameter jet) in the Rotax 582. These jets have a combined area of 4.2765 mm squared. Therefore according to the distributor the 3mm (7.0686 mm squared) restrictor jet is the smallest that should be used on this engine yet the distributor suggests a 2mm jet. The instruction sheet is contradictory.

During the testing with the 2mm jet the engine did attain sustainable RPM and did not oscillate. However, there was a 100 rpm gain in RPM when the sender was removed from the system. The engine RPM dropped by 100 rpm when the sensor was reintroduced to the system. This shows that even with the two (2) mm suggested jet the engine is not receiving the proper amount of fuel for safe operation. The two (2) mm jet leaves no room for error. An air leak in the fuel system between the fuel flow sensor and the fuel pump could additionally cause such a reduced fuel flow rate that full power could not be sustained.

We installed an air bleed valve on the suction side of the fuel pump to see what effect an air leak would have when using the two (2) mm restrictor jet. A steady stream of small air bubbles was introduced imitating a simple bad fitting connection and the system did indeed fail. It took about two and one half minutes of full throttle before the

system ran into a deficit fuel situation and the engine would not sustain full rpm. In this scenario the two mm restrictor jet leaves no room for error. A failure would occur if an air leak developed in the system. In short, adding these restrictive jets to the suction side of the fuel system greatly reduces your safety margin to tolerate any potential air leaks in the system itself.

Comments cannot be made as to the suitability of the 3mm jet as testing was not done with this sized jet.

We have found at least one other manufacturer who is using a restrictive jet in order to obtain accuracy of their fuel flow monitor. In this case the area of the restrictive jet was only 1.239 mm squared. When the restrictive sensor was removed from the system the engine gained 250 rpm at wide open throttle.

There are fuel flow sensors available that do not use a restrictive jet in order to obtain accuracy. The fuel flow meter/sensor on our test stand has 6.6mm inlet diameter (an area of 34.2mm squared). This is a very accurate sensor operating without a restrictive jet. 34.2mm squared is almost twice the area of the unrestricted fuel line.

In conclusion, following the Rotax requirements of having no restrictions and a minimum of 4mm diameter flow medium (tubing, any items such as fuel "t"s, filters

etc.) is the safest setup.

We know that the engine will sustain engine rpms when using the 2mm restrictor jet, but there is no safety margin at all. A minor air leak could result in a major fuel starvation situation. The 2mm jet may actually be causing a very slight fuel starvation issue under normal operating parameters. There is no drop in engine rpms when the diameter of the smallest restrictor in the fuel system is 4mm.

When operating correctly this type of instrument gives lots of valuable information to the pilot. However if it is unsafe to operate, then all that good information is useless. Putting safety first and taking no shortcuts will help keep you in the air. **R**

Historical Replica Completed



On a Tuesday afternoon last October - for the first time in about 8 decades - the Montreal sky becomes the backdrop for a piece of Quebec's aviation history.

The Fairchild FC 2, nicknamed 'The Razorback' after its triangular sectioned rear fuselage, emerged from the Canadian Aviation Heritage Centre (CAHC) workshops at the Old Cow Barn on the McGill Campus in Ste Anne's de Bellevue.

Built from scratch from original plans, and supplemented by the creativity, ingenuity, craftsmanship and enthusiasm of volunteers, this full scale 1926 'multi-tasker of the skies' aircraft is the first of several aviation projects, currently underway at the Centre, to be completed.

For more information check out the CAHC's website at

<http://www.cahc-ccpa.com/> or view Global's coverage:

<http://www.globalmontreal.com/video/recreated+aircraft/video.html?v=2297544111#stories>



Member Profile:

Bill Rice

I have written this in recognition of Bill Rice, aviator par excellence, of Thorndale, Ontario.

My name is Peter Hanna, born and raised in London where I got my PPL in 1968, then bought and restored a 1943 Taylorcraft L2M (US military grasshopper liaison) with Bill's help at his London-Thorndale farm airstrip and workshop. Now retired, lost medical, I live in Mississauga, but nostalgia brought me back to London recently to visit old haunts.

One glorious autumn day in October, after many years, I dropped in to visit Bill and Mary Rice and found them sitting out under the majestic trees at their beautiful Thorndale farm. It was a trip down memory lane for all of us because in the 70s and 80s when I lived in London, I spent a lot of my aviation time there, often with my family. After I bought my 1943 Taylorcraft in 1972, and then discovered it 'needed work', Bill became my mentor who supported and encouraged me in my total restoration of XST, which I finally completed in the late 80s at my new home in Waterloo, then at CYKE.

Bill generously gave vital help to me in getting me started with my restoration of my T-craft, and to many other builders and restorers. I truly think he should be honoured for his contributions to Canadian recreational aviation. Bill deserves the admiration of all RAA members today.

In those early days I met all their seven kids, who all got through university and now honour their parents. If how one's children turn out is a measure of success in life, Bill and Mary can be proud.

Bill tells me he got started flying in Port Colborne, Ont. In the 60s, his college teaching career brought him to Fanshawe College in London. They bought a 100 acre farm just north of London and developed an airstrip on adjacent land across the road. Later he added a new grass strip 'out behind the barn'.

When I first flew off Bill's original airstrip the procedure was to taxi down the front lane, cautiously look both

ways, taxi out the front gate and go quickly down the road about 100 yards and onto the 2000 ft. airstrip. If there wasn't a Yield sign there should have been; one just checked for dust before powering out onto the gravel road and along to the grass strip. Taking off to the east took you out over the Thames River, and for finding your way back home you just followed the river back to Bill's strip and taxied back down the road, through the gate to tie down by the barn.

Gradually over the years his barns and workshops filled up with his many homebuilt and rebuild projects. Eventually

it became the home of London's RAA chapter with Bill as president.

Bill was a real pioneer in recreational aviation back in EAA Canada days, having become involved with homebuilding long before there were kits. In those days one built a plane from scratch following plans approved by EAA. I knew best his homebuilt V-tailed all metal Davis DA2 which he flew regularly.

His List of past projects includes: Laister Kaufman Glider, Aeronca Chief, Aeronca Champ, Taylorcraft, Piper

Bill is currently building a half-scale replica of a DeHavilland Mosquito.

J3, Piper Tripacer, Taylor Monoplane, Davis DA2A, Mini-Plane, Loehle 51-51 Mustang Replica, American Eaglet Glider, Wagabond, Woody Pusher, Schweitzer I-26 Glider, Cara-2, Flybaby, Silver Bird Texas Parasol, Pietenpol, Lazair, and a Jodel 2-place.

In his shop, Bill is currently building a half-scale replica of a DeHavilland Mosquito. In the door window of his shop is an example of his newest hobby: a beautiful stained glass Loon.

Many more projects, too numerous to mention but including a member's SE-5 replica, are gathering dust in his barns or documented on the walls of his big workshop; it is a veritable museum of classic factory and homebuilt aircraft and spare parts from his many projects.

Bill is now 82 and he has accepted an offer on the farm, so he has begun to reduce his collection. Some planes have been sold, the glider has been given to a friend, and the Cara-2 has been donated to the members of the London-St. Thomas chapter. ♣



Across Canada

RAA Chapters in Action

RAA Chapter 41 Toronto

Demystifying Amateur-Built Aircraft
Alain Ouellet, P. Eng.

RAA Chapter 41 had 70 people attending the "Demystifying Amateur-Built Aircraft" event, held for the PEO Brampton Chapter September 8, at the RAA-Toronto Region hangar and clubhouse located at the north end of Brampton Flying Club (BFC).

Amity Lam and Max Morrow were busy registering the incoming attendees. Parents and kids enjoyed the instructional displays of aviation related materials, a fuselage and wing section made out of wood, as well as the aircraft parked in front of the hangar and on the adjacent taxiways.

