

- June 2023 -



Geoff Gartshore is shown here with the tables and chairs set up for our second Aerospace lesson on May 23rd. We do a number of science experiments to illustrate the properties of air, talk about organic flight, give the kids some hands-on time with the KR2 and flight simulators, then show some videos and a play a game to talk about aircraft designs, propulsion and mission profiles. We finish up by everyone building a balsa wood glider to take home. We hope they all learn something about aviation.

President's Message

Warm enough for you? As I finish up the June newsletter, we are experiencing a short spell of 30-degree weather, so it should make for a hot fly-in at Tom Shupe's place on Saturday. Keep the altitude density in mind if you plan on flying into the strip, which is only 1600 ft. Although it has clear approaches, consider this as you plan your arrival and departure.

As mentioned in the May newsletter, I made a few upgrades to Aerial 2, and documented a few in this issue. Please consider writing up a short article when you make changes and upgrades to your own aircraft as our other members would like to consider if the changes are suitable for their own planes.

The Cadet Youth Aerospace Program is going well and we received a ringing endorsement from the Experiential Learning Co-ordinator, who attended the session on Tuesday at the

Cadet Training Centre. KWRAA's participation in this program has been a major contributor to its success. Special thanks to Don, Lee, David, and Geoff for helping with the teaching aids.

Geoff and I have been teaching the grade six kids the properties of air, the 4 forces of flight, the 3 axes of movement (roll, pitch and yaw) as well as another hands-on session called airframes and aircraft design.

As a result of our efforts, KWRAA is gaining greater recognition and we have been offered one of the larger lockers in the parade square for any of our equipment, tools or custom teaching aids. We have also been asked to display a good-sized RAA banner there. We hope to keep this synergy going into the fall when classes and KWRAA meetings resume.

2023 is going to be a great year for KWRAA!

- Dan

The Upgrades Continue...

Auto-pilot and iPad Instruments

Over this past winter as with many before, I planned on the upgrades I wanted to do to my plane. I am certain many of you do the same.

For some time now, I have been looking at the iLevil AP, an all-in-one solution for flight instruments and auto-pilot. I was interested in the convenience and safety it might offer, even in a hands-on aircraft like the Highlander.

My AvMap engine monitor was experiencing a few issues, so I considered the addition of a GRT4000, since it would provide engine information on my iPad panel. Given the price differential, I decided to simply repair the AvMap EngiBox and replace a few probes.

Regardless, I ordered the iLevil AP just before Sun-n-Fun with the assumption that they had ramped up production beforehand and I wouldn't have to wait six to eight weeks to get it. My bet paid off and I had the unit within a week or so. It was a chore to move a few things around behind the panel in order to find a level, forward-facing spot to mount the unit.

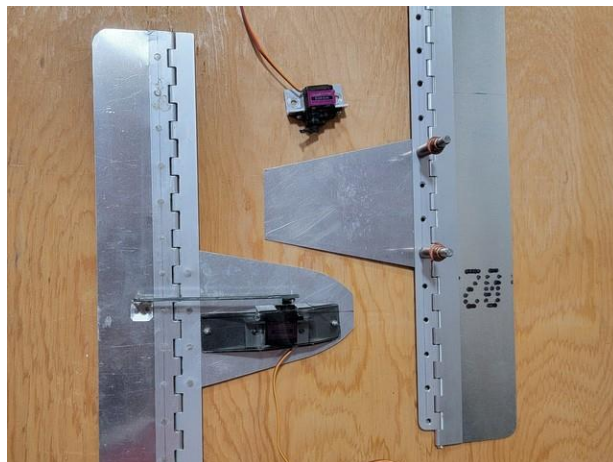


The iLevil AP is the blue coloured box in this photo

When purchasing the AP, there is an option to either buy pre-made servo trim tabs or build your own. Never one to turn down a reasonable challenge, I decided to build my own and save several hundred dollars.

The AP unit uses model aircraft servos to control the roll and pitch of the aircraft. Since they are small tabs, they can easily be overridden manually by the pilot if required.

The trim tabs that can be ordered with the AP unit are a nice carbon fiber construction, making them very light, but they are rather expensive. I chose to use .020 aluminum instead. The tabs are only about 2 inches by 16 inches, so the .020 seems plenty strong and is still relatively light.



The servos are very light and operate by trimming the aileron and elevator to achieve roll and pitch control. Since I was unable to find out the exact model number of the servo required, I bought three different ones to test out on the AP unit.

