

Monthly Newsletter of the Kitchener-Waterloo RAA

- February 2022 -



For a number of years, this is how I monitored my gear position on the Zenair Amphibious floats. Convex mirrors mounted on the jury struts allowed me to look under the plane and floats to see the position of the wheels. Although it worked well in good lighting conditions, there were times when pre-defined procedures and luck was used in less than ideal light conditions. I am adding an LED 'Gear Position Indicator' system on the floats in 2022.

President's Message

My new Highlander "Aerial 2" is snugly tucked away for the winter and I'm tearing up the ski slopes waiting for warmer flying weather!

I hope all of you are making the best of winter whether you are flying or not. With a good portion of the cold weather over now, it won't be long before we are once again planning flyins and adventures to other parts of the province, country or beyond.

In this issue, you will find an article by David Wood on the BlueFire WiFi endoscope. This is an excellent tool for enclosed areas and an invaluable tool for inspections in hard to reach areas. It pairs with your cell phone or tablet to give you the ability to see inside the structure. Thanks David for this excellent review. Also in this issue of the newsletter, I delve into my simple design for a gear position indicator that uses magnetically-actuated reed switches to control LEDs that will show the position of the wheels of my Zenair amphibious floats.

This design considers simplicity, reliability, convenience, additional weight, and ease of use. I believe it gives me the best of all worlds, short of having an audible warning for incorrect position on landing. I hope to work on that issue soon too. For now it will be nice to know the position of my gear at a glance under all lighting conditions.

2022 is going to be a great year for KWRAA!

- Dan

BlueFire Wi-Fi Endoscope Tool Review

I recently purchased a BlueFire Wi-Fi endoscope from Amazon to facilitate the annual inspection of the horizontal stabilizer mounts on my CH750. We have a Ridgid See Snake in our tool inventory, but it has a few limitations. The biggest drawback of the See Snake is the size of the camera, which is quite large, so it is difficult to get into and maneuver in tight spaces. It also has a small screen and has no ability to take pictures or video.

The BlueFire endoscope costs as little as \$40 and ships for free from Amazon in a few days. Prices can be higher depending upon the resolution you require, but even 2 MP produces a nice image on your phone or tablet.

It includes a built in LED light, a 90° mirror, a hook and a magnet. The camera is battery powered and is recharged using a standard USB cable. For that price and knowing Amazon's no fuss return policy, I decided to give it a try.



There are two apps recommended to view the video from the camera on a smart phone or tablet: Scope View and HD WiFi. I tried both on my Android smart phone and was unable to retrieve the photos I took using the Scope View app to transfer them to another device, but I was able to view them in the app. The HD WiFi app is very similar to Scope View in function. It

stored normal .JPEG format photos in the Camera directory on my phone. I was able to transfer these to my laptop just like photos taken with the phone. I also tried the HD WiFi app on my iPad and it worked well.

After I got the app working, it was time to put it to work. The front stabilizer mounts are hidden under the skin. There is a small opening where each mount penetrates the skin on the bottom side of the stabilizer, but they are not useful for inspecting the mount unless the stabilizer is removed. I wanted to avoid disassembling and reassembling the stabilizer at each inspection.

The BlueFire endoscope fits into the opening and I was able to get a look at the mount and some of the rivets. In order to see all of the rivets and get another perspective I drilled a 3/8" hole in the skin above each mount. The diameter of the camera is less than $\frac{1}{4}$ ". A $\frac{3}{8}$ " openina gives enough extra room to maneuver. Using both the straight camera and the 90° mirror. I was able to get a very good look at the entire mount and all of the rivets, without removing the stabilizer. I was able to view the back side of the rivets through an existing opening in the top skin.



View from the top



View from the 90° mirror



New access holes in top stabilizer skin



View of rivets from the back



Front stabilizer mount

There are controls for the camera on the battery pack. You can set your phone or tablet where you can see it and use the controls on the camera to take pictures, zoom and adjust the light intensity. It was reasonably easy to get within the advertised 30-80mm focal length to get a good clear view. The cable was rigid enough to extend from the opening for the control cables, through the rear spar to the front spar where the mounts are attached. The length of the cable is about 4' so it should be useful in many locations.

I haven't had the opportunity to try this feature for real, but the magnet and hook attachments should be very useful for retrieving dropped tools or fasteners and I am sure that there will be many more times the camera will be useful.

For the price, this is definitely a good purchase for anyone wishing to inspect enclosed or hard to reach areas on aircraft.

- David Wood

Amphibious Gear Position Indicator

If you read last month's newsletter, you already know that I rebuilt my damaged Zenair floats and really look forward to this year's flying adventures. One of the changes I wanted to make to the setup I had on C-FDEP (Aerial One) is the addition of a visual indication of gear position that works in spite of adverse lighting conditions.

