

- November 2015 -



A trip to Tillsonburg Airport is almost always rewarding if you enjoy seeing vintage aircraft and warbirds. There are a number of resident Harvards and Yales as well as several migratory birds. ☺

## President's Message

Is it really November? What a great opportunity to get some late season flying in this year! With average temperatures almost 10 degrees above normal the last few of weeks, there have been some good flying days interspersed with the wet and windy November weather. I can't help but think that this is our reward for enduring one of the worst winters I can remember in recent years.

Who knows what this winter will bring, but for now, I'm enjoying some of the best flying I have had all year. We all know that cooler air helps with aircraft performance for both the engine and the lift generated by the wings, but another bonus is the cooler air can provide a few benefits for the pilot too.

During the hot summer months, I had to carry cold water to combat the heat of the sun in the cockpit, which leads to more frequent pit stops. I also had to constantly be flying with a hat and sunglasses, which may look cool, but restricts vision a bit. This time of year there is little

worry about overheating of iPads and Stratus unit, which happened on really bright days under the hot direct sun.

We are getting to the point now where pre-heating will become a must if we continue to fly as we move toward December and temperatures below the freezing mark. I'll soon have to make the decision about bringing the plane home to my garage for its annual and saying good bye to another flying season. But for now, the predictions are good for another week of Fall flying and that means it may be a shorter winter hiatus from flying this year.

All this flying has meant less progress on the floats, but I still figure that my Highlander will undergo a metamorphosis this winter and emerge as a seaplane. Who knows what adventures await in the 2016 flying season.

- Dan

*Thanks again to Lee Coulman for another great technical article in this month's issue.*

## Traffic 12 o'clock, 2400 feet?

My transponder is reporting my position and altitude but ATC reports to my conflicting "Traffic 12 o'clock 2400 feet, a Searey southbound". But I was actually travelling at 3100 feet and traffic coming at me was at 3000 and climbing! Better sort this out quickly, as this is Class C airspace and my transponder better be working properly!

Well, there is more to this. The week before the tower had reported they had an issue with my transponder altitude output. I thought I had some pitot/static problems, so I had cleaned out the static lines and patched up a pitot line leak on my amateur built. Anyway, that's all I could find. The reported transponder pressure altitude (PA) seemed to agree when I departed. I don't fly much above 2500 feet, so I don't normally exercise my encoder over a wide range.

**Aircraft Altitude** – Is obtained on the ATC radar display by adding in the local altimeter setting.  $Altitude = PA + 100ft \text{ per } 0.1" \text{ above } 29.92"$

I had to do a little bit of a step back to think about how all this was connected. The static port on my Searey is connected to the steam gauge altimeter, the airspeed and then to my Dynon D10A EFIS. The Dynon displays the barometric altitude but also outputs the pressure altitude (PA) to the transponder. Unfortunately, my Microair T2000 transponder

**PA** – pressure altitude. Set the altimeter setting to 29.92" Hg (standard atmospheric pressure). The transponder encoder reports this altitude via the Mode C link to the ATC ground radar as Flight Level (FL). Ex 2400 ft PA becomes FL24.

requires a parallel interface, so a Dynon Encoder Converter was required. The 12 individual wires reflect the Gilliam Code for the Mode C of the transponder. This unique interface covers the altitude range of -FL15 to FL1270 with only one bit change per increment. (see sample in Table 2)

So what was really happening? Why was my altimeter indicating 3100 ft., but ATC thought I was at 2400 ft.? They had given me a transponder code to identify me. I had set the altimeter setting of 29.92" from the ATIS. Well it was me and I wasn't at 2400ft. It was Class C airspace (or about to be) and the Tower should have known better. Let's back up again to attempt to sort this out.