These aircraft presented the different construction technologies used in aircraft fabrication. Small groups went to visit planes in neighboring hangars and planes at different levels of completion. All attendees were able to see the excellent care and workmanship taken in the making and maintenance of these aircraft. Many questions were asked of the owners and builders during the day.

We (Brian Heinmiller and Alain Ouellet) presented a review of the requirements on who can build and fly these planes, not only in Canada but anywhere in North America and the world. Some homebuilt aircraft have actually flown overseas.

Topics covered: different construction methods, requirement for inspections, and testing prior to their full release to flight operations were explained and discussed. Many kits are now available to builders in today's marketplace, and they may build from plans only, and from partial and full



70 people attended Chapter 41's event. Topics covered included different construction methods, inspection requirements, and testing prior to full release to flight operations. An important and valuable seminar!

kits from various suppliers.

Questions on how to obtain a pilot's license were answered. Subject to certain accomplishments such as passing an aviation medical, nationality status, relevant training and testing, one can become a pilot. And yes a pilot

can train in own plane...

The Brampton Flying Club (BFC) school has a great pilot training program. They provide ground schooling, instructors, aircraft rental, written testing facilities and flight testing to allow you to realize your dream.



Another option would be to combine the BFC ground flight school, use your own certified or amateur-built aircraft with an independent instructor, write the theoretical exams at BFC and use an independent flight examiner, which is what I did. BFC does not conduct flight training on amateur built aircraft, but you can complete the other items with them.

What's a nice day without a BBQ? We had beef, chicken and vegetarian burgers, creamy coleslaw, salad, pop, water and coffee to top the morning presentations. Cooking was by the wonderful duo of Dave and Eillean MacKenzie.

During lunch Mukesh Ramchandani won the introductory flight in a Zenith CH300 amateur built aircraft. Due to the weather conditions that day the flight occurred later in the week. Great thanks are due to all who attended, participated in bringing their planes, setting up the displays, tables and chairs in the hangar, registration and cleaning up after the event.

RAA London St-Thomas

In the last Slipstream, Denny Knott wrote an article about the Skyhopper and posed the question as to what to do with it. We will need to have a bit of a discussion around this at the December Meeting. I am hopeful that the team that worked on this project will provide some guidance in this discussion.

We had a great turnout to the November meeting. I expect that the draw was Dr. Chapeskie's presentation of his summer flight into northern

Canada. As always, the presentation left us in awe, the pictures of the landscape were fantastic. It is amazing to think that with some careful planning, a good aircraft, some flying skills and a whole lot of passion and desire, one can travel over 6000 miles and still never leave Canada. What a great place we live in!

I would like to thank Dr. Chapeskie for inspiring us. Bill Weir, as an attachment to the last Slipstream, briefly introduced us to the author Nevil Shute by having two chapters of "Trustee From The Toolroom" attached. Bill presented a test on the material as he promised he would, but alas much of the membership had not done their homework, therefore having no clue as to the answers for the test questions.

Phil reported that Tom Bestard was resigning the position of Secretary after fifteen years in the post, and thanked Tom on behalf of the Chapter for the years of service, followed by a nice round of applause. Phil announced that a replacement volunteer for secretary would be appreciated for the December planning meeting next month.

Denny Knott reported that the Skyhopper has, as of last Saturday, had the required twenty-five hours flown off, and now some direction regarding the future of the aircraft is required. Will it be sold, or will a small flying club need to be created for it so that insurance can be obtained? Denny will prepare an article for a future Slipstream outlining some possible future scenarios for the Skyhopper. Although its restoration was theoretically a Chapter proj-

ect, and thus the Chapter must have input to its future, the vast majority of the work done on the aircraft was done by a small core group of members, and they must be allowed a great deal of input regarding the future of their rather extensive restoration efforts. Chapter discussion of this issue must soon be done and a future resolution figured out.

Project Reports: Phil Hicks noted that he recently spent an inordinate amount of time carefully running the wires through the wings for the strobe lights. Dan Oldridge has started covering the wings. Dave Hertner moved his RV-10 to Collingwood, near where the test pilot lives, to continue flight testing. He has about six hours flying time and reported cruising speed in the 180 Knot range. However the rear seal in the prop reduction box came out, so did the oil Bearing and shaft catastrophic failure resulted in a forced landing, fortunately on a nearby grass strip. Damage to the aircraft was negligible.

We then heard a presentation by Doctor Henry Chapeskie. Dr. Chapeskie is very well known to this Chapter and has treated us to slide presentations from his flying adventures, and the use of the Spider Tracks aircraft tracking system on previous occasions. This presentation was about a flight made by himself accompanied by his sister Cathy, to Nunavut and the North West Territories. Over fourteen days, having sixty-one hours airtime, and covering 6100 miles, only two short rainy periods were encountered. The rest was clear skies and ideal flying

Join the RAA Forum

RAA's new forum is online! We hope to add many features over the next while to enhance the value of your membership. The URL is the same at raa.ca - once you're on the home page, simply click on the "forum" tab to get there. You'll find it a useful place to exchange ideas and ask questions - but it's only as good as the people

who contribute to it. Help make this a useful resource for builders and pilots.

Any suggestions and ideas for improvements are welcome and can be sent to George Gregory at gregdesign@telus.net. Stay tuned for further developments!



RAA KARS

This week we said good-bye to an good friend. Dennis Pharoah passed away last week in an auto accident. Anyone who had Dennis as an instructor will know about his excitement with and devotion to aviation. Dennis continued to instruct in multi-engine and IFR procedures up until his accident. Dennis was also cocaptain of the local COPA Flight 8. You can read more about Dennis at the Flight8 Blog: <http://copa8.blogspot.ca/2012/10/flight-8-member-killed-in-collision.html>

RAA London/St. Thomas

It is with much regret that we learned of the death of Norm Beckham on Tuesday November 20th. Norm was well known to aviation enthusiasts throughout southwestern Ontario and beyond. He was one of the co-founders of the Canadian Harvard Aircraft Association and carried the well-deserved moniker of Mr. Harvard. We will always remember his impressive aerobatic performances at countless air shows. His Harvard displayed the buzz number 53 which corresponds to 1953, the year he graduated as an Agricultural Engineer from the Ontario Agricultural College.

conditions. The pictures were breath taking and his narrative descriptions were extremely interesting. He even showed a picture of the Buffalo Airways hangar from the air, with the DC-3 parked out front. It was indeed an excellent presentation as always.

Toronto Rotorcraft Club

Annual elections were held at our September meeting, with all members retaining their 2011-12 positions. Congratulations to all.

The club is looking into a gyro meet at Wingham, again next summer. There is an interest growing. Please come with more questions, so that this can be a safe undertaking for all. Jerry Forest is looking into the insurance required.

Jerry Forest again provided some excellent screening of the Carter copter. Cartercopter.com for more information.

RAA Chapter 85 (Vancouver)

Approximately 10 members met today at the workshop to contribute to the Turbi project, the club airplane being repaired after some recent damage during taxi. Gerard, John de Visser, Robin McNamara, Dan

McGowan, Clif Dawson, Steve Gillis, myself, Cyril Henderson, Charlie Longstaff, and a couple of dogs who wanted to learn how to do fabric work.

John de Visser had previously prepared the hangar and Gerard had prepared the airplane. The temporary patch was removed and the area opened for inspection.

Jack Pomerleau arrived at about 11:00 and proceeded to inspect and test the fabric. He also looked extensively at the damage and the temporary repair patch.

His conclusions are the following:

The fabric is in very good shape. The fabric is a vinyl type and the process appeared to look like the Polyfiber Process.

The fabric tolerated a punch of 40 lbs, much over the required amount with no damage. A spot on one of the ailerons was tested.

Jack inspected the main spar inside the cabin and said that it was a very strong spar and looked very good.