The software seems to be working well and I can display my flight information on the iPad. I hope to finish the calibration and set-up of the auto-pilot feature in the next week or so.

I will follow up in July with a review of how it works for me in the highlander and maybe a couple of links to videos of it in operation.

Fairings (Covers)

When I was trying to get the plane in the air in the autumn of 2021, I skipped putting on a few of the "finishing touches". This spring I finally constructed and installed some see-through pulley covers for the flap and aileron cables. These mount under the wing and attach to the fabric gluing plates around the pulleys.

I used 0.060 Lexan and bent them using a sheet metal brake. I have found that Lexan bends very cleanly and a series of small bends can be used to form a nice curve or even to create a mounting tab with a 90-degree bend.



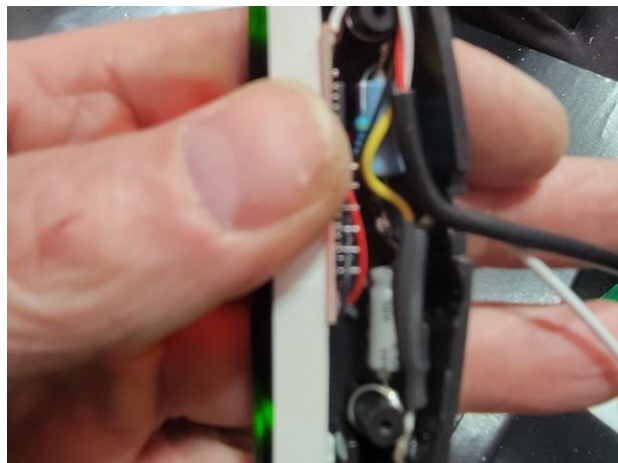
The result of using Lexan for pulley covers is not perfect by any means and I'm happy with the result, but until someone invents transparent aluminum, it will have to suffice.



Vertical Height Warning Device

A few years ago, I documented how I was using a car back-up alarm to assist with landings whether on land or water. I found this worked quite well on Aerial One, but the alarm function was not loud enough to always hear it over all of the other sounds in the cockpit. Also, I had a somewhat complex method of automatically turning the device on when needed and off when not needed.

To overcome the first issue, I removed the internal buzzer and installed a resistor and two capacitors to isolate the voltages, smooth out the square wave signal and pass the audio signal into my intercom audio line.



To solve the second issue, I installed a normally closed push button switch under the flap handle. When the flaps are up (flap handle is down) the circuit is open because the switch is depressed. When the flaps are deployed for take-off or landing, the circuit is activated and the audible height warnings are fed into the intercom.

I can report that this warning device is working very well. The sensors mounted on the wheel axels are pointed slightly inward so they don't see the tires, only the ground. The range is only about six feet and under; the same as a car backing toward an object. This device does not make landings easier, but it does provide a very BIG confidence boost as you near the ground and hear the beeping speed up as you transition (flare) to land the aircraft. When the aircraft is within a foot or so of the ground, the tone becomes steady, signalling you are about to touch down.

I will try to shoot another video in Aerial 2 and provide a link in the next issue, but for now, here is one from Aerial One five years ago that illustrates how it works. The audio is much harder to hear than the new circuit that feeds directly into the intercom.

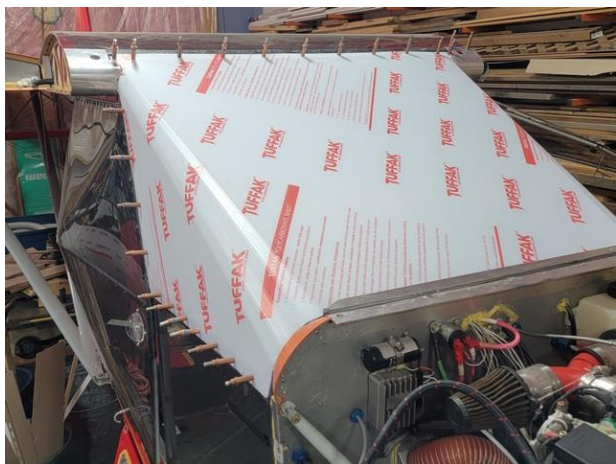
<https://www.youtube.com/watch?v=-Ugs9eoX26Y>

My New Custom Windscreen

While the Highlander was in for its annual this winter, I had a number of repairs, improvements and additions that I wanted to make. One of the key items in the repair/replace category was my custom Highlander windscreen. As many of you know, I wanted a bigger view area than the original Highlander provided, so I had made a custom windscreen that was 100% Lexan and did away with the boot cowl. Instead, the Lexan windscreen mounts directly to a custom bracket on the firewall and thus provides an uninterrupted forward view. The Lexan also extends down the sides all the way to the custom mounting strip attached directly to the chromoly frame at the sides of the cabin; providing improved views to each side.