On initial contact with a "Class C" ATC facility there is a very important interchange on the radio, such as:

*"Waterloo Tower, Searey Golf Juliet India Bravo with Information KILO"*

*"Golf Juliet India Bravo, Waterloo Tower, squawk 1234, state altitude and intentions"*

*"Waterloo Tower, Juliet India Bravo over Elmira, 3 thousand 100 hundred, landing Waterloo"*

What should happen next is that the radar picks up the reply from my transponder so that the controller can confirm my position and altitude.

What should have happened was:

"Juliet India Bravo confirm your altimeter setting."

"2992, Juliet India Bravo"

"Juliet India Bravo, your radar reported altitude is 2400 ft."

At that time I probably should have been refused entry into Class C airspace and told to turn off my Mode C altitude reporting.

Instead, I got the response,

*"Juliet India Bravo radar identified; cleared for left downwind Runway 26"*

The tower gave me the traffic advisory as if I was really at 2400 ft. With my altimeter confirmation that I was actually at 3100 ft., my eyeballs peeled back as I searched for the conflicting traffic at 3000 ft. heading my way.

# The Leading Edge

What is the real root cause of the incorrect Pressure Altitude? I ran a flying test of course, but a ground test would have worked I guess. So, climb to 3400 with the altimeter set to

29.92, and what do we see on the PA display of the transponder? Then change the altitude and see what happens.

**TABLE 1** Altimeter Flight Test Results

Altimeter (old steam gauge @29.92)	Transponder – Pressure Altitude	Comment
3400	2100 (FL21)	Oh-Oh, try a climb...
3500	2000 (FL20)	What? I climb, it goes down?
3300	2200 (FL22)	I descend, but goes up?
3100	2400 (FL24)	Ditto.
2800	2700 (FL27)	Well, that's closer.
2700	2700 (FL27)	Bingo. Finally, it really does work
2600	2600 (FL26)	Again, it's good?
2400	2400 (FL24)	Again, it's good!!

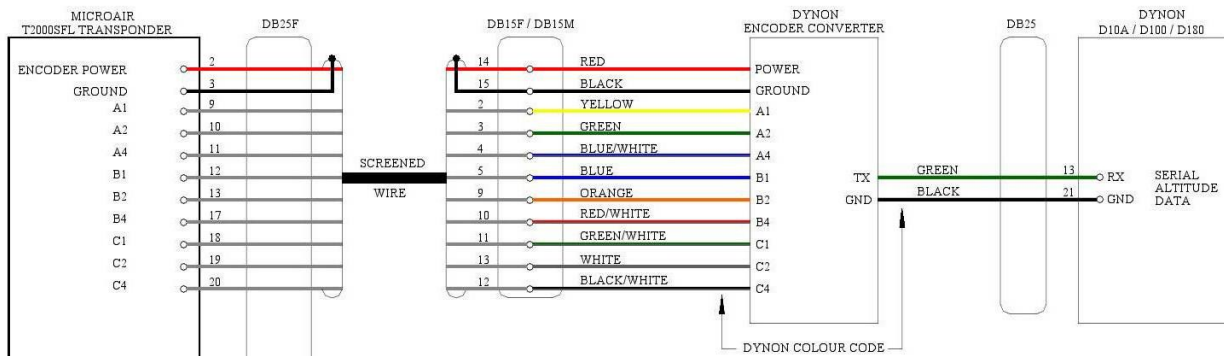
**TABLE 2** Gilliam Code to the Transponder – 12 interlines for -1500 ft to 126,700 ft PA