There did not seem to be any areas of concern in the fabric or the structure that would otherwise be a cause for concern although no internal inspection was done. He commented on our

concern that the paint was peeling of the wing at a point of damage.

This tendency to peel is only significant at the damaged area and does not appear at any other location. He said this is characteristic of high gloss Endura Paint rather than dope.

Jack suggested the repair process could be limited to the Local area of damage. There did not seem to be any reason to remove the fabric from the rest of the wing.

He described a repair process which would be very adequate and he has identified an individual to do the work (August at ZBB) who he will ask to do the work.

Jack has offered to help and supervise the work if necessary.

Charlie Longstaff and Dan McGowan both agreed that the repair could be limited to the local area of damage. Jack's friend will come to look at the airplane and he will decide if he wants to do it. If so he can tell us whether the wing needs to come off in order to do the repair properly and whether the rest of the wing needs to be inspected through inspection ports. We will wait to hear his recommendation. **A**



Ambitio

Ross and Marie Somers' C-130 Hercules Re



In the circuit at Stratford my passenger looked down and yelled through the intercom, “What the hell is that?” and pointed to a four engine plane tied down near the terminal. We taxied up and did a double take – it was a Hercules the size of a Piper Comanche, and the cabin had its clamshell doors open and the pilot appeared to be out of scale for a plane that was playing tricks on our eyes.

We walked over to introduce ourselves and met Ross Somers, a quiet no-nonsense fellow who admitted that he had designed and built this plane, and walked us around it answering our many questions.

First question was, “What made you want to build a Hercules?” Ross answered that he had been flying for many years and had always wanted to build his own plane but he did not want just another cookie cutter plane, differing only in the paint job from a field of nearly identical homebuilts. His first thought had been to build a P-63 Kingcobra, mid engine and all. However he really wanted a multi, and the DH Dash 7 appealed to him but the landing gear looked difficult and the T-tail was unexplored territory. He settled on a Lockheed Hercules and decided on approximately ¼ scale, and began sketching the major sections.

Ross began in 2000 and uses a computer for

email but does not use CAD, so everything was sketched and then cut and tried. Ross is a heavy equipment operator and he also runs a farm so his skills are wide ranging and practical. Ross has a heated garage workshop at his house and another shop at his farm. His equipment includes a tig welder, a couple of bending brakes, and he has a neighbour with a good machine shop. Ross has owned many aircraft and has multi and IFR ratings, plus some Bell 47 helicopter time. He has flown most of the Cessnas and many Pipers, and he and his wife Marie have flown to Florida many times in their Comanche.

Once the sketching was done, Ross bought a batch of cheap plywood and made a cabin mockup to see how ¼ scale would work with two crew. Then he made a jig from a length of steel channel fastened to the floor of his shop and on that erected verticals to position all of the bulkheads and stringers. The fuselage is essentially a five foot diameter tube made from .032” sheet aluminum wrapped around circular bulkheads. The floor is approximately 8 inches off the bottom and is supported on two longitudinal channel sections ten inches apart. These channels frame the nosegear at front, and act as the supports for the main gear. The nose of the Herc was carved from foam and glassed inside and out for strength, and is removeable.

The cockpit has clamshell doors on both sides, with the lower doors acting as entrance steps. Behind the seats is a vertical bulkhead with a door to the rear section of the fuselage. On the CG, which is at the forward spar, is a pair of 100 litre half-round aluminum fuel tanks, with space between them as a pass-through to the rearmost room of the fuselage. Immediately behind the fuel tanks are a couple of hatches that may be opened for full access to the retractable landing gear. Hinged from the rear of this section is a dropdown hatch door. The fuselage has enough space for crew to sleep, and if they wanted to take bicycles or a scooter there is plenty of space and payload.

Ross says that the hardest part of build-

Ambition²



Top: Panel is a combination of electronics and steam gauges. Above, having four engines means four of every engine control and monitor.

ing the plane was the tapered tailcone which transitions from a 5 ft diameter circle to an oval at the rear. He did the lofting using tried and true drafting techniques and the smooth lines show that it was done accurately. The fuselage was riveted while it was on the jig, and every rivet was bucked by his wife Marie. Once this was done the fuselage was removed from the jig and the last panel was fitted and riveted. I asked if any pulled rivets were used and Ross answered that there are only a handful in the whole plane.

The wing of the Hercules is based on the Comanche, but Ross used a Riblett GA 37A 415 airfoil. The wing is fully tapered so every rib is different, and each one was lofted directly onto a pair of plywood formblocks for each station. Because the spars taper, every nose rib is different too – this is clearly not a project for the faint of heart. Ross snipped out each rib from .032 sheet and hand whacked out a right and a left, then flycut and flanged the lightening holes.

The main spar is 293 mm high at the root, and meets the front spar just outboard of the outboard engine. For both spars the shear webs are .060 and the caps are made from aluminum flats and angles. All wing skins are .032” and of course these are buck riveted too. The wings have no washout, patterned after the Comanche and Aero Commander. The ailerons are piano-hinged and the flaps are Fowler type, actuated by a manual hydraulic pump, with spring return.

I asked Ross how he decided on the angle of incidence, and he replied that he first read Barnaby Wainfan’s book so that he could understand Riblett, and then he used Riblett’s charts to determine the incidence. When-

MD-RA’s Bob Buchanan did the inspections and found only a few minor snags during his rigorous eleven hour final inspection. First flight showed a control problem but Ross got the plane safely down on the ground and made the corrections. He has since been doing circuits and his preliminary performance numbers are:

Performance:

Takeoff roll 1000 ft
 Rotate at 70 kt and climb at 75-80 kt at 500 fpm climb rate
 90 kt on the downwind with landing gear and flaps down. Ross has not retracted them yet so speed when clean is yet to be determined.
 Approach at 80 kt and put the wheels on the pavement at 70 kt.
 Landing roll 500 feet.
Dimensions
 Wingspan 36.5 ft

Wing area 197 square feet.
 Tailspan 18 ft
 Length 27.5 ft.
 The planned empty weight was 2600 pounds and the plane came out at 2458 pounds.
 Gross weight 3400 pounds
 so even with two 200 pound crew and 200 litres of fuel there is still over 200 pounds of payload.
 CG empty with one 200 pound pilot is right at 25% MAC and filling the tanks does not make any difference. A passenger moves the CG forward but not markedly. The engines are right on the CG so any changes there will not have a CG effect. Clearly Ross put a lot of thought into designing his Hercules replica.



A door in the cabin bulkhead accesses the rear rooms. Both handmade seats are fore and aft adjustable with spring loaded pins. A hydraulic pump actuates the flaps.

ever questions arose during construction Ross used AC 43-13 and other reference manuals.

The vertical fin has two tapered spars, which means that every rib is different. Ross lofted these, cut out the wood formblocks, and hammered all the ribs. The skins for the vertical fin are .032", same as most of the plane. The rudder is aerodynamically balanced but not mass balanced. Instead of a rudder horn Ross has used a cable drum at the base of the rudder.

The horizontal stab has an aluminum spar that is a miniature version of the wing main spar. The rear spar is mounted to the wide tailcone with four bearings, and the forward edge is attached to a jacking mechanism that uses 5 inches of the lead screw from a Chev truck jack. This is operated by a cable that runs along top of the fuselage to a hand crank on the roof of the cabin. The position indicator is linear, operated by cable and pulleys. The elevator is hinged at many points along the length of its spar and is aerodynamically balanced. In the testing that Ross has done the trim seems functional and

holds altitude.

Ross chose Piper Arrow parts for the landing gear, and the main gear even uses the original retract mechanism. For the nose gear Ross made his own retract mechanism, and the whole system is powered by an off the shelf 12 volt Parker hydraulic system that was designed for the wheelchair lift of a van. Lights on the panel indicate gear up / gear down.

