Flying by Feel

by Stu Simpson

Flight instruments. We need them, or do we, really?

In Canada, there's no legal requirement for an ultralight aircraft to have any instruments by which to fly. That's an interesting notion, since that rule was put in place back in the 80's when the ultralights of the day simply didn't have any place where they could mount instruments. Most ULs at that time were similar to the much revered Lazair; largely open-air, and there was no more protection than a helmet, goggles and a leather jacket. Big bugs were the biggest hazard.

I acquired my first aircraft, a Spectrum Beaver, in the early 90s and flew it for a couple of years with only two instruments. One was a tachometer that was - and I kid you not - duct taped to the fibreglass wind fairing near my feet.

The other was a Hall Brothers airspeed indicator clamped to a cockpit support tube. This ASI was simply an 8" high clear plastic tube with graduated speed markings in 10 mph increments. It had a small pitot hole in the bottom and a vent hole on the top. Forward speed forced the airstream into the pitot and lifted a small disk on a central rod. You divined airspeed from the 10 mph mark the disk hovered closest to. At this writing it has not been certified for IFR use.

There was a yaw string atop the fairing, too, but does that qualify as an actual instrument? Flying then was done almost completely by feel and sight. It was largely inaccurate, of course, especially without an altimeter. But I'd learned what things looked like from about 1000' AGL and was able to stay clear of Calgary's class C floor.

I learned a lot about flying in those years, and it was markedly different from what pilots learn in planes with more gauges. I learned to listen to my airplane, to know I was yawing when the wind hit me on the side of the helmet, to sense what the Beaver was doing without any dials there to tell me. I learned to fly by feel. And those lessons have served me well in my flying career.

Aviation's pioneering airplanes also had no instruments, which evoked the term 'flying by the seat of your pants'. It meant you judged what the plane was doing by how it felt in your bottom. Early ultralight flying, essentially aviation having come full circle, is as direct a comparison as you can get to flight in the early 1900s.

Ultralights have long since evolved into proper and capable aircraft but the instrumentation rule still stands. I don't know if that's good or bad.

As my flying has evolved, so have my airplanes and so have their instrument panels. My Cavalier is the most complex plane I've owned. The panel sports a Dynon EFIS, two GPS units, an extra ASI and altimeter, a quad engine gauge, ammeter, fuel pressure, carb temperature, back-up oil pressure, tachometer, radio, transponder and even an autopilot. Plus, there are all the switches, circuit breakers and controls for the plane.

As you can imagine, the back side of the panel is something akin to the jungles of Borneo, lacking only a babbling brook and howling monkeys. It's an easy place to get lost and I've often been tempted to hack at it with a machete.

We all know that flight instruments serve many purposes and add immensely to aviation safety and aircraft capability. But what happens when the instruments don't work? Can a pilot continue to fly safely, and equally important, can he or she land safely without reference to the instruments?

I always wondered about that very question. One summer day I had the opportunity to learn my own answer when I lost all my flight instrument information without warning.

I'd flown the previous day from Chestermere-Kirkby Field to Castlegar for an overnight stay with my folks. Heading home on a pristine summer morning, north of Cranbrook in the Columbia Valley, my Dynon EFIS went black. It was my primary flight instrument that fed me airspeed, altitude, horizon, vertical speed, turn and bank and heading information.

I tried everything possible to get it working again, but it remained lifeless. Fortunately, the laws of physics hadn't changed any and I was still flying. Fuel still flowed and the engine was running just fine. Plus, I had two GPS's, a map and perfect weather. My satellite receivers both display ground speed and altitude so I had the crucial information I needed to continue on safely. At the time I did not have the back-up ASI or altimeter.

All this put me in a pretty good position. The next available airport was Invermere, about 40 miles away, less than 20 minutes in the Cav. Should I land and try to fix the problem, or continue on to home? I decided I should land in case the dead Dynon indicated a deeper electrical fault. I didn't want to deal with something like that over mountainous terrain.

But it meant landing at an unfamiliar (not completely unknown) airport, with no direct airspeed readout. Could I do so safely? I reckoned I could.

As I did in my Beaver, I have pretty good skills in feeling what my Cavalier is doing, skills that improve as I get more experience with it.

I know the Cav's RPM just by the engine noise and how the prop looks. I can deduce airspeed from the engine sound, cockpit noise and control feel, and on approach by the visual ground speed. I can often tell if I'm climbing or descending just by a glance at the wing's angle of attack, and the feel in seat of my pants. Frequently, but less accurately, I can also discern altitude from a look out the window.

Thus, my landing at Invermere was absolutely a non-event. I flew the approach by feel and sound, and according to GPS, just a touch fast.

I couldn't fix or even locate the fault on the EFIS and it was clear there was no other fault in the electrical system. I did have another dilemma, though. Should I continue on to home?

I weighed all the important factors. First, could I safely fly the plane with the instruments I had available? I'd answered that question already by the simple fact of the effortless flight to, and landing at,

Invermere. What about the weather? It was great; a clear sky and a very light wind at my current location, and along the route home. Nav Canada posts forecasts for Calgary every three hours, adding to my confidence in the weather predictions. I wasn't working with old forecast data.

The airplane was otherwise sound, I had lots of fuel and two additional sources of speed and altitude information.

Had the winds been strong or gusty I wouldn't have flown on. Discerning airspeed from GPS alone in steady, light or calm winds is one thing. Doing so with strong gusts could be quite another, leading to larger disparities between perception and reality. The same applies to cloud height and visibility. Had there been low cloud or questionable vis, I'd have taken a bus home.

My flight to Kirkby's was a beautiful flight through the Rocks. There's only one point of note. Leaving the Bow Valley put me pretty close to Springbank airport's control areas. There's not a lot of space between the hilly terrain and the controlled airspace. I was unsure of how accurate the GPS altitude was and I didn't want to bust into controlled airspace unannounced and unwanted.

Thus, I called Calgary Terminal, which governs the airspace outside of YBW's control zone and asked for vectors. I let the controller know my altimeter was unserviceable and that I was flying by GPS altitude alone. The controller appreciated my heads-up to him and remarked that my GPS appeared to be bang on for height. There was no trouble getting vectors to the east side of Calgary, where I dropped beneath the class C floor and headed on to Kirkby's a few minutes away. Once again, I landed the Cav without any trouble at all.

The whole incident drove home to me a number of important points. First, fly the plane. My EFIS broke, but nothing changed to affect the Cav's ability to fly safely. It pays to know your airplane and especially how to fly it safely when problems arise. Know how the airplane really feels in crucial aspects of flight. Practice partial panel flying with an instructor. Had I been less familiar with the Cav I'd not have continued from Invermere without repairs.

Weigh ALL the factors that affect your flight each time you fly. Had the weather been less than perfect, or the Cav been any less capable, such as only having one GPS, I likely would have stayed on the ground. The same goes for whether or not I was up to flying the airplane safely without the EFIS.

Don't be shy to ask for help. My decision to contact Terminal and to tell them the score was a great move that really enhanced my safety and others' on a busy day in crowded airspace. I've also since installed a back-up ASI and altimeter.

There's one last thing to tell you. I contacted Dynon about the broken EFIS. They responded wonderfully and had another one in the mail for me the next day, based on me returning mine for repairs. The re-conditioned one I received has performed flawlessly since installation, and it's under a new full warranty that began upon my receipt of the instrument. I would readily purchase Dynon products in the future.