

- March 2022 -



Aerial One on final approach to Largo Woods fly-in in 2017. David and Cam Wood and their families have hosted many fly-ins over the years and most of our members know how to find Largo Woods field. For anyone that is not sure how to find it, it has been a challenge in the past due to its relatively narrow runway and planted fields on either side, but the flight planning job just got a lot easier. Largo Woods is now a registered aerodrome and appears in the most recent issue of the CFS as Conestogo and also now in most flight planning applications like ForeFlight.

President's Message

I trust everyone is doing well in spite of winter and the challenges that it brings to Ontario. Traditionally, I have done annual inspections in early April, which means flying season is likely only a few weeks down the road for me now. ☺

Covid-19 numbers are on the decline, so it appears we will soon be experiencing some sense of normal again soon... barring another variant taking hold in Canada. It's likely safe to cautiously plan fly-ins, in-person meetings and other aviation-related events for 2022.

In this issue, you will find an article by David Wood, updating us on the status of Largo Woods registration. The process was relatively simple, but took much longer than David expected it to take. Along with Roger Deming's Damascus Field CDF6, it's good to see two more airstrips protected, especially after the loss of CPR3 and CMZ2 recently.

David has also provided us with a great technical article on fatigue-related fractures in aluminum aircraft parts. Zenair has had at least one fatality related to this issue, but all aircraft with aluminum parts are susceptible to some degree. Reading this article and keeping these issues in mind during your aircraft's annual inspection could save your life! Thanks David.

Also in this issue of the newsletter, I highlight a couple of interesting links to some excellent aviation photography from Gusair, local photographers extraordinaire, Gus and Clara. Whenever I see them at an event, I always look forward to seeing their work. Check out this article and their website to see if you can find photos of your plane or yourself and friends at local aviation events.

2022 is going to be a great year for KWRAA!

- Dan

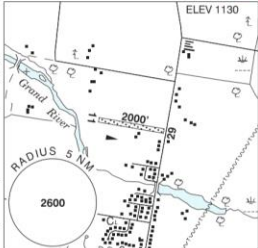
How Largo Woods Field became CLW6

(Part 2)

Largo Woods Field is on the map!

At my last report, the information for Largo Woods Field had been passed from Transport Canada to NAV CANADA for publication in the CFS and charts.

In September and October 2021, NAV CANADA asked for clarification of a couple of minor items. In early February this year, I downloaded the updates to ForeFlight and found Largo Woods Field on the map and in the CFS.

CONESTOGO / LARGO WOODS FIELD ON		CLW6
REF	N43 34 00 W80 28 15 2.1SW 10°W (2022) UTC-5(4) Elev 1130' A1900 A5000	
OPR	David Wood 519-500-8629 Reg PPR	
PF	B-1 C-2,3 D-4,5,6	
FLT PLN	FIC London 866-VXBRIEF (Toll free within Canada) or 866-541-4104 (Toll free within Canada & USA)	
RWY DATA	Rwy 11/29 2000x35 TURF Opr No win maint. Rwy soft in spring.	
COMM	ATF ttc 123.2 5NM 4200 ASL	
CAUTION	Marked P-lines aprx 45 AGL on apch to Rwy 29. Trees aprx 25 AGL at Thld 11. Cultivated field both sides of rwy.	