The Leading Edge

Unfortunately, I had never attempted to bend such a large piece of 0.120 Lexan before and found that the installed windscreen was stressed too much, causing it to craze. This spring, I used a metal brake to make a series of 15-degree bends (bend to 30 and it springs back to 15) in order to achieve the 90 degree bends I required for my custom windscreen. When compared to the original Highlander windscreen, this looks more like a Whitman design, but given the improved view, reduced drag, and possibly more lift from the air passing over the cabin, I am pleased with the look.



I was concerned that this new design might have too much flex in the centre, but once it was mounted in place, there was very little flex and it seems to perform quite well even at 100kts., which is pretty much my top end anyway.

I will keep you posted on how this brake-bent windscreen holds up against the stresses, but I'm hoping the crazing problem is solved.

As for the view through the multiple bends, each line is practically invisible when looking through it with both eyes. Because of stereo vision, our brains "see" around anything smaller than the distance between our eyes, so even the much larger chromoly "V" braces of the cabin disappear when looking at the horizon. I used ¼ inch spacing at the top and 1 inch spacing at the bottom for the bends, so the windshield conforms to the shape of the firewall and engine cowling and forms a tight curve near the top. The fan shape of the

overall bends adds to the look and reduces the prism effect.

I am sure the camera did not do it justice since it's not stereo vision, but here is a photo showing the view through the new brake-bent Lexan windscreen. You can see some shadows of the bends, but they all but disappear when viewed from the cockpit. The reflections of the gray crossmembers show up more than the bends in the Lexan.



Creating the replacement windshield was not too difficult. I straightened out the old windshield and traced it onto a new sheet of 0.120 Lexan. I then used the old windshield to position the new mounting holes top and bottom. There are two holes at the firewall end since the Lexan is held there mostly by sandwiching it in aluminum strips and by the silicone caulking that seals it to the elements. The two holes are for pop rivets that hold it in position as the silicone cures. The top row of holes secure it to the overhead bulkhead mounting strip inside the cabin, but fasten through a finish and sealing strip outside above the cabin.

Once the windshield was clecoed in place, I positioned the sides over the mounting tabs and worked my way towards the lower rear corners, drilling and clecoeing as I went. I have 1/8" foam strips on each of the tabs and mounting points to reduce point loads and potential pressure point cracking of the Lexan.

You can check it out at an RAA fly-in and let me know what you think!

- Dan

Upcoming Events in 2023:

- Highlighted lines are KWRAA Events*
- Bolded Lines are KWRAA Fly-ins*
- *Fly-in Data Sheets are available on the KWRAA website at www.kwraa.net*

June 3	-	KWRAA Fly-in at Tom Shupe's (Mount Forest)
June 18	-	Father's Day Fly-in at CNC4 (Guelph)
July 8	-	KWRAA Fly-in at Largo Woods - CLW6 (Winterbourne)
July 24-July 30	-	Oshkosh Air Venture 2023
Aug 5	-	KWRAA Fly-in at Juergensen Field CPG7 (Fergus)
August 18-20	-	UPAC Convention 2023
Aug 26	-	KWRAA Fly-in at Largo Woods - CLW6 (Winterbourne)
Sept 2	-	KWRAA Fly-in at Deming Field – CDF6 (Damascus)
September 14	-	September Meeting at 7:30 in the Cadet building at CYKF
October 12	-	October Meeting at 7:30 in the Cadet building at CYKF
November 9	-	November Meeting at 7:30 in the Cadet building at CYKF
November 24	-	KWRAA Christmas Party – Details to follow later in 2023

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

KWRAA Executive Contact Information:

Due to an increase in spam emails, please reach out to me directly for the latest contact information for the KWRAA Executive members. Thank you, Dan Oldridge (519) 651-0651.

Classified Ads:

Mac Mc Culloch has two folding bikes for sale. He is asking for \$150 each, or best offer. Contact him at macpat@live.ca for details.