P-ALTITUDE	FL	A1	A2	A4	B1	B2	B4	C1	C2	C4	D1	D2	D4
D Encoder		Y	G	B/W	B	O	R/W	G/W	W	B/W	X	X	X
Transponder		9	10	11	12	13	17	18	19	20	X	X	X
-1500.....	-15	0	0	0	0	0	0	0	0	0	0	0	0
2000	20	0	0	0	1	0	1	0	1	0	0	0	0
2100	21	0	0	0	1	0	1	1	1	0	0	0	0
2200	22	0	0	0	1	0	1	1	0	0	0	0	0
2300	23	0	0	0	1	0	0	1	0	0	0	0	0
2400	24	0	0	0	1	0	0	1	1	0	0	0	0
2500	25	0	0	0	1	0	0	0	1	0	0	0	0
2600	26	0	0	0	1	0	0	0	1	1	0	0	0
2700	27	0	0	0	1	0	0	0	0	1	0	0	0
2800	28	0	0	1	1	0	0	0	0	1	0	0	0
2900	29	0	0	1	1	0	0	0	1	1	0	0	0
3000	30	0	0	1	1	0	0	0	1	0	0	0	0
3100	31	0	0	1	1	0	0	1	1	0	0	0	0
3200	32	0	0	1	1	0	0	1	0	0	0	0	0
3300	33	0	0	1	1	0	1	1	0	0	0	0	0
3400	34	0	0	1	1	0	1	1	1	0	0	0	0
3500	35	0	0	1	1	0	1	0	1	0	0	0	0
3600	36	0	0	1	1	0	1	0	1	1	0	0	0
3700	37	0	0	1	1	0	1	0	0	1	0	0	0
3800	38	0	0	1	1	1	1	0	0	1	0	0	0
3900	39	0	0	1	1	1	1	0	1	1	0	0	0
4000	40	0	0	1	1	1	1	0	1	0	0	0	0
...126,700	1267	0	0	0	0	0	0	0	0	1	0	1	0