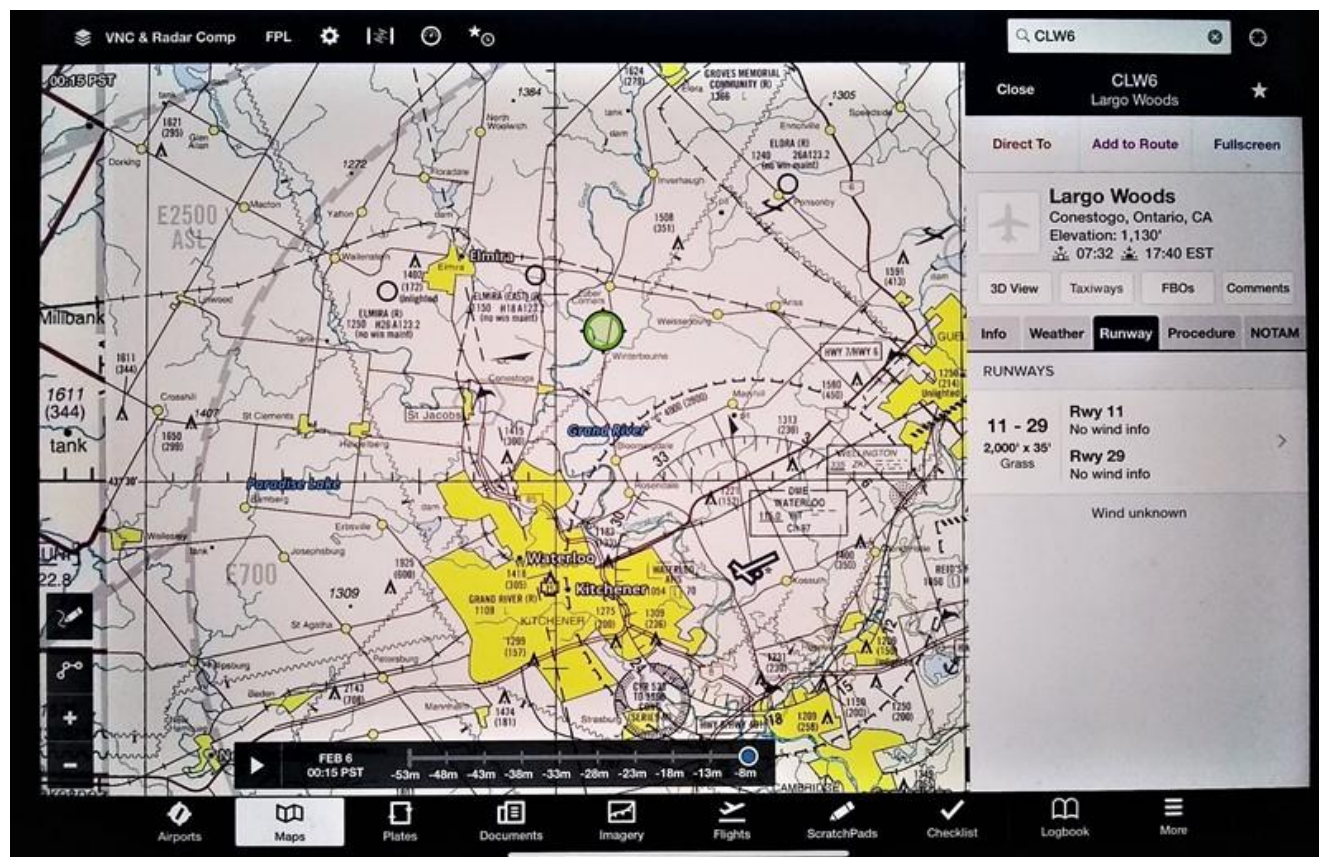
Overall, the process was quite simple, but did take longer than I would have liked. We have noticed more traffic lately, including low-flying helicopters, a twin turbine that made a very fast and low run up and down the Grand River right at the end of our runway and a drone that made a run up and down the river at around 200' at dusk. We hope that being on the map will help other pilots be more aware of our presence and avoid any potential incidents.

The location is listed as Conestogo and the identifier is **CLW6**.

KW RAA members are welcome to drop in. We encourage you to call ahead to check on runway conditions as they do change.

- David Wood

Editor's Note: CLW6 shown on the ForeFlight map below. By entering 'CLW6 D' in Fore Flight, it will plot a course from wherever you are directly to Largo Woods Field.



Aircraft Photographers Extraordinaire

Although most of us carry a camera or cell phone to capture a few photos at fly-ins, no one does it like Gustavo & Clara Corujo.

Known as Gusair, they have been shooting aviation events for a number of years and produce some of the best aviation photos to be found anywhere!

We were lucky enough to have them at Roger Deming's fly-in and they captured a number of great pictures of the aircraft owned and flown by our chapter members. Aerial 2 was still operating with a 25nm. restriction to the C of A at the time, so I was unable to fly it there.