Night operations were always a challenge and a bit of a gamble, since I could only "see" the position when the wheels were aear illuminated. This also posed a challenge when the ambient light was just low or the contrast between the wheels and background inadequate to confirm their position. My verification system was simply a couple of convex mirrors mounted on the jury struts. By looking in the pilot side mirror I could see the passenger side gear and vice versa.

There are a number of commercial gear position systems available, but most are designed to operate on land-based aircraft. Seaplanes of course face the added challenge of operating in wet environments that require water proof switches. After consideration of a number of options, I decided to try to build my own system using reed switches and small magnets rather than micro-switches.



I ordered a number of reed switches and was surprised to find out how small they were. My last tango with reed switches was several decades ago when everything electronicsrelated was much bigger than today. The small size of the reed switches presented a bit of a challenge to mount them and I considered several mounting methods, but settled on a simple mount using a combination of a zip tie and protective shield of plastic tubing.



I drilled the end of the zip tie and inserted it through the tubing, and then I slowly and carefully worked the reed switch into the tube. The reed switch itself has a glass tube around it, so the plastic tubing should provide an added degree of protection from small objects that may strike it when taxiing.



I soldered on a length of 22 gauge tefzel wire and heat shrunk it onto the lead of the reed switch. I bent the other end to allow it to fit under the fastener that I will use to ground that end of the reed switch. I then cut and drilled the other end of the zip tie to complete the mounting strip.



Once the switches are mounted in the correct position on the amphibs, I will squeeze a bit of clear silicone sealant into each end to complete the watertight seal and protect the electrical connections.

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Next, I focused my attention on the display portion of the gear indicator. One of my main concerns was the number of wires required and how I could accomplish the goal with the minimum number of wires entering the cockpit.

One of my objectives when I initially built the floats was to make change-over from bush wheels to floats as easy as possible. I built the hydraulic system so that everything was selfcontained within the floats, including the hydraulic pump and lines, with the exception of the two wires that power the electric-hydraulic pump. Reversing power on those wires drives the gear up or down.

In keeping with my original goal for the floats, I decided to mount the gear position indicator on the floats, outside the cabin, so that only one wire was required to power the system. As a safety, I included a single red light to indicate power inside the box that contains the LED indicator circuits. Using the KISS principle, the circuits were kept simple. 12 volts DC is supplied to the LEDs then through resistors, whose values determines the brightness of the LEDs, then through the corresponding reed switches to ground.

The board I used was a simple pre-drilled multi-strip design that made assembly and layout fairly simple and logical.

Gear Position Indicator



The basic circuit of the gear position indicator is shown here although I did have to make a slight modification to the wiring. As luck would have it, the initial twelve column design required one more column of copper strips than would fit comfortably within the box I was using. I trimmed down the board to eleven columns, moved half of the circuits over one column then redesigned the middle rows to accommodate the red LED and its resistor.



I laid out the LEDs in a manner that would show at a glance whether each of the wheels had reached its full up or full down position. No light indicated that the gear was in transition or not fully deployed in either direction. As expected, four greens will indicate gear down for land and four blues will indicate gear up for water or sky. As mentioned previously, a centre-mounted red LED will remain on to indicate power is applied to the indicator circuits.



I kept the indicator circuit and box as light and small as I could while still making it large enough to keep a bit of separation between the LEDs so that gear position could be determined with a quick glance at the externally mounted box.

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The picture above shows the power leads connected to a nine volt battery to test the system out. There will be a total of eight additional wires into the box; one from each of the four reed switches indicating "gear up" and four from the reed switches indicating "gear down". I will be mounting the box on the pilot side of the floats, likely on the front riser strut in plain view from the pilot seat. All wiring that enters the box will be sealed with silicone, as will the mounting bolts and box closure screws to reduce possible corrosion to a bare minimum.

You can expect to see the rest of the story in one of the next issues of The Leading Edge. I will include additional photos and details once I complete the mounting of the box and all eight of the reed switches with their corresponding magnets onto the floats in March. Then, hopefully I can provide you with an update in May or June to let you know how my homebuilt gear position indicator is working for me on the new Highlander.

- Dan Oldridge

I saw this post the other day on one of my Facebook groups and was blown away!



Can you imagine a true 200hp. Rotax in a Highlander, Kitfox, Searey or Zenair 750?

I installed the Edge Performance EFI and Big Bore kit on my Rotax and found the difference in power was amazing at 120hp. I have trouble even imagining the short field performance with 200hp. No mention of price yet. It may even find its way into a Van's RV soon. The Rotax is much lighter than a Lycoming or Continental, so it would take off and land shorter, climb faster, cruise faster, fly higher, allow for more payload and burn high test auto gas instead of avgas once W&B issues are resolved.

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

Meetings are now held on the second <u>Thursday</u> 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.

February 10	-	February Meeting at 7:30 Details to follow as the situation changes.				
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)				
Look for summer fly-in details later in the New Year.						
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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