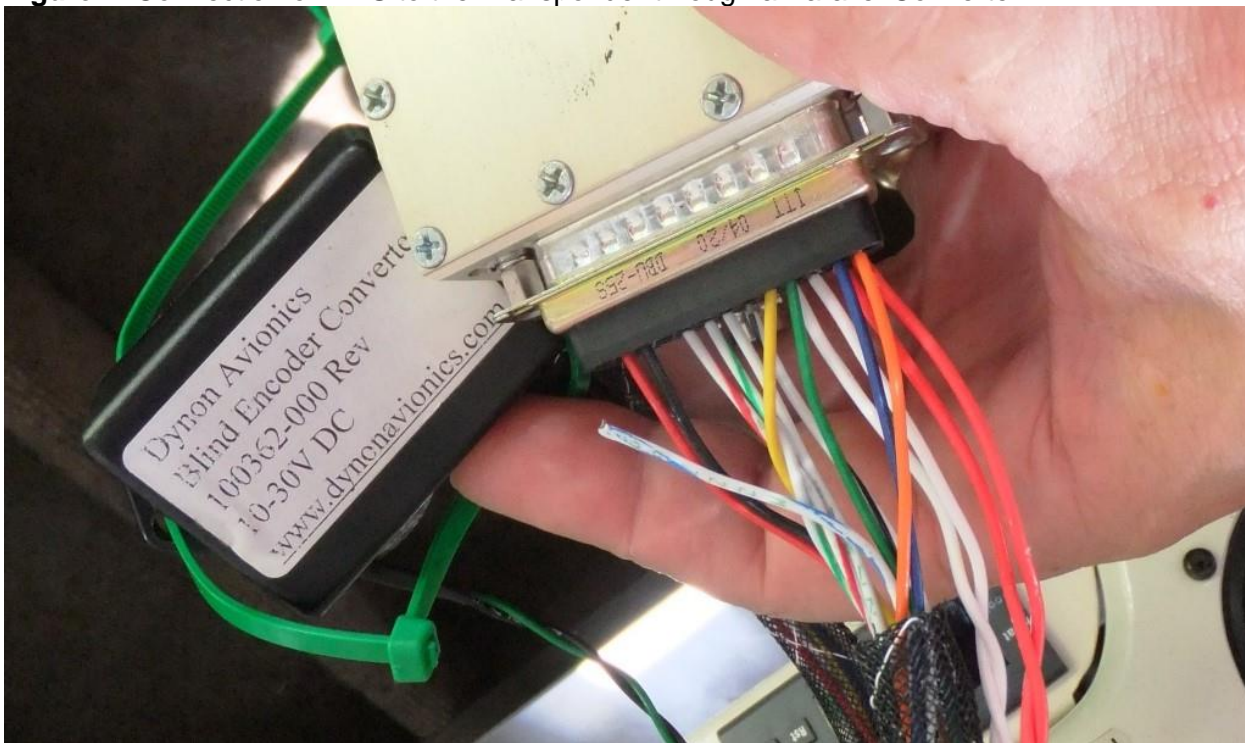
# The Leading Edge

Well that gave me some very solid clues. The results showed that the same 2400 PA for input altitudes of 3100 and 2400 ft. If you look back at Table 2, then you see that the only difference between these two is the A4 bit (shaded). If the A4 bit doesn't get set to "1"

then the output will increase to 2700 and then fold back down. This matches the results. So the A4 input is dead or the wire for A4 is broken. The first course of action was to open the connector of the back of the transponder.



**Figure 1** Connection of EFIS to the Transponder through a Parallel Converter



That was it ... the white/blue wire was broken at the contact insert. I removed the pin and put on a new one, while straightening out the other wires to improve the strain relief effectiveness.

Well, that was easy and cheap. I can now fly into Class C airspace with confidence.

Another learning moment... Keep your eyes open for traffic at ALL times. It sure helps to know where other traffic is reported, but it may be wrong. Keep your safety equipment up-to-date and functional. This of course includes your transponder and pitot / static system.

So, how can we make sure that our transponder systems continue to work properly? Here are a few ideas.

1. Have your system checked by an avionics tech. The two year recertification process takes the system through the complete altitude range and validates the transponder replies. (Altimeters per CAR 571 Appendix B, CAR 571 Appendix F for transponders )
2. Annual Inspection: Better yet, why not at every annual (amateur built), exercise the pitot/static system. I use a syringe connected to the static system to carefully check out that the altimeter readings and look for leaks in the lines.
3. Design. If you're designing your pitot/static and transponder installation, then make sure you get a transponder with a pressure altitude read-out. Lay out pitot static lines for easy testing and maintenance. Buy well integrated equipment that minimizes the interfaces and provides full function, hopefully leading to ADS-B compatibility.
4. Pre-Flight. Visually inspect the pitot and static ports for foreign objects in the ports, security of the attachments and of course remove the covers. Clean around the transponder antenna base, especially if you have one of those cheap "TED" antennas. A little bit of dirt, oil and water can severely affect the performance.
5. Periodically check, or put it in your pre-take-off check list to check, the Pressure Altitude read out on your transponder, versus your altimeter. Check it during flight.
6. ATC Check. Periodically, talk to ATC to verify your altitude. At one time we called this a "harmonization check". This is a good reassurance that things are functioning normally and rarely a bother to ATC except at the very busiest of times.

Fly safely and have fun!

Lee Coulman  
Director of Airmanship & Flight Safety KWRAA

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## See you at the January 2016 meeting at 7:30 on the 11<sup>th</sup>!

Fred Grootarz will be conducting the annual Re-currency training and issuing logbook stickers. This is a great opportunity to fulfill the bi-annual currency training requirement.

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**Please note:** The RAA Christmas party date has been confirmed on **Friday, November 27, 2015**.

We are back at Ariss Valley Golf and Country Club (Room seats 125 people)

**Less than two weeks left to get your tickets or confirm your attendance!**

Price is confirmed now at \$35 per person. Contact Mike Thorp or Mac McColluch.

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## Upcoming Events in 2015: (Highlighted lines are KWRAA Events)

**November 27** - KWRAA Christmas Party in lieu of a December meeting

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**Be sure to check out the KWRAA website regularly for the latest information regarding KWRAA events and more chapter information.**