<https://gusair.com/htdocs/Aviation/2021/21-Hawkefield-Orono/21-ORRA-Trilium-Aviators/21-Roger-Deming-s-Fly-In/21-roger-deming-s-fly-in.html>

Gusair was also at the UPAC Convention where they captured a number of great moments and aircraft photos too.

<https://gusair.com/htdocs/Aviation/2021/21-Canadian-Formation-Clinic--/21-Canadian-Formation-Clinic-C/21-Canadian-Formation-Clinic--/21-Ultralight-Convention-UPAC-/21-ultralight-convention-upac-.html>

Here's a great action shot Gus took of Aerial One at the UPAC convention a few years ago.



If you have flown to any of the aviation-related events in the last few years, there are likely one or more photos of you or your plane in Gus and Clara's galleries of aircraft photos. To view more of their excellent photography, check out their website at: www.gusair.com where you will find a variety of other types of events they attend or are contracted to work at.

Thank you Gus and Clara for your contribution to the local aviation community.

- Dan

EP 4 into 1 Electronic Fuel Injection

For several years now, Edge Performance in Norway has been producing some well-engineered modifications for the Rotax 912 series of engines. When I began construction of Aerial 2, I wanted to increase reliability, improve fuel economy, and reduce weight, while increasing power and torque as much as possible on my Rotax 912ULS. EP's EFI fit my requirements nicely.



EP Big Bore Kits

Edge Performance offers three different big bore kits but the largest one requires significant machining and changes to the block, so I opted for the medium sized one, a 1484cc Big Bore Kit that maintains the standard Rotax high compression 10.5: 1 ratio requiring 91 octane premium automobile fuel.

More info: <https://shop.edgeperformance.no/>





Although this article centers on the repairs to Zenair Aircraft, the problems encountered relate to all aircraft, especially those using aluminum parts in key areas of their construction. Thorough annual inspections are critical.

Horizontal Stabilizer Inspection and Repair

(Fatigue-related Failure of Aluminum Parts)

As many of us are aware, there was a fatal incident involving a Zenair CH601 near the Guelph airpark in 2016. As a result of the investigation, a Safety Advisory was issued by the Transportation Safety Board of Canada and Zenair issued a Mandatory Action calling for immediate inspection of the horizontal stabilizer attachment brackets. All CH series Zenair aircraft models have similar designs. The Safety Advisory and Mandatory action apply to all.

The incident was a result of deviations from the Zenair design. Although I was confident that we assembled the stabilizer (and the rest of the aircraft) to Zenair's specifications, my

experience shows that there are still potentially serious issues that can arise.

First, a bit of material science:

Aluminum has a finite fatigue life. This means that anything made of aluminum that is subjected to cyclic stress will eventually break. A fatigue fracture will start at a point of high stress, often this is a scratch or a sharp corner. A crack will form and grow at each stress cycle. Eventually, the crack becomes large enough that the remaining material cannot support the load and the part will completely fracture.

A fatigue failure can be identified by the appearance of the fracture surface. The surface will be smooth where the crack propagates and rough where fast fracture occurs. Sometimes, when the material is

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subject to corrosion, heavy corrosion can be seen at the origin of the fracture, progressing to pristine material at the site of the ultimate fracture.

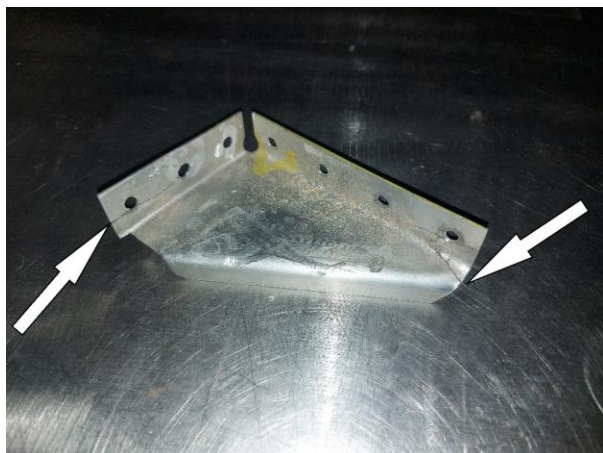
It is important to note that fatigue develops from elastic, as opposed to plastic (permanent) deformation of a material. The component is not permanently deformed (until it breaks), and it may be difficult to detect an impending failure, particularly when paint or dirt covers the surface. I have seen demonstrations of so-called fatigue where a paper clip is bent back and forth until it breaks. This is not fatigue and it is important to understand the difference.