The main gear sits inside nacelles made from aluminum and fiberglass. It is supported by a heavy bulkhead extending down from the main spar, and is partly enclosed with doors. The nose gear retracts rearward into a wheelwell between the seats, with no doors. There is a failsafe in the system – if the pump fails, hydraulic valves between the seats can allow the gear to drop by gravity. Wheels and brakes are Grove, and the tires are low profile 15 x 6 x 6 to give better clearance in the wheel wells. The brakes will hold against 3/4 throttle of the four engines, at which point the tires start to skid along the pavement.

The idea of assembling even one engine is daunting to most builders.

First question was, "What made you want to build a... Hercules?"



Ross began with just one engine, and built a test stand to determine if the engine would be reliable. At his farm he ran that first engine for 25 hours at a high power setting and when it proved to be trouble-free he built another three engines. The inner engines are 2270 cc's and the outers are 2180, mostly because there were some bargain engine parts packages available at the time. There is a noticeable difference in settings of the Warp rive props between the two sizes.

The weak point of many VW's is that the prop is fitted to the small end of the crankshaft, so Ross bought and modified four Great Planes rear drive units that drive the prop from the flywheel end. The camshaft is an Engle unit designed for offroad racing and provides good torque in a usable rpm range. Ross made his own paired exhausts that exit straight rearward, and each exhaust has a heatbox, so each intake has redundant carb heat.

For intakes Ross used the original aluminum VW end castings and made his own T-section that places the carb right behind the pulley. Originally he used a Zenith 14998 carb but there was some stumbling so he switched to the 14992 with smaller venturis. Ignition is the popular Bosch 009 distributor with a Compufire trigger module and a Bosch Blue Coil that does not require a ballast resistor. Ross runs a single ignition per engine rather than dealing with the complication of machining for dual spark plugs. Each engine has a full flow oil filter tapped off the pump, and then through an oil cooler on the side of the cowling, fed cool air through a duct. Ross uses Shell Rotella fleet oil for all of his equipment and the VW's are happy to run on this lubricant.

Once the subassemblies were built, Ross took everything out to his farm workshop for fitting and rigging. The wings were aligned so



Above: How big are these pilots? It's easy to do a double-take when seeing this out of the corner of your eye. Each engine has good access via dropdown panels; and paired exhausts provide good heat for the carburetors.

Ambition²

Top right, Wheelchair lift hydraulics actuate the landing gear. Ross perches inside to give a bit of perspective. The angled hatches provide access to the main gear, and the doorway is framed by the two fuel tanks. Top, landing gear nacelle door is linked to open and close when the gear is actuated; above, Ross designed everything for ease of servicing - the landing gear linkage is fully accessible by opening the hatch lid.



that the leading edge is dead straight, with all taper on the trailing edge. The top surface of the wings is straight as well, with all dihedral on the bottom surface. Initial taxi tests were done at the farm and when these were finished the problem remained how to get the Hercules to Stratford Airport, some thirty miles away. Rather than dismantle and reassemble at the airport, Ross decided to trailer the assembled plane on a farm trailer towed by a tractor, a combination exempt from the wide load limitations. With a truck ahead of the tractor and another following the trailer the group made the trip on back roads early one Saturday morning, and met only one or two cars en route.

No one ever builds an entire plane by himself, and Ross had considerable support and construction help from his wife Marie. He also thanks his neighbour Greg Williams, who has a good machine shop near Ross and Marie's house. Greg has been invaluable in machining up the many custom parts that went into this unique aircraft. Without these two it is likely that the Hercules could not have been built.

What about the future? Ross had at one time considered doing the airshow circuit with this plane but construction has taken more than a decade. He plans to continue with the 25 hour test period but if someone younger is looking for a plane that is guaranteed to be an airshow attraction, Ross could be persuaded to part with his Hercules. Imagine being asked by another pilot what you are flying and being able to answer – a Hercules! 🛩

Article by Ross Somers and Gary Wolf. For more information on this unique project, Ross can be reached at rsomers@sympatico.ca

General Seeker Inspection Camera



The camera includes a mirror, a hook, a magnet, and a cap, plus of course the software.

The General Seeker 050 inspection camera is similar to many of the available camera-on-a-wand systems except that it does not include a video screen. It might seem counter-intuitive but the lack of a screen is actually an advantage – most that I have seen have a grainy, low resolution image that gives little useful information.

The DCS 050 camera plugs into the USB port of a computer and uses its display, giving much better resolution and a larger display. The camera is also powered through the USB port so there is no need to recharge any batteries except those of the computer if it is a laptop. The flexible wand of this device is a metre long and the camera is 12mm diameter including the two lamps flank-

ing the camera itself. There are three clip-on accessory end pieces - a hook, a magnet, and a right angle mirror.

The initial test was to have a look inside an engine's spark plug hole, and this was rather marginal. The 12mm head will just sneak into a 14mm spark plug hole but not if any of the mirror or other attachments. This means that all that can be seen is the top of the piston, and there is no opportunity to look sideways for a look at the valves. On engines with 18mm plugs the mirror can be used but it does knock down the resolution somewhat.

When used to look inside an oil filler or up an exhaust pipe the lighted camera provides a very good view, and if the port radius is not too tight it is even possible to check the



seating surface of a valve. The end piece is 2 inches long and the manufacturer recommends bending the wand over a radius no tighter than 2 inches, so this is the limiting factor.

Airframe inspection is made easier with a camera, and taping this device to a length of 1 x 2 makes it possible to get down the length of a tailcone to have a close look at the cables, pulleys, and fairleads. A wing can also be inspected if the tip is removed, or by going through individual inspection holes. A ten foot USB cable extension would make airframe inspection simpler by allowing the laptop to be positioned somewhere convenient.

The software that comes with

the camera allows for video footage to be shot and stored in the laptop, handy for having a second look later. The camera gives the best resolution in the range of 2 inches from an object but typical magazine type may be read from 1 to 8 inches away. A thumbwheel on the handpiece varies the intensity of the lights on the endpiece, very

useful because they are very bright.

The manufacturer suggests that this camera may be used for inspecting plumbing and machinery but cautions that the camera must not be immersed.

Canadian Tire lists the General DCS 050 camera for \$90 but it has been on sale as low as \$45. **R**

POWERBUILT REVERSE THREAD CHASER

We had a slightly cross-threaded spark plug on a Rotax 912, enough that it was not possible to get the plug into the correct threads. I followed the simple instructions on the tool a) lightly grease the tip to catch any chips b) insert fully into the plug hole c) expand the tool to mate with the good threads at the bottom of the hole and d) back the tool out to remove it while cleaning the threads. Per the instructions I did 3 passes with only enough expansion so I could back the tool out by hand. After this 60-second process the plug threaded in all the way by hand and was tightened normally. Compared to the other options of chasing the threads from the outside in and risking getting chips in the cylinder, or removing the head and chasing from the inside out, this tool paid for itself the first time it was used!

Nick Jones

Tightening the knurled knob pulls the tapered expansion plug into the tap and expands it to full diameter.



Handy Hints

Accelerated Tire Test

Wayne Hadath



I fly my F-1 Rocket a lot and its 500-5 tires touch down at about 70 kt. The plane initially had a lot of positive camber, and because the spring gear spreads out when loaded there is also a lot of lateral motion.

The kit came with Airtrack tires that said 6 ply but in this case it meant a 6 ply rating. Initially I had 3 degrees toe-in and 3 degrees positive camber, and these tires lasted 31 hours, mostly touch and goes. The outer edges wore first with all of this camber so I tried demounting and reversing the tires on their rims, but it seemed to be a lot of work for minimal savings.

I changed the camber and toe to zero, these settings in the three point and with full fuel, and replaced the Airtrack 6 ply rating tires with a set of Condor 10 ply rating tires. These lasted 180 hours before becoming too worn to be useful.

The next set were Airtrack 10 ply rating and these lasted 140 hours. After these I installed another set of Airtrack 6 ply rating and these lasted 68 hours.

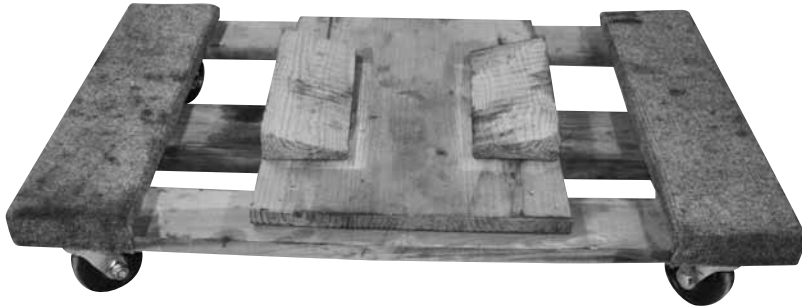
Next I tried a set of Condor 6 ply rating and they lasted 60 hours. I have recently installed a set of the 10 ply rating Condors and expect 120-150 hours, or a season of flying.

In Sept 2009 I switched the inner tubes to Michelin Airstop butyl rubber type. The kit came with Specialty Tires inner tubes that required at least a monthly refill. The Michelins get topped up at the first of the year, and at the end of the season they might need just a bit of air added. It would be possible to run a whole season - I run 42 psi.

My conclusion is that the ply rating seems to make a difference to life of a tire. On average the 10 ply rating costs only \$15 per tire more than the 6 ply rating, and gets double the life. A Michelin tube costs more than a tire but it can outlast many sets of tires, and I consider them well worth the money. With wheel pants these tubes mean a lot less maintenance. **R**



*Condor 10 ply rating with Michelin Airstop inner tube is the top choice so far.
Three degrees camber and toe means a lot of asymmetrical wear*



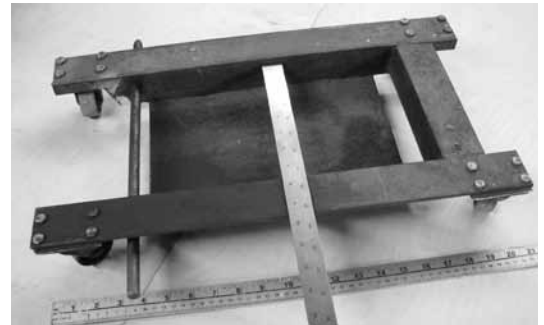
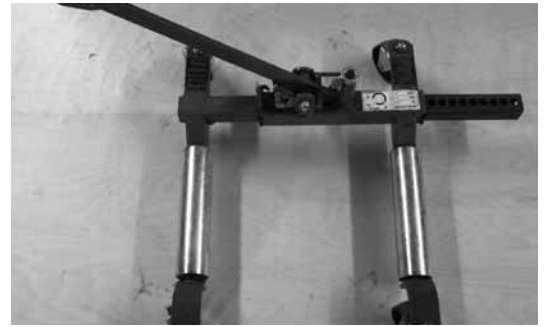
AIRCRAFT DOLLIES

HANGARING A PLANE for the winter is expensive but usually necessary. The cost can be reduced if several planes can be crammed together into a hangar but it is sometimes difficult to make them move sideways. A set of dollies for each plane can make it a lot easier to pack the planes in. In most cases it is desirable to have all casters full-swivelling.

Furniture dollies are available cheaply at Princess Auto, usually under \$20 each, and sometimes as little as \$10 when on special. It will be necessary to screw one or two lengths of 2 x 4 lengthwise under each dolly to take the load that will be placed centrally on the deck. Chocks may be made by splitting some 2 x 4's diagonally and screwing them down to

the deck. Furniture dollies will have a deck height of about 5 inches so it will be necessary to jack each wheel up to get the dollies underneath. For safety it might be advisable to tie each wheel down to its dolly, or block it in laterally with short sections of 2 x 4's, just in case.

Squeeze dollies are sold at Harbor Freight and at some automobile enthusiast shops. These have two long rollers that flank the wheel, and the operator then pumps the jack handle with his foot, causing the rollers to approach each other until the wheel has been lifted clear of the floor. These dollies are sized for automotive tires so some aircraft tires will just barely clear the floor unless they are pumped to a high pressure. If your plane has wheel pants you



Above: Furniture dollies can become aircraft dollies if reinforced. Top right, At minimum a pair of screwed down chocks, and perhaps lateral blocks or a tiedown; a squeeze dolly; A shop-fabricated low floor dolly. Second from bottom, the low floor makes it easy to roll the tire up onto this dolly; while CTC dollies (right) have a 4 inch high lip.



Jimmy Kennedy's hangar requires that the plane be pushed in sideways. The ramps hinge down for loading / unloading.

had better check the height of their lower edges.

Shop made dollies are very good but wait until there is a sale on casters. This unit uses swiveling casters with a 2-1/2" height. The side rails are made from 21 inch lengths of 2 inch steel angle, with the ends cut away to allow the casters to swivel. The 1/8 plate base base is 7-1/2" x 13 and the retaining rod is 13-1/2" from the opposite face of the dolly. The dolly shown has been welded but it could easily have been riveted or bolted together from steel or aluminum angles and plate. The advantage of these dollies is that the parking surface is only 1/2 inch off the floor, making it easy to roll the tire onto the dolly.

There are other wheel dollies available, some with a

half-round form that the wheel drops into, and four swiveling casters for support. These require jacking up about 4 inches, but they do keep the wheel in place longitudinally and laterally. Again, if your plane has wheel pants, check the height of their lower edges. Canadian Tire carries wheel dollies, and Christmas season means that a lot of automotive products will be on sale.

For a hangar with a dirt or gravel floor none of these dollies are very useful. However RAA member Jimmy Kennedy designed and built a triangular rolling airframe dolly that uses wheelbarrow wheels. His requirement was to be able to roll his two ultralights sideways into his narrow fabric Quonset hangar that has a gravel floor.

Each dolly is specific to its plane's landing gear, and is

made from three 8 foot lengths of 2 inch square tubing, welded together into a triangle with reinforcing plates at the corners. Three- quarter inch rods are welded to these corner plates to become the axles, and parallelism is important here. The main gear parking pads and the hinged ramps are made from steel angle and plate, and the round tubing tail support can be telescoped. The large wheels accommodate the grass parking area and the gravel hangar floor, and the occasional nudge ensures that the dolly remains headed in the right direction. ♣

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AirWear.....Dave King

Alberta North:

Pending

Alberta South:

President's Message / cont'd from page 2

their annual elections. If there have been changes that will affect the wording of your chapter's listing in this magazine, please have your chapter secretary email new text to gregdesign@telus.net.

Minimum Useful Load

Transport Canada has a Minimum Useful Load (MUL) requirement for many categories, and it is important to understand what this means. MUL is added to a plane's empty weight and the numbers had better not add up to more than the registered gross weight. MUL is based on the number of seats and the horsepower of the engine. Each seat is considered to be filled with a 175 pound person, and the engine horsepower is halved and expressed as pounds of fuel. For a 2 seat 100 hp plane this means that the crew allowance will be 350 pounds, and the fuel will be 100 divided by

2 = 50 pounds. Assuming that you and your passenger together weigh no more than 350 pounds, this leaves enough weight for one hour of flight until the engine stops, so half an hour if you observe the requirement for fuel reserve. Should it happen that you and your crew together weigh less than 350 pounds, you can then carry more fuel or some luggage. MUL is definitely the minimum that would allow a plane to be marginally useful.

Installing heavy floats will frequently push up the empty weight until the requirement for MUL cannot be met, rendering the plane illegal. In the Amateur category the owner can provide "acceptable data" to Transport Canada to justify a rise in gross weight. However in the Basic and Advanced UL categories, if the plane is already at the category maximum of 1200 and 1232 pounds respectively, there is nothing that can be done to make the plane legal

except to remove the floats. There is no allowance for floats above these numbers, and every flight will be illegal when the MUL requirement cannot be met, even if flown solo. If you are planning to install floats on a light aircraft, especially in the UL categories, do your homework before ordering the floats. If in doubt, call or email to the RAA office.

Transport Canada

A few members have asked why there have recently been no complaints in this column about Transport Canada. RAA responds to complaints from members, and in the past few months there have been none. Either our members have become complacent or Transport Canada has been doing a decent job. Either way, it has been quiet lately. Sorry.

Merry Humbug,
Gary Wolf

***The cabin filled with
the smell of hydraulic
fluid. Not good.***

Rebel / continued from page 11

wheels hanging down into the water.

It didn't take long to fix the broken connection, check the others and test the gear. There was no damage to the plane so we were soon having a lovely lunch up on the patio. Great food, great friends, great to be alive.

Ray had told us about flying up the pass that goes up behind Whistler, over Cheakamus Lake and then down into the Pitt River Valley. It sounded great, but required some very serious climbing. After dropping Ray back at Pemberton, we decided to give it a try.

Walter had no trouble making the climb but I was working pretty hard at it. The valley is very wide, so if I had to, I could circle back for altitude or just go home the way we'd come. I was about to do that when Walter suggested getting over a bit closer to the sunny side of the valley, in the hope of catching some up slope lift. Like magic, suddenly I was climbing at 1100 FPM instead of 300 and the ridge ahead no longer looked so threatening.

We cleared the ridge by a com-



Above: More dramatic British Columbia scenery. Every landing provided more nature to see and even this rustic cabin. We often forget how big our country is, how wild and spread out.



comfortable margin and headed down the Pitt River Valley, over Pitt Lake, past Pitt Meadows and on to Langley. On the ground at Langley, we again checked the hydraulic connections and rigging.

It was another wonderful, though at times worrisome, day of flying. ✈



Apparently, Walter was satisfied with my abilities, and over the next week or so we flew almost every day, touching down in spot after spot of absolutely breathtaking beauty. The BC mountains seem to go on forever; left, the Rebel is dwarfed by the mountains around Whistler.



Digital page design that works right.

Brochures	George Gregory
Newsletters	Pagemeister
Posters	604-773-0035
Web Pages	george@sidekickgraphics.com
Branding	http://SideKickGraphics.com

One day, the pilot of a Cherokee 180 was told by the tower to hold short of the runway while a DC-8 landed. The DC-8 landed, rolled out, turned around, and taxied back past the Cherokee.

Some quick-witted comedian in the DC-8 crew got on the radio and said: "What a cute little plane. Did you make it yourself?"

Our hero the Cherokee pilot, not about to let the insult go by, came back with a real zinger: "I made it out of DC-8 parts. Another landing like that and I'll have enough parts for another one."



RAA Chapters and Meetings Across Canada

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

ATLANTIC REGION

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

QUEBEC REGION

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

LES AILES FERMONTOISES (FERMONT): First Sunday 7:30 pm at 24 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

OUATOUAIS/GATINEAU: Every Saturday 9:00 am to noon at the restaurant 19Aileron 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 AEROSPOTIVE 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 Fourth Saturday (and second Sat. as well) each month 9:00 am at the restaurant at Lake Simcoe Regional Airport Contact Secretary Dave Evans 705 728 8742 E-mail david.evans2@sympatico.ca

COBDEN: Third Thursday 8:30 pm at Club House, Cobden Airport. Contact Pres. Clare Strutt, 819-647-5651.

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. George Elliott gaelliott@sympatico.ca 705-445-7054

EXETER: Second Monday 7:30 pm at Summers-Sexsmith Airfield, Winters-Exeter Legion. Contact Pres. Ron Helm, ron.helm@sympatico.ca 519 235-2644

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

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

KITCHENER-WATERLOO: Meets the third Monday of each month in the upstairs meeting room of the cadet building at CYKF, except during the summer months when we have fly-ins instead. Please contact Clare Snyder clare@snyder.on.ca

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

Meeting: First Tuesday, 7:30 pm at Midland/Huron airport (CYEE) terminal building. Contacts: President Ian Reed - 705-549-0572, Secretary Ray McNally - 705-533-4998, E-mail - raa.midland@gmail.com

NIAGARA REGION: Second Monday 7:30 pm at Niagara District Airport, CARES Building. Contact Pres. Elizabeth Murphy at murphage@cogeco.ca, www.raa-niagara.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

OWEN SOUND Contact President Roger Foster 519-923-5183 rpfooster@bmts.com
OTTAWA/RIDEAU: Kars, Ont. 1st Tuesday. Contact: Secretary, Bill Reed 613-831-8762 bill@ncf.ca

SAUGEEN: 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. 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 Don Rennie drennie@hemisphere-eng.com

403-874-0876

EDMONTON HOMEBUILT AIRCRAFT ASSOC: First Tuesday 7:30 pm EAHS boardroom. Contact President Bill Boyes 780-485-7088

GRANDE PRAIRIE: Third Tuesday, Chandle Aviation Hangar, contact Jordie Carlson at 780-538-3800 work. or 780-538-3979 evenings. Email: jcarlson@telusplanet.net

BRITISH COLUMBIA

ABBOTSFORD: Third Wednesday 7:30 pm Abbotsford Flying Club, Abbotsford Airport. Contact President, John Vlake 604-820-9088 email javlakca@yahoo.ca

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

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

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

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

CHAPTER 85 RAA (DELTA): First Tuesday 7:30pm, Delta Heritage Airpark RAA Clubhouse. 4103-104th Street, Delta. Contact President: John Macready jmacready@shaw.ca. Website <http://raa85.b4.ca>.

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

THOMPSON VALLEY SPORT AIRCRAFT CLUB: Second Thursday of the month 7:30 pm

Knutsford Club, contact President - **ZZALASKA 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 email: raa@raa.ca web: www.raa.ca

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

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For Sale

FOR SALE KR-2 FUSELAGE in boat stage and metal kit for retractable landing gear castings \$300.00 call Ian 604-856-1159 or email tri-pyramid@telus.net Dec11

PROPELLERS, wood, new, never mounted, tractor cwise (view from cockpit), priced OBO plus shipping: One 42x23, weight 2 lb., Lepper, conventional outline, 4 bolts on 70 mm b.c., \$195. One 43x34, 4 lb., squared tips, 6 bolts on 75 mm b.c., \$295 Call Frank, 905 634 9538



2002 CP 301-A Emeraude. First flew June 2003. TTAF 50 hrs. 0 290G Lycoming 396 hrs. since major. Sensenich metal prop inspected and refurbished by Hope Aero June 15/09. Dual controls (pedals, sticks throttle) custom interior. Annual due May 2012. Always kept in a hanger. Contact Jim Demerling 519-348-9655 (Ont.) \$19,900

Whelen lights \$650 OBO Whelen A650-PR-14 and PG-14 wingtip pos/strobe. A500AVD1 Tail pos/strobe, A490TCF power pack. NEW! Chris 1-866-733-8432

0320 E2C currently mounted on my Osprey which could be included in sale. Osprey has 175 hrs since new engine has 1850 but was disassembled for a propstrike inspection 200 hrs ago Compression 125 lbs cyl on all four jugs oil pressure good complete with accessories. \$6000 for engine \$9000 for all aircraft needs refinishing and recover Larry Taylor 250-492-0488 days ltaylor@pacificcoast.net

SKYBOLT FUSELAGE with Marquart Charger cantilever U/C., tail feathers, rudder/brake pedals, metal fittings, axles, wheels. Offers. Bill Phipson #3954. Phone 416-431-2009 Dec11

FOR SALE: Zenith CH601XL, airframe 80% complete, controls installed. Canopy mold.

No landing gear. Subaru 2.2L no re-drive. \$3000 or best offer. Call 705 279 4399 or 519 351 6251



EUROPA XS monowheel with Rotax 914 turbo engine and Airmaster constant speed prop, 87 hrs total time. VFR panel with Mode C transponder, KMG GPS, Becker 720 com with intercom and headsets. This is a fast and efficient cross country aircraft with low fuel consumption. Asking \$65K, no reasonable offer refused. Contact Hazel Peregrin at 250-672-5587 snowgoose@telus.net

Woodward Governor, Guaranteed serviceable, was overhauled and used 25 hours before removal for engine upgrade. \$350. Chris 1-866-733-8432

ZENITH CH300 for sale First flight 1990 265 hours TT airframe and engine. Lycoming O320 E2D 150 HP engine professionally "zeroed" by Leavens aviation with all documentation. New McCauley cruise prop installed 3 years ago (cruise all day at 135-140 mph on 8gph). Professionally painted by flying colours in peterborough. \$10,000. New sliding tinted canopy installed 5 years ago. New interior Full IFR steam gauges. Blue mountain EFIS light. 3 axis auto pilot. True Trak pictorial pilot AP coupled to Garmin 396 Trak Trak Altrav VS altitude hold with verticle rate. Flo scan fuel management system computer with optical transducer King digital 720 radio. Narco mode C transponder with encoder. Ammeter and Volt meter. 4 place intercom for front and back seat headsets. Full lights inside and out for night flying. New tires 2010.12 volt recepticals front seat and back seat for PAX. Reiff full pre-heat system for winter operations..(oil pan heat and cylinder bands for each jug.). Air Wolfe remote oil filter system installed for 50 hour intervals and added engine protection.

New Marvel carb installed 2007. All logs and plans..All owners manuals and profes-

sionally produced POH Always maintained to highest standards...\$ 35,000....(certified and e-tested!!). I would have no qualms selling this aircraft to anyone.....a joy to fly. Warren 289-259-6460

CAVALIER 102.5, "Aero Sport Power" O-320-B2B; 152 TTSN. Sensenich metal prop. Airframe was totally rebuilt in 1997; 1750# GW, 622 lb useful load; VFR instruments + Garman GTX 327 TXP Mode C & Val Radio; Trutrak Turn & Bank; Kept in heated hangar; 8/10 inside and out. \$28,000 or would consider trading for a 912 Kitfox, Merlin, Zenith 701, or similar. cavalier102@uniserve.com or 250-558-5551. Ask for Cameron.

LONGEZE PROJECT with all major fibreglass work completed. Main wings and canard have been matched with the fuselage. Baggage /fuel strakes are complete. There is also a Lycoming O-235 engine available. Work remaining includes elgine mount, instrumentation, prep and paint. j.f.doyle@shaw.ca

TWO NEW 600-6 CLEVELAND WHEELS complete with brake discs and hydraulic pucks. 1.5" bearings included. New tubes and Mallory Airhawk tires 600-6 type 3, 6 ply. Selling for \$240 per side. Complete front landing leg and engine mount including oleo and nosewheel with tire from 65 Cessna 150, not damaged. This has been sandblasted and undercoated. \$400. O-200 Continental starter, cable type with 60 hrs since major. \$100. Carb airbox for O-200, \$40. 403-545-2609 in Bow Island, west of Medicine Hat.

MINI-MAX. TTSN 220. 31 hrs since ROTAX 440 and GSC prop overhaul. Always hangared VG condition. ICOM Nav/Com. Medical forces sale. \$9,900.00 OBO. 780-460-6841 or cell 780-945-0411

ENGINE - LYCOMING O-320 A3A, 968 SMOH, with starter, generator, mags, to remove from flying a/c, \$9000 + shipping. 905.878.4017, mohne40@yahoo.ca

Glasair 1 kit. as supplied by Glasair but

with both conventional and tricycle gear and extended wing tips. Wing in jig, close to closing. Good short field airplane capable of 200 MPH. \$13,500 no tax, or crating fees ect. Richard 705-652-6307



Bowers Fly Baby, Continental 85, 350 TT on engine and airframe. Always Hangared, flown regularly, owner built. Fun, affordable flying, \$12,000. Phone 403-614-3855 or email, jw.gray@shaw.ca

King Avionics as removed wrkg from a 182. KMA24, KMD150, KT76, KY197. All guaranteed working. Offers? Chris 1-866-733-8432

Heated Pitot, off C150. \$350 Chris 1-866-733-8432

Bendix/King KY 97A vhf com radio with shelf and wiring harness. (\$1500). Collins transponder (mode 'C') with antenna, shelf and wiring harness (\$1100). I-com 4 place intercom (with music option), with shelf, wiring harness and head phones jacks. (\$100). 2, 4 point hooker harness. (\$ 100 ea. set) Contact Norm at graham110@rogers.com for details.

VAL 760 TRANSCEIVER, SN. 04275. Worked when removed for panel upgrade. Asking \$600 obo. Comes with mounting tray and connector. Estimated mailing cost \$35. Direct inquiries to blehm-ann@pris.ca

CESSNA RT-459A TRANSPONDER, PART No. 41470-1028, SN 6993, 14V Unit, (for use in 28V aircraft use dropping resistor on mounting) Authorized release dated 11-Jul-13. Worked when removed for panel upgrade. Asking \$600 obo. Comes with tray and connector. Estimated mailing cost \$35. Direct inquiries to blehmann@pris.ca Tail wheel assembly complete, New, off

Rebel, also main wheels. \$350 for all. Chris 1-866-733-8432

Cessna 150 Seats and Rails \$400, Nice set of seats and rails. Covered in red vinyl. Chris 1-866-733-8432

2005 CESSNA/CYCLONE 180 FOR SALE

Due to re-injury of a lumbar disk, I have to seriously consider selling C-GLEH: Engine Cont. 0470R, McCauley Prop, both 310 hrs SMOH. Float kit, with heavy duty engine mount. King package: com, VOR w. glideslope, ADF & Garmin 295. Classic six pack flight panel. Leather articulating seats, extra light front seats & rear folding bush seats available. Fuel 74 US gallons, 6hr range. C185 landing gear held by full P.Ponk STC kit. 850x10 Cleveland wheels & double puck brakes. Airwolf oil filter & Airwolf oil-air separator. Bubble side windows, large extended baggage compartment for light but bulky items. A/C empty 1700lb, MTOW 2950. Price \$96k OBO, or trade your homebuilt PA12(or equivalent) towards purchase.

For serious inquiries email: blehmann@pris.ca Aircraft based at CDC3, near Dawson Creek, BC



DAVIS DA-5A for sale. All metal Single seat "V" tail with A75 Continental engine balanced with two advanced magnetos: 68h SCMOH; airframe 142h TTAF since new. See RAA magazine article of Sep/Oct 2011 issue: http://www.raa.ca/magazine_pdf/Sept-Oct2011_ProofREV2.pdf. A joy to fly and priced only \$ 15,000 (...which is less than price of bare kit: less engine, propeller and instruments! Rob (905) 484-0804 or Charlie (905) 928-7766 robtea2005@yahoo.ca

1960 Bellanca Cruisemaster 2555 TT 260

HP IO-470F A fast aircraft with good short field performance and triple tail style. Full size nosewheel suitable for grass fields. 1000 mile range. Gami injectors, engine analyser, white polyurethane paint. Otherwise stock. Have paperwork to turn it into an amateur built.

\$65,000.00 Richard 705-652-6307



Airdrome Aeroplanes full scale WW1 Nieuport 17 scout. The fuselage is on the gear, with control stick mounted and the rear flying surfaces are finished (rudder, elevators and Horizontal stabilizer). It has a Matco tail wheel. The firewall is on and engine mount for a VW engine. I have the fuel tank and instrument panel and turtle deck bulkheads. It comes with a Stearman throttle quadrant, Tracy O'Brien brakes, C182 rudder pedals. Save about 100 hours or more in having your own "Billy Bishop WW1 scout aircraft". Still needs wing, cabane, cowl and covering kits for AA. All aluminum tube and gusset construction which is light and very strong. Asking \$4,000 obo (less than price of raw tubing kits purchased so far). Also have Subaru EA81 with geared 2.44:1 reduction drive sold separate for \$2500, that could be sold together for a better deal. If a person had the time, it could be flying by spring.

Doug Cowlthorp thorp@mts.net 204-896-3930

C150 Engine Mount \$450 Overhauled & painted by certified aircraft welder, O-200 to M model C150. Packaged and ready to ship. Chris 1-866-733-8432

Chelton Flight Systems: 2 complete Chelton dual screen EFIS systems. 1 with crossbow AHRS one with GADAHRS. Serious offers? Chris 1-866-733-8432

CHINOOK Factory built in Edmonton 1983. Out of long term storage. Good sails in original color scheme. All oiled and inhibited for storage. Very low hours suspect < 20. VG 54" prop. \$4990.00 OBO 780-460-6841 or cell 780-945-0411

KING AVIONICS as removed wrkg from a 182. KMA24, KMD150, KT76, KY197. All guaranteed working. Offers? Chris 1-866-733-8432



RV6 Project for sale - sliding canopy tail-dragger model. Wings and tail surfaces complete, fuselage is on metal jig 50% complete and ready for skinning. Jig included - readily transportable. Started in 1995, lost medical. All parts from the original kit are primed and ready for assembly. \$20,000 complete. Required sheet metal tools available - negotiable. Available: the ideal engine for the RV-6 - Lycoming 0320 160 hp (stored with preservative oil) low time (120 hours) since remanufacture by Lycoming. Call for viewing at Waterloo Regional Airport. Photos of parts available on request. Peter Hanna 905-629-8836 Mississauga peterd-hanna@gmail.com or Terry Jantzi 519-748-1817 Kitchener tjantzi@p3tec.com

ACEY DEUCY 2 seat open cockpit project. Fabric covering completed and painted. Engine Continental 0200A rebuilt with logs. New Warp Drive 3 blade ground adjustable prop. B and C Light weight starter and alternator. Full instruments and gauges in rear cockpit basic flight instruments in front cockpit. Full electrics. Aluminum fuel tank. Radio included. ELT included. Gross weight 1230lbs. Estimated 50hours to final inspection. Asking \$18000. Will sell only as a package. Many extras. 905-786-2482.

FOR SALE: Advanced Flight Systems Engine information system. Some probes,

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Douglas Norrie's Savannah

Send us photos of your completed projects !

Share your accomplishment with others - you've earned it! Please include a brief description of your aircraft and any other details you want to include, and send us a colour print or digital copy (preferred) with it.

Mail your material to the Recreational Aircraft Association of Canada Waterloo Airport, Breslau ON NOB 1M0 ...or **email us** the information and a high resolution digital picture (jpeg format please, and the bigger the better!) to raa@raa.ca or to art director George Gregory at gregdesign@telus.net.

This aircraft took five and half years to construct, being completed in late 2011. It is the slatted version of the Savannah with full-span flaperons. With its low wing loading and quite high power ratio, this gives significant short take-off and landing capability. The 3-bladed Kiev prop has been pitched to match its torque curve peak to that of the Rotax 912 ULS 100 hp engine. This gives a climb rate of 1500 fpm at 200 lb under MAUW and a cruise speed of 78 mph. Maximum speed in straight and level is 89 mph. Because of additional instrumentation and a full paint scheme, the aircraft at 699 lb empty weight is somewhat heavier than most of its brethren, but registered as an Advanced Ultralight still has a 533 lb payload capacity. The first test flight showed only two problems: a reversed trim switch and front wheel shimmy. The first was easily fixed by interchanging two wires and the second by balancing the wheel and lowering the tire

pressure. Subsequently, there have been no significant problems. The aircraft flies straight and true with light control forces and is well behaved through its flight envelope. Although it is usually flown in the normal front-of-the-curve regime, it is also well behaved in the back-of-the-curve STOL regime (as for all STOL aircraft, appropriate training is strongly recommended for this regime).

The aircraft was professionally painted by Antique Aircraft Restoration and Refinishing Ltd of Springbank. Marcus Stephenson of this organization also provided indispensable help and support during the construction and especially final assembly stages. Many others from RAA, EAA, and other organizations gave valuable advice and more. To all who gave assistance, my grateful thanks. Finally, this project would not have been possible without the support of family.

fuel flow. \$750 OBO. Chris 1-866-733-8432

TEENIE TWO PROJECT, 1600cc VW engine test run, nearly complete, 2" wider cockpit, 6" longer fuselage, tubing motor mount, instrumentation complete, canopy with turnover protection, \$7,500 invested, good buy at \$5,000 306-764-2549 E-mail: williamfr@hotmail.com

FOR SALE: Autopilot - 2 axis. Servos, control head. Etc from a 182 Serviceable. Maybe adaptable to a homebuilt? \$500. Chris 1-866-733-8432

Stinson 108-3, a classic aircraft for sale. Airframe 2365TT. Franklin 165 hp engine 998 TT, 82 hours since top overhaul. Fabric in 2005, float kit, wheel pants, spare engine parts, 2 metal props - seaplane and cruise. 30K OBO. 250-991-7958 Quesnel BC.

SMYTH SIDEWINDER LANDING GEAR LEGS with axles. Never used - free to good home. 519-648-3030 garywolf@rogers.com

LYCOMING 0-290-D ENGINE. Comes with: alternator, gascolator, starter, cooling shroud, newly rebuilt carb, 6 bolt pattern prop extension, logs and maintenance manual. \$10,000. Bendix / King KY 97A VHF com-radio with shelf and wiring harness. \$1500. Collins mode 'C' transponder with antenna and wiring harness. \$1100. Two sets of 4 point 'Hooker harnesses' seat belts. \$100 each..Please contact Norm @ graham110@rogers.com.



1964 Corben Baby Ace . 600 TTAF. Recovered and TOH in 2000. A65. Metal Prop. Great flyer. Can be flown with ultra-light permit. \$15000. Gary Wallace 519-223-0368 Hangared in Roseville, Ontario.

FIBERGLASS FLOATS-1500 lb+, all bulkheads installed, just ends need finishing, can be finished as amphib or straight floats- complete with aluminum streamline spreader bars, rigging tubing, fittings. 15' 2" L x 22"W at step- \$1500, pictures available.- Also MA-4 SPA carb set up for 125 HP with new float and pump plunger. Includes aluminum airbox- \$200. Bob 519-271-9575 trimb@cyg.net. Stratford ON Fiberglass floats-1500 lb+, all bulkheads installed, just ends need finishing, can be finished as amphib or straight floats- complete with aluminum streamline spreader bars, rigging tubing, fittings. 15' 2" L x 22"W at step- \$1500, pictures available.- Also MA-4 SPA carb set up for 125 HP with new float and pump plunger. Includes aluminum airbox- \$200. Bob 519-271-9575 trimb@cyg.net. Stratford ON

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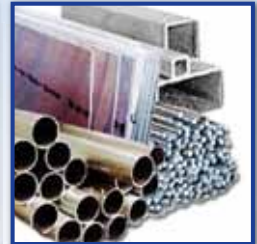
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