Steel is also subject to fatigue failures, but as long as the stress is below the fatigue limit, a steel component can have an infinite fatigue life.

Elevator Centre Hinge Gusset:

I was alerted to cracks in the centre hinge gusset by another RAA member who found similar cracks in his. The gusset supports the hinge laterally. Complete failure of the gusset would not be catastrophic, but it would subject the hinge to greater stress and premature failure.

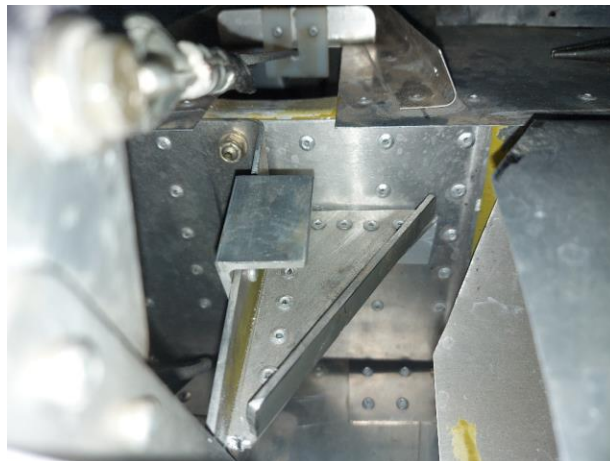
I kept a very close eye on this part before I repaired it, but the extent of the cracks was not visible until the elevator was removed. Lesson learned. Pay extra attention to this part at the walkaround and replace it at the first sign of cracks. It is not easy to see this part, so a casual look is not sufficient.



Cracks in elevator hinge gusset

Owners of Amateur-built aircraft can make modifications as long as appropriate standards are followed and logbook entries are made. This MD-RA publication has the requirements: <https://www.md-ra.com/docs/J845ER.pdf>

I fabricated a new gusset from extruded aluminum angle and thicker aluminum sheet. This gusset has held up well. It is important to note that since it is stiffer, the gusset will transmit more stress to the elevator hinge. Failure of the hinge would likely be more serious than failure of the gusset, so I am very strict with my walkarounds and inspections of these components. The most likely failure points on the hinge would be near the end where the gusset ends or at the hole where the elevator pivots. These points are visible on both sides of the hinge, so inspection is not difficult.



New gusset installed on elevator hinge



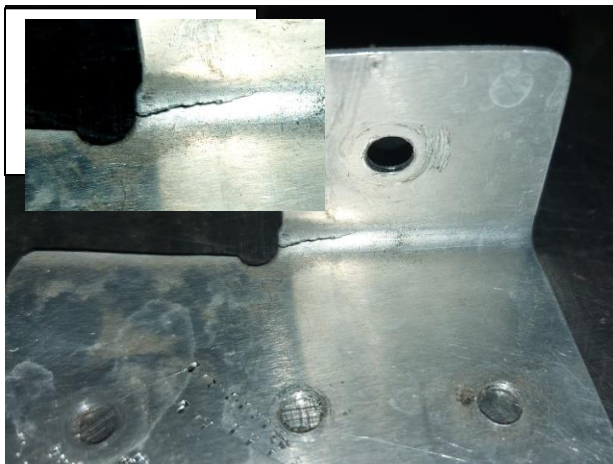
Opposite side of elevator hinge
(This part is easily observable during a walkaround.)

Horizontal Stabilizer Attachment Brackets:

The horizontal stabilizer is attached with four brackets. Each bracket has a gusset made from formed 0.040" aluminum sheet. The gussets must be trimmed to fit, and it can be difficult to trim just the right amount of material to fit, while maintaining the required hole edge distances. In fact, I trimmed too much material from one when we were initially building the airplane. I scrapped that part and made one from some thicker material I had on hand. This thicker part cracked at the bend several years ago and was replaced with a new part from Zenair.

Another lesson reinforced. While aluminum is reasonably ductile, thicker sheets require greater bend radii. Forming the part with thicker material and the same bend radius work hardened the material and made it brittle, which quickly led to a crack.

At my annual inspection this year, I found cracks developing at both rear gussets. This time, when trimming the gussets to fit, I used a larger diameter drill to provide a greater stress relief at the corner where material was removed. I also polished, instead of sanding the surface.



Old gusset showing a fatigue crack

Notice that the cracks started at a stress concentration point and that there is no permanent deformation of the parts. They are fatigue cracks making their way through the material and would have eventually led to a complete failure of the parts.

It remains to be seen if the new parts will last longer, but they are not too difficult to replace, if necessary. Again, these are gussets, so a failure would not be catastrophic, but could lead to serious consequences if ignored. In this case, I did not attempt to re-engineer the parts because I had factory original spares on hand and the original parts lasted seven years.

Determining the Cause:

One final piece of the puzzle is the question of what caused the cyclic stress that led to the failure of these parts and is it possible to reduce or eliminate it. I showed a picture of the hinge gusset on an internet forum and several "experts" insisted the elevator is binding and flexing the hinge. This is not the case, but if it was, it is certainly something that should be corrected promptly.

Another theory I heard is that the engine and propeller excite a natural frequency of the stabilizer and elevator. This might explain why some Zenair aircraft apparently do not experience this failure. A low-revving traditional aircraft engine with a 2-blade propeller would vibrate at a different frequency than my 5000 RPM Rotax with a 3-blade propeller. The member who pointed out the crack in my hinge gusset has a similar engine/propeller combination in his airplane. More data from different aircraft or maybe some camera footage would be required to determine whether this theory is valid.

For now, I am confident that the parts that could catastrophically fail are sound and properly assembled. I plan to order a new set of attachment bracket gussets in anticipation of replacing them again in the future.

Although this article covers specific components on a Zenair aircraft, fatigue failures can affect any aircraft. Aluminum is particularly susceptible, but other materials can and do suffer fatigue failures. It is important to identify the critical areas on your aircraft, inspect them at regular intervals and to address issues as soon as they are apparent to avoid a catastrophic failure.

- David Wood

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Upcoming Events in 2022: (Highlighted lines are KWRAA Events*)

Meetings are now held on the second Thursday night each month due to Monday night scheduling conflicts at the Cadet Youth Development Centre!

Meeting dates and protocols have changed as the pandemic progresses.

On-line meetings will resume due to the new Omicron variant of the Covid-19 virus.

Updates will be sent out to members via e-mail, along with a link to the meeting.

Look for KWRAA summer fly-in details soon.

March 10	-	March Meeting at 7:30 in the Cadet building at CYKF (tentative)
April 14	-	April Meeting at 7:30 in the Cadet building at CYKF (tentative)
May 12	-	May Meeting at 7:30 in the Cadet building at CYKF (tentative)
June 4	-	Northern Regional Fly-in – Midland Huronia Airport (tentative)
June 19	-	Shiny Side Up Rendezvous - Guelph Airpark (tentative)
June 23-25	-	Great Lakes International Airshow – St. Thomas ON
June 23-25	-	COPA Convention and Trade Show in Saint-Jean-sur-Richelieu, PQ
August 20-21	-	UPAC Convention, Plattsville ON (tentative)
September 8	-	September Meeting at 7:30 in the Cadet building at CYKF
October 13	-	October Meeting at 7:30 in the Cadet building at CYKF
November 10	-	November Meeting at 7:30 in the Cadet building at CYKF
November 25 ?	-	KWRAA Christmas Party – Details to follow later in 2022

* KWRAA events are fly-in and/or drive-in